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Codification of lines and wagons for combined transport and associated operational procedures

Technical document : ERA/TD/2023-01/CCT

Version : 1.0

Date : 6 March 2023

	<i>Drafted by</i>	<i>Validated by</i>	<i>Approved by</i>
<i>Name</i>	Antoine DEFOSSEZ	Olivier PIRON	Pio GUIDO
<i>Position</i>	Project Officer	Head of Unit	Head of Department
<i>Date</i>	06/03/2023	06/03/2023	06/03/2023
<i>Signature</i>			

<i>Version</i>	<i>Date</i>	<i>Comments</i>
0.1	28/02/2023	First draft - Conversion from the FCT document drafted by the topical working group on combined transport / combined with UIC 50596-6
1.0	06/03/2023	Second draft for upload for the RISC 98
1.1	21/03/2023	Editorial changes further to the review by the members of the Topical Working Group on Combined Transport Addition on the terms of the copyright

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1 DEFINITION OF ASPECT/SCOPE

1.1 General

In most of the European countries, a freight wagon loaded with an intermodal loading unit will exceed in its upper part the loading gauge permitted on the line. Consequently, the loaded freight wagon may have to be operated under the rules applicable to exceptional transport.

To facilitate the operation of such loaded freight wagons under other rules than exceptional transport, a codification system is applicable to the three constitutive elements that are the line, the freight wagon, and the intermodal loading unit (ILU). This codification system permits to check the technical compatibility between the loaded freight wagon and the line.

The present document is largely based on the UIC IRS 50596-6:2018, whereas its scope limited to:

- the codification of lines as required in RINF,
- the codification of wagons for those lines, as required in WAG TSI, and
- the procedures for operating codified loaded freight wagons on the codified lines, as required in OPE TSI.
- the codification of ILUs isn't specified in this document; ILUs are considered codified, identified by marking according to ISO 6346:2022 or EN 13044-1:2011 and suitable for wagons with an appropriate compatibility code.

The relevant part of UIC IRS 50596-6 have been integrated with the permission of UIC. However, as UIC IRS 50596-6 is also covering the ILUs and is intended to be applied as a whole, UIC does not take responsibility on how the present document will be used.

The codification of the lines is specified in point 2.1. Two approaches are possible to codify the lines of a network. The choice of the approach used is determined by the Infrastructure Manager.

The codification of freight wagons is specified in point 2.2. It includes the wagon compatibility code and, where necessary, the wagon correction digit.

According to the comparison made between the code of a line and the code of loaded freight wagons, specific operational procedures can be defined. This is specified in point 3.

1.2 Reference documents

Acronym	Name	Reference
RINF	Register of Infrastructure	Commission Implementing Regulation (EU) 2019/777 of 16 May 2019 on the common specifications for the register of railway infrastructure and repealing Implementing Decision 2014/880/EU
OPE TSI	Technical specification for interoperability relating to operation and traffic management	Commission Implementing Regulation (EU) 2019/773 of 16 May 2019 on the technical specification for interoperability relating to the operation and traffic management subsystem of the rail system within the European Union and repealing Decision 2012/757/EU
WAG TSI	Technical specification for interoperability relating to freight wagons	Commission Regulation (EU) No 321/2013 of 13 March 2013 concerning the technical specification for interoperability relating to the subsystem rolling stock – freight wagons of the rail system in the European Union and repealing Decision 2006/861/EC

1.3 Definitions

Combined Transport: in this document, Combined Transport is a subcategory of Intermodal Freight Transport as defined in the “[Glossary for transport statistics](#)” where the longest of the successive modes of transport is rail and of which the movement of empty intermodal transport units is considered to be part.

Combined Transport Train: as defined in the TSI OPE, Appendix J, a combined transport train is a freight train composed completely or partly of freight wagons loaded with intermodal loading unit(s) (e.g. swap bodies, semi-trailers, containers, roller units).

Combined Transport Profile (CTP): it is attributed to a section of line. It represents a completely closed envelope with specified shape and dimensions which a given intermodal loading unit, in loaded position on a suitable codified wagon, shall not encroach upon at any time. It is a combination of the wagon compatibility code (WCC) and the Combined Transport Profile number (CTP no.) (e.g. C45, P400).

Intermodal Loading Unit (ILU): Loading which is suitable for intermodal transport on road, rail and inland waterways or sea. It is a synonym of ITU (Intermodal Transport Unit) as defined in the “[Glossary for transport statistics](#)”.

Roller Unit: Roller units for horizontal handling are units which have two side-bearers, one or several front-end grab handling fittings, and one or two pairs of wheels at the rear. They may be loaded on special lorries and conveyed by road. In this document, the roller units considered are codified and suitable for wagons with a compatibility code B.

Semi-trailer: Non powered road vehicle which is transported by rail loaded on fixed-recess wagons (pocket wagons). In this document, the semi-trailer is meant to be suitable for handling by crane. It is handled by gantry cranes or mobile transshipment equipment by the grapples pockets using grabs and lifted and loaded on the pocket wagons (vertical transshipment). In this document, the semi-trailers considered are codified and suitable for wagons with a compatibility code P.

Swap body: Intermodal Loading Unit optimised to road vehicle dimensions and fitted with handling devices for transfer between modes, usually road/rail. It is handled by gantry cranes or mobile transshipment equipment by the grapples pockets using grabs and lifted and loaded on the carrier wagons (vertical transshipment). In this document, the swap bodies considered are codified and suitable for wagons with a compatibility code C.

Technical Number: the technical number is attributed to an ILU. It is a combination of the wagon compatibility code (WCC) and the Combined Transport Profile number (CTP no.) (e.g. C45, P400).

Wagon Compatibility Code (WCC): the WCC is a letter indicating, for an ILU, which the freight wagon is compatible and, respectively, for a freight wagon, which ILU is compatible (e.g. C, P). The WCC is also used in the combined transport profile of a section of line.

Wagon Correction Digit (WCD): the WCD is a relative number reflecting the characteristics of a given wagon compared to a reference wagon; this number is subtracted from the technical number of the ILU.

2 REQUIREMENTS ON CODIFICATION

2.1 Codification of lines – RINF parameters 1.1.1.1.3.4, 1.1.1.1.3.5, 1.1.1.1.3.8 and 1.1.1.1.3.9

The determination of the Combined Transport Profile (CTP) of a section of line can be based either on the structure gauge of that section of line or on the characteristics of the section of line and the exact position of the obstacles.

When the codification is based on the structure gauge, it shall be determined according to point 4.2.3.1 of the TSI INF (referring to EN 15273-3:2013+A1:2016) or according to other standards when this would result in a better CTP.

When the codification is based on the physical position of obstacles, which in practice is beyond the calculated limits of the gauge, the physical position of obstacles is determined by field measurements. On that basis, associated rules shall be determined considering section 5 of EN 15273-3:2013+A1:2016 and section 5 of EN 15273-2:2013+A1:2016.

A CTP consists of one or more letters followed by one or more numbers of 2 or 3 digits:

- the letter(s) correspond to the type of wagon + ILU for which the line is codified, according to the Table 1,
- the number(s) correspond to the line profile for the type of wagon + ILU considered and is established as indicated below.

The standard CTP number comprises:

- 2 digits
 - for semi-trailers up to a maximum width of 2.50m
 - for swap bodies and roller units up to a maximum width of 2.55m
 - for ISO containers up to a maximum width of 2.438m
- 3 digits:
 - for semi-trailers wider than 2.50m but not wider than 2.60m
 - for swap bodies and roller units wider than 2.55m but not wider than 2.60m

The special CTP number comprises:

- 2 digits
 - for semi-trailers up to a maximum width of 2.50m
 - for swap bodies and roller units up to a maximum width of 2.55m
- 3 digits:
 - for semi-trailers wider than 2.50m but not wider than 2.60m
 - for swap bodies and roller units wider than 2.55m but not wider than 2.60m

Note: the use of special CTP number should be avoided in the EU Member States .

A profile is composed of a “lower part” and an “upper part”. It is the “upper part” that determines the CTP of the line according to:

- Table 1 and Table 2 that determine the type of wagon + ILU for which the line is codified,
- annexes B, C, D and E of this document, in which the half-widths are given in relation to the mean longitudinal vertical plane of the ILU, and
- appendix H.3 of the WAG TSI determining the characteristics of the reference wagons for the 'P' profiles and for the 'C' and ISO profiles.

It is possible to carry out a single or a separate codification for the ‘P’ and ‘C’ profiles: the ‘P’ profile number may be subject to an abatement because of the roll due to the tyres of the semi-trailer while this abatement wouldn’t apply to the ‘C’ profile number.

The standard design characteristics of other types of wagons given in Table 2 are defined in such a way that they can be ascribed either to line profile ‘P’ or to line profile ‘C’, as follows:

- if the section of line has a single codification ‘P’/‘C’, this code also applies to the carriage of roller units for horizontal transshipment ‘B’,
- if the section of line has a different codification for ‘P’ and ‘C’, the code for ‘C’ also applies to the carriage of roller units for horizontal transshipment ‘B’,

The profile number allocated is independent of the deflection under load and of the wear condition of the wagon.

The CTP, with its letter and number, is directly comparable to the Technical Number of an ILU. This makes it possible to readily assess the type of coded ILU that can circulate on a section of line, when loaded on a wagon having similar characteristics than the reference wagons specified in Appendix H.3 of the WAG TSI.

For wagons whose characteristics don’t match those of the reference wagons, wagon correction digits shall be calculated in accordance with point 2.2.2.

2.2 Codification of freight wagons – TSI WAG point 4.2.3.1

The codification of a freight wagon consists in the allocation of a wagon compatibility code (WCC) and, where necessary, one or more wagon correction digits (WCD).

2.2.1 Wagon compatibility code

The attribution of the WCC is always part of the authorisation of the freight wagon (see WAG TSI, point 4.2.3.1). The WCC specifies the type of wagon on which an ILU can be loaded. That code is defined according to table 1 and it is valid for the whole Union rail system.

Table 1 wagon compatibility codes considered in this document

Wagon compatibility code	ILU	Suitable wagon
P	Semi-trailers	Recess wagons with seating device
C	Swap bodies and ISO containers with a width of 2438mm	Carrier wagons and recess wagons
ISO	ISO containers with a width of 2438mm	Carrier wagons ¹
B	Roller units ²	Carrier wagons

Table 2: characteristics of combined transport wagons considered in this document

¹ A wagon marked ‘ISO’ shall not be marked ‘C’; it is authorised only for the carriage of ISO containers of 2438mm wide

² In addition, roller units and the wagons suitable for their transport are attributed a level of compatibility which isn’t considered in this document.

	Bogie carrier wagon	Carrier wagon for roller unit for horizontal transshipment	2-axle carrier wagon for swap bodies and roller units
Wagon compatibility code	P / C / ISO	(B)	B / C
Total lateral play of the wagon	11.5mm	11.5mm	23mm
Distance between bogie pivots or wheelbase for 2-axle wagons	See points A.1, A.3 and A.4	See point A.1	See point A.2
Bogie wheelbase	See points A.1, A.3 and A.4	See point A.1	
Height of reference plane in relation to rail level	330mm	330mm	330mm
Maximum overhang of the ILU in relation to bogie pivots and in relation to axles for the 2-axle wagons	P: see point A.3 C: See points A.1 ISO: See point A.4	See point A.1	C: See point A.2
Maximum off-centre position of the ILU resulting from centring tolerances:			
- near the tyres	10mm		
- near the seating or bearing device	10mm		
- for swap bodies, ISO containers and roller units	10mm	10mm	10mm

2.2.2 Wagon correction digit

2.2.2.1 Attribution of wagon correction digits before the authorisation

The attribution of the wagon correction digit is part of the authorisation only upon request of the applicant.

The diagrams of Annexe A shall be used to obtain a correction digit applicable on all networks based on a comparison of the characteristics of the wagon being codified with those specified in Table 2.

Accordingly, the characteristics of the wagon being codified may be:

1. equivalent to the characteristics specified in Table 2: the representative point of the wagon being codified is on the limit curve of the figure provided in Annex A. No wagon correction digit is required.

2. better than the characteristics specified in Table 2: this is the case when the representative point of the wagon is in the positive number zone of the figure provided in Annex A. In that case, for bogie wagons for the carriage of swap bodies, roller units or semi-trailers, a correction digit may be determined based on the difference between the height of the limit curve for the wheelbase in question and the height of the loading plane of the wagon being codified.
3. worse than the characteristics of a reference wagon: this is the case when the representative point of the wagon is in the negative number zone of the figure provided in Annex A. In that case a wagon correction digit needs to be obtained for all networks where it is intended to operate the wagon.

Note 1: when the characteristics of the unit being codified don't permit to use the figures provided in Annex A, the case 3 applies.

Note 2: in case 2, the resulting positive correction digit is valid for all EU, meaning that it isn't the optimum for each EU network. To determine an optimum positive correction digit for a network, point 2.2.2.2 applies.

According to Appendix H of the WAG TSI, a Notified Body should assess the comparison performed by the applicant and include it in its report.

2.2.2.2 Attribution of wagon correction digits in case it isn't delivered during the authorisation

When the wagon correction digit isn't delivered during the authorisation (due to the applicant not requesting it or due to the characteristics of the wagon being in case 3 above), or when a requester wants to get the best possible positive correction digit for a given network, a request for codification should be addressed for each network where it is intended to operate the wagon.

The attribution of the wagon correction digit in that case isn't in the scope of the present document.

3 OPERATIONAL PROCEDURES

3.1 Route compatibility check - TSI OPE Appendix D1

This compatibility check consists of a comparison between the following codes, as defined in point 1.3:

- the Combined Transport Code (CT code) of the loaded freight wagon on one side, which results from the combination of the Technical Number of the ILU and, for the freight wagon, of the Wagon Compatibility Code (WCC) and Wagon Correction Digit where necessary, and
- the Combined Transport Profile of the line on the other side.

This check is summarized by the following equations:

Loaded freight wagon for combined transport:

ILU Technical Number (WCC + CTP no) combined with freight wagon WCC and WCD
where necessary = CT code

CT code = 1 letter (WCC) 2 or 3 digits (ILU CTP no. – WCD)

Infrastructure:

Maximum allowed CT code on a line = Combined Transport Profile (CTP) of the line

Compatibility is demonstrated when:

CT code \leq CTP

Example:

A swap body codified C 36 is placed on a wagon codified C +6 for a given network → the CT code of the loaded wagon is C (36-6) = C 30. This loaded wagon can circulate on lines with a Combined Transport Profile of C 30 and higher.

The same swap body placed on a wagon codified -10 for a given network will have a CT code of C 46. This loaded wagon can circulate on lines with a Combined Transport Profile of C 46 and higher.

Notes:

The CT code of a combined transport train is the highest CT code of the loaded wagons of the train.

The CTP of a line is the lowest CTP of the sections of that line.

3.2 Specific operational procedures applicable to combined transport - TSI OPE point 4.2.2.5.1 and Appendix I

Point 4.2.2.5.1 of the TSI OPE specifies the following:

Specific elements for route compatibility of combined transport trains:

- 1) a Combined Transport train not exceeding the loading gauge of all tracks of the line, and for which the CT code does not exceed the codification of all tracks of the line, shall be considered as a normal transport;
- 2) a Combined Transport train exceeding the loading gauge, and for which the CT code does not exceed the codification of the line, shall be considered as a transport with specific requirements as referred to in Appendix I. Such requirements shall be universally applicable to all trains in this category and compliance with them shall not need to involve any further authorisation process between the RU and the IM;
- 3) if the CT code exceeds the codification of the line, or if the line is not codified, a specific authorisation (exceptional transport), based on an evaluation of the operational and technical feasibility, shall be issued by the IM.

Accordingly, for the case n°2) above, a railway undertaking may request a train path allocation for a codified CT train which exceeds the loading gauge, but which does not exceed the codification of the line (CT code \leq CTP). In that case, the infrastructure manager may apply specific requirements which depend on the comparison of the CT Code with the line CTP.

Those specific requirements may amongst others cover the following aspects:

- Run the CT train as normal transport
- Run the CT train under some of the requirements applicable to exceptional transport
- Possibility (or not) to run on the opposite track,
- Exclusion of certain tracks, sidings and switches in stations,
- Speed restrictions for specific profiles on certain track sections.
- ...

Those specific requirements may depend on the CT code of the train, which should be indicated by the RU in its request. Those requirements should be applicable to all trains having the same CT code and compliance to them should not require further dialogue between RU and IM for each operation.

For trains which are not codified or for which the CT code is greater than the CTP of the line (case n°3 above), the RU can request a feasibility study from the IM for this exceptional transport. The RU should indicate all necessary technical and operational information in its request. Based on the information given by the RU, the IM decides for the individual case if the train may run on the respective line and if so with which specific requirements for exceptional transport.

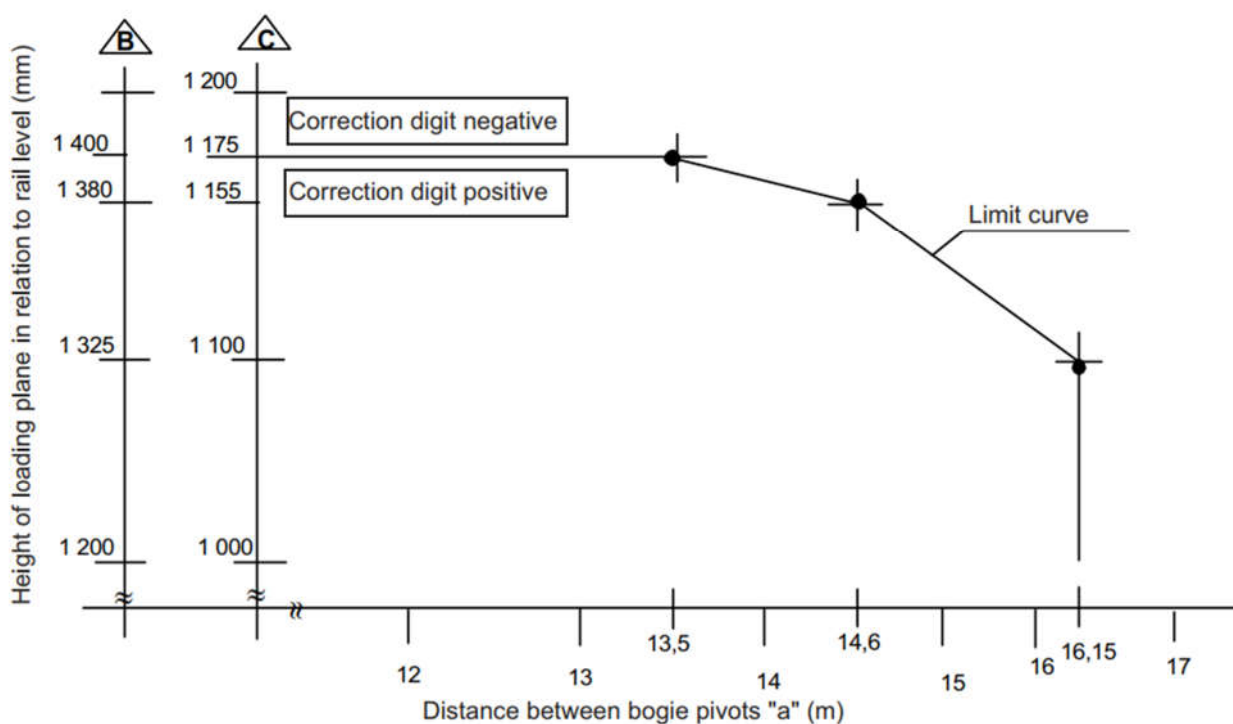
Annexe A – Calculation of equivalence curves for bogie wagons and 2-axle carrier wagons

A.1 Bogie wagons for the conveyance of swap bodies and roller units

Swap bodies which can be grab-handled and suitable for wagon compatibility code $\triangle C$.

Horizontally transferred roller units suitable for affixing with wagon compatibility code $\triangle B$.

Valid for swap bodies and roller units up to 2600mm width maximum.



This limit curve applies under the following conditions:

- Reduction of $E_i > E_a^3$
- Compliance with the conditions of Table 2
- Maximum bogie wheelbase 2000mm

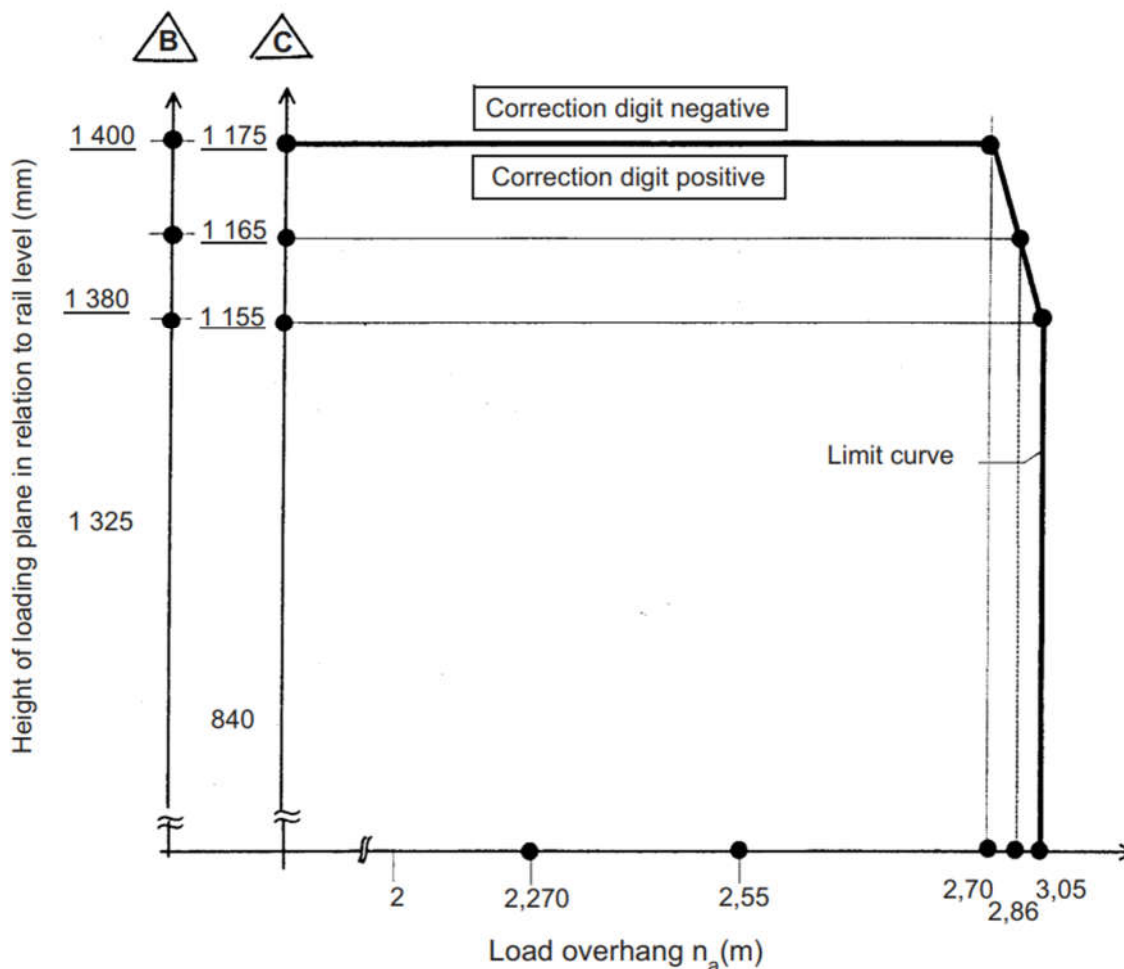
³ E_i in relation to wagon centreline - E_a in relation to end of loading plane

A.2 Two-axle carrier wagons for the conveyance of swap bodies and roller units

Swap bodies which can be grab-handled and suitable for wagon compatibility code $\triangle C$.

Horizontally transferred roller units suitable for affixing with wagon compatibility code $\triangle B$.


Valid for swap bodies and roller units up to 2600mm width maximum.



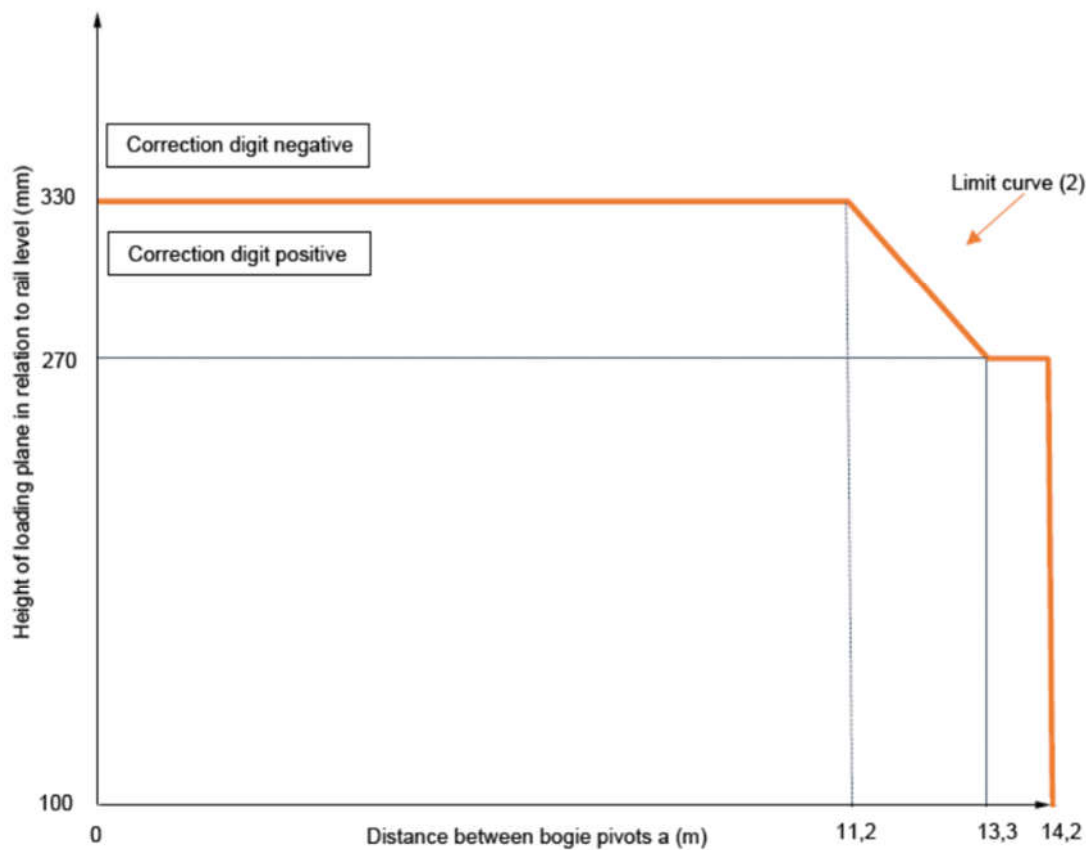
This limit curve applies under the following conditions:

- Valid for 2-axle wagons with $a=9$ m and $a=10$ m,
- For wagons with $a=9$ m, the load overhang must not exceed $n_a=2.55$ m,
- Compliance with the conditions in Table 2
- $E_a > E_i$,
- For wagons with a wheelbase $a=8$ m, the load overhang must not exceed $n_a=2.27$ m.

A.3 Bogie wagons for the conveyance of semi-trailers

Semi-trailers suitable for affixing with wagon compatibility code  .

Valid for semi-trailers up to 2600mm width maximum.




This limit curve applies under the following conditions:

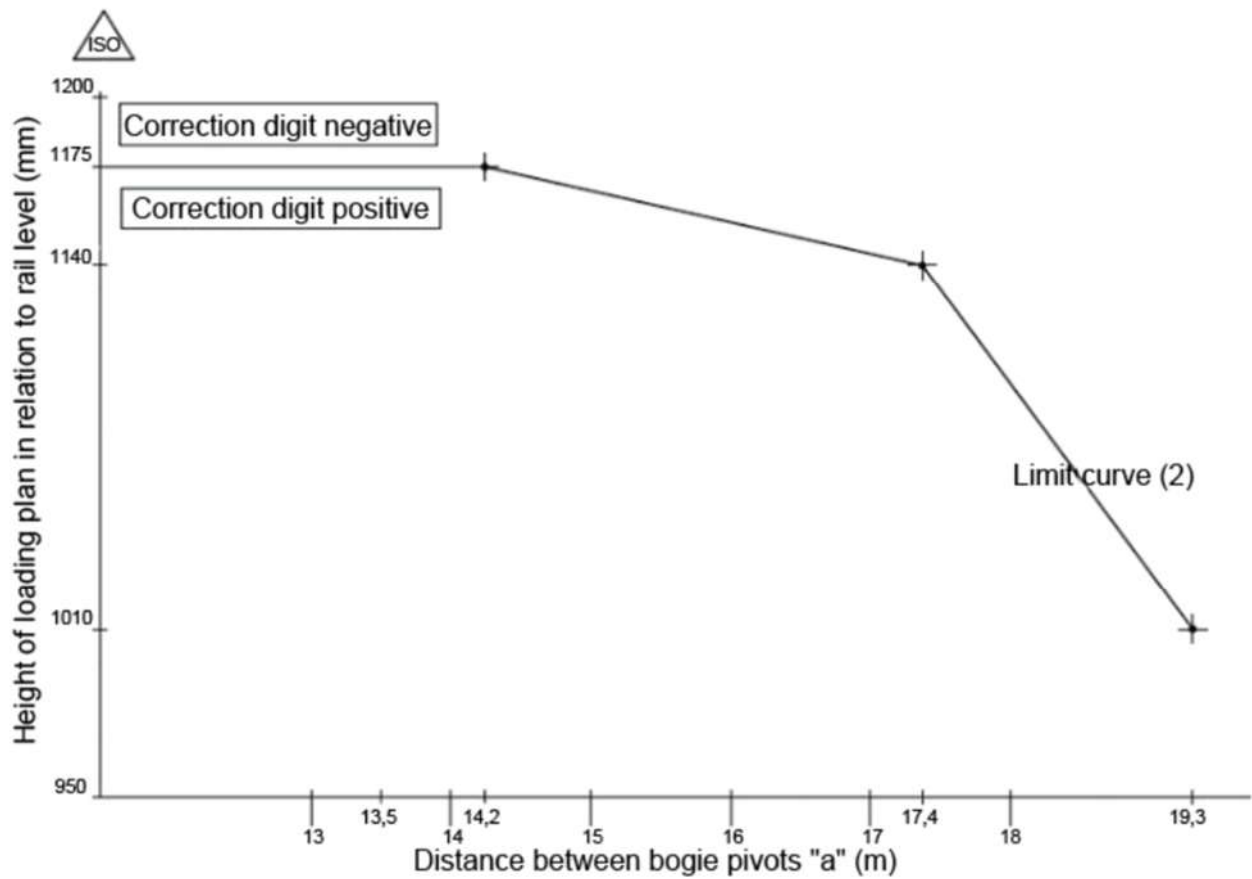
- Semi-trailer centring using centring gear identical or similar to reference recess wagon,
- Total maximum lateral play: 11.5mm
- Maximum bogie wheelbase 2000mm
- Reduction of $E_i > E_a^{45}$

⁴ E_i in relation to wagon centreline - E_a in relation to end of loading plane

⁵ The lower gauge of wagons as per point 4.2.3.1 of the TSI WAG must be observed

A.4 Bogie wagons for the conveyance of ISO containers

ISO containers which can be grab-handled and able to bear the  wagon compatibility code.



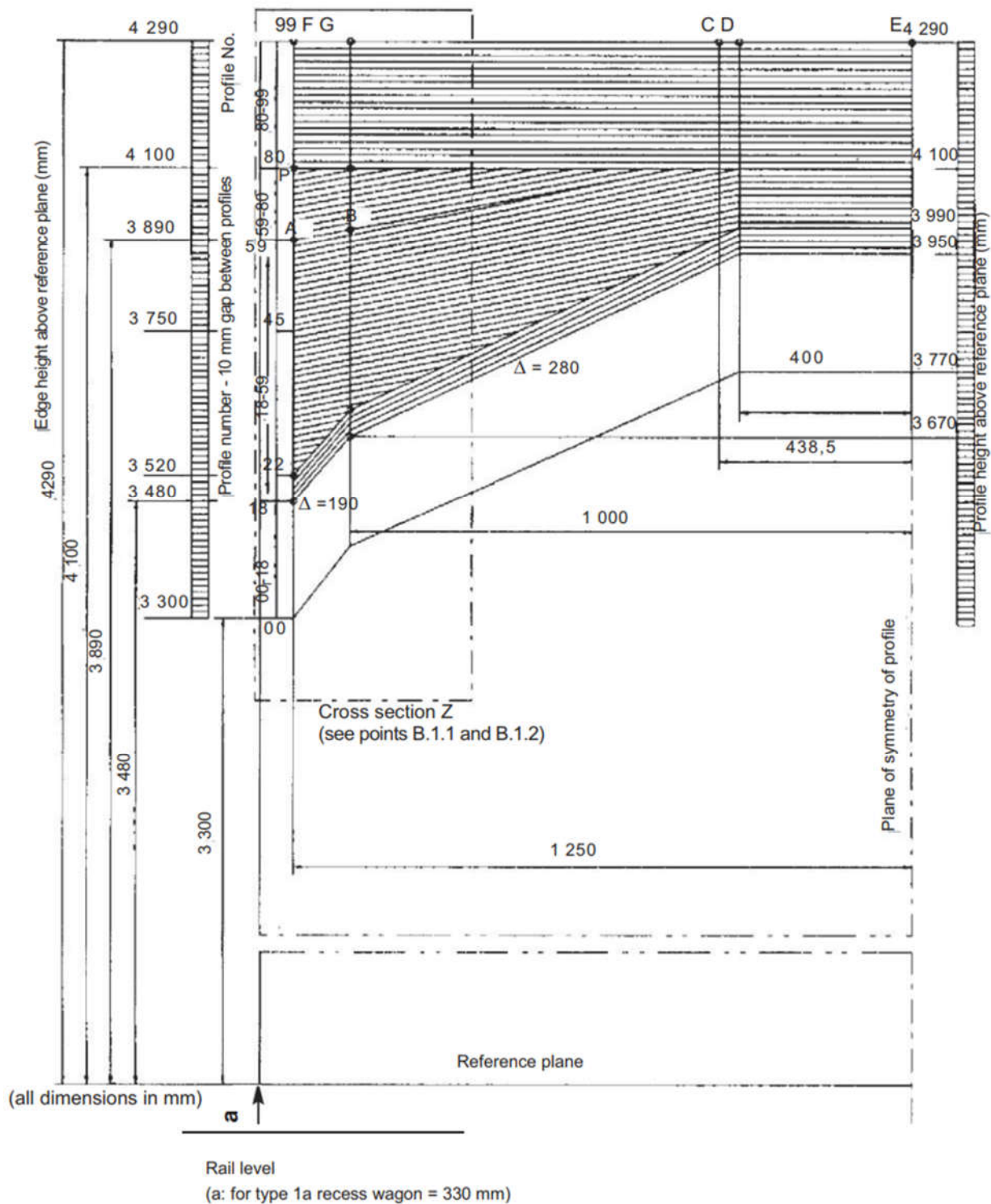
This limit curve applies under the following conditions:

- Reduction of $E_i > E_a$ ⁶
- Compliance with the conditions of Table 2
- Maximum bogie wheelbase 2000mm

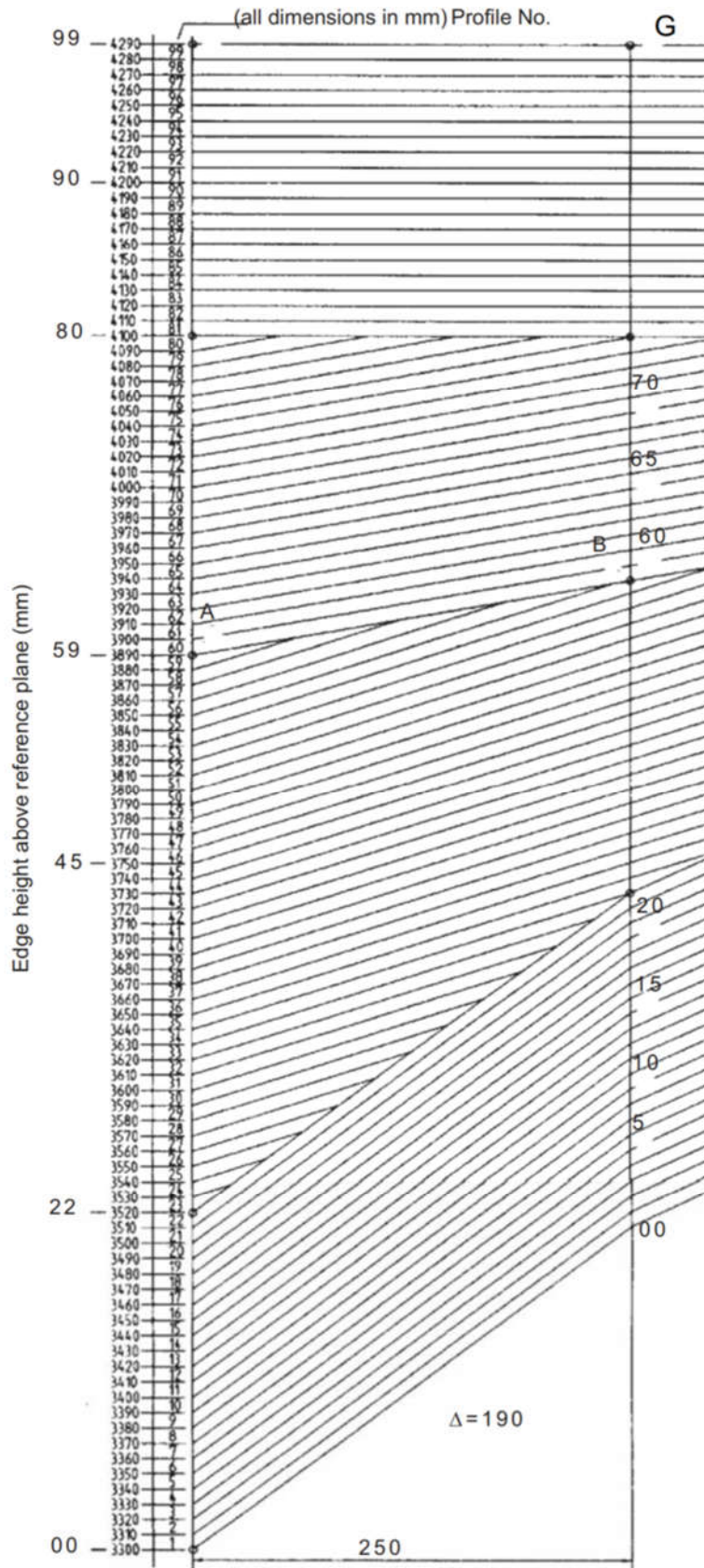
⁶ E_i in relation to wagon centreline - E_a in relation to end of loading plane

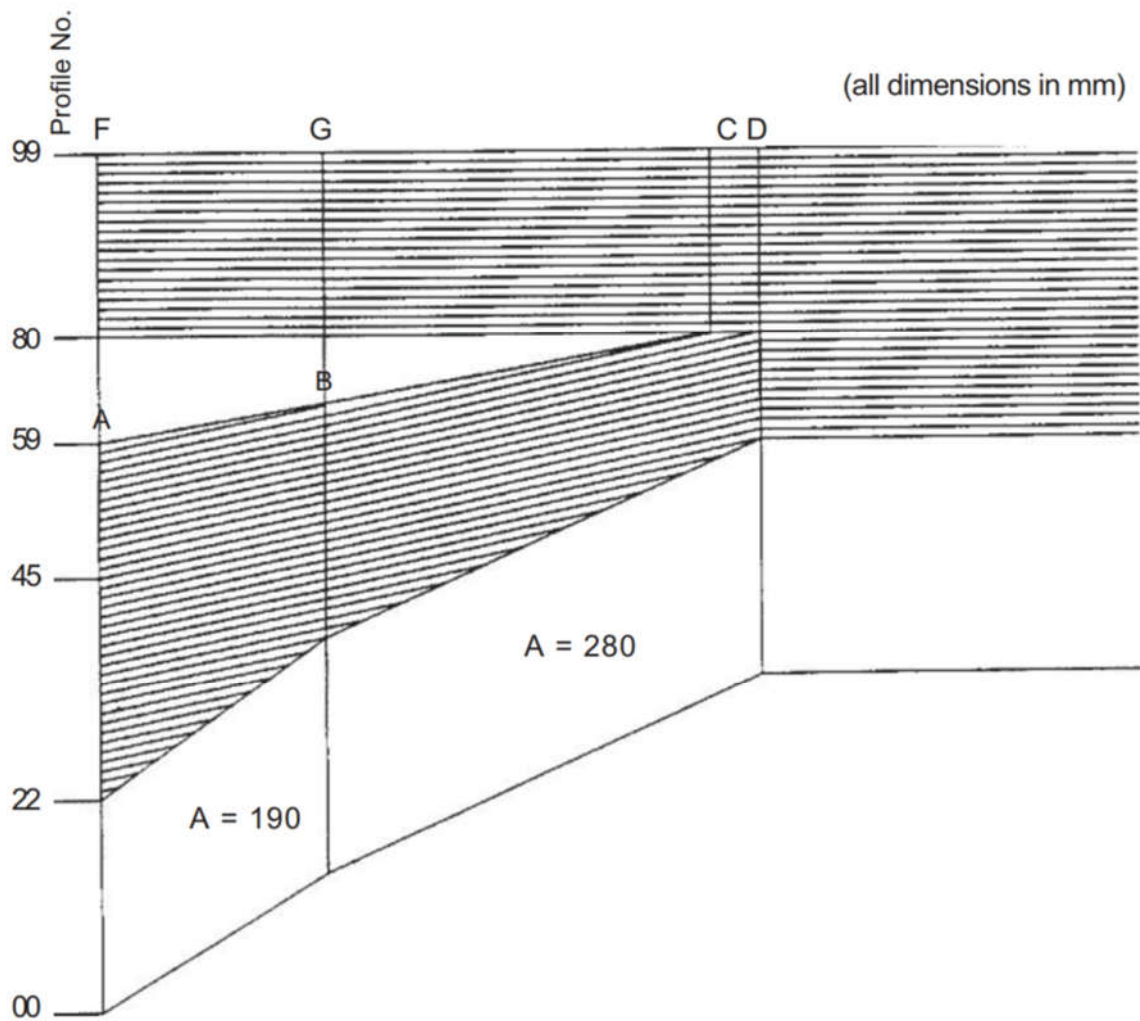
Annexe B - Combined transport profiles - Conditions for coding semi-trailers

B.1 Conditions for coding semi-trailers up to 2500mm maximum width



B.1.1 Cross section Z on CT profile



B.1.2 Cross section Z on CT profile – Profiles 22 to 59 and 80 to 99

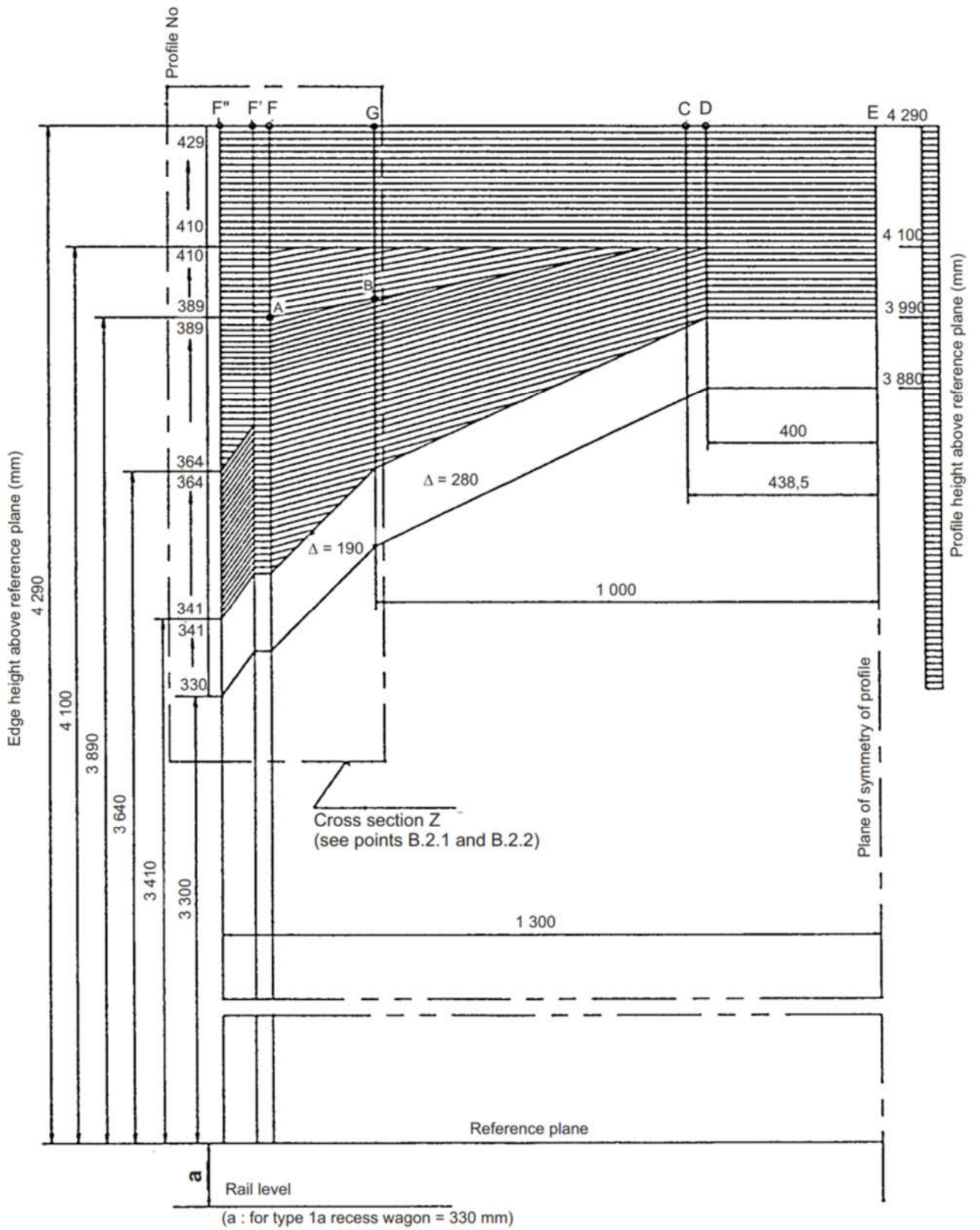
Incline P n°22 to 58 → determined by P n°45

Incline P n°59 to 79 → determined by P n°59

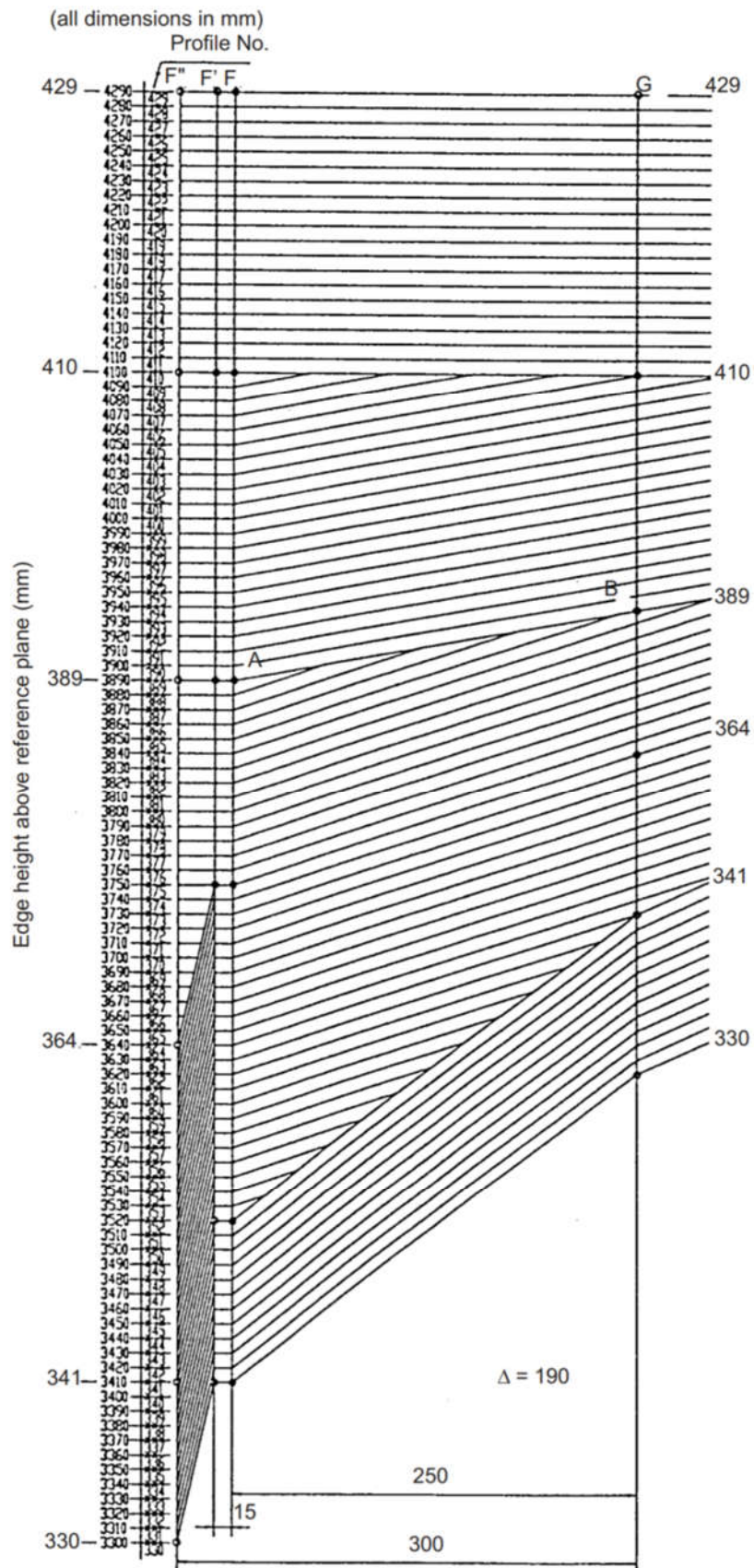
Incline P n°80 to 99 → determined by P n°80

B.2 Conditions for coding semi-trailers with a width greater than 2500mm and below or equal to 2600mm

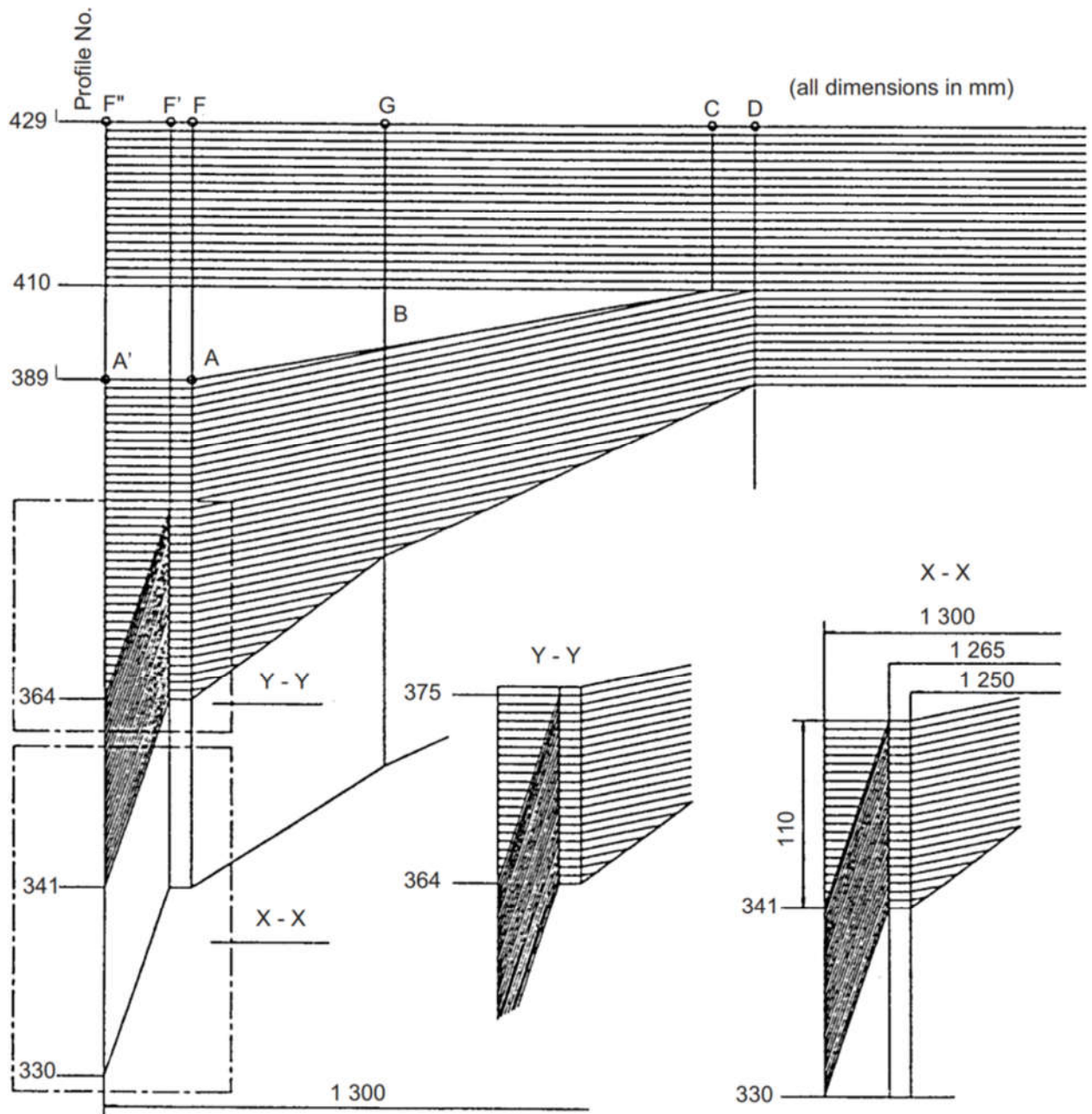
(all dimensions in mm)



B.2.1 Cross section Z on CT profile

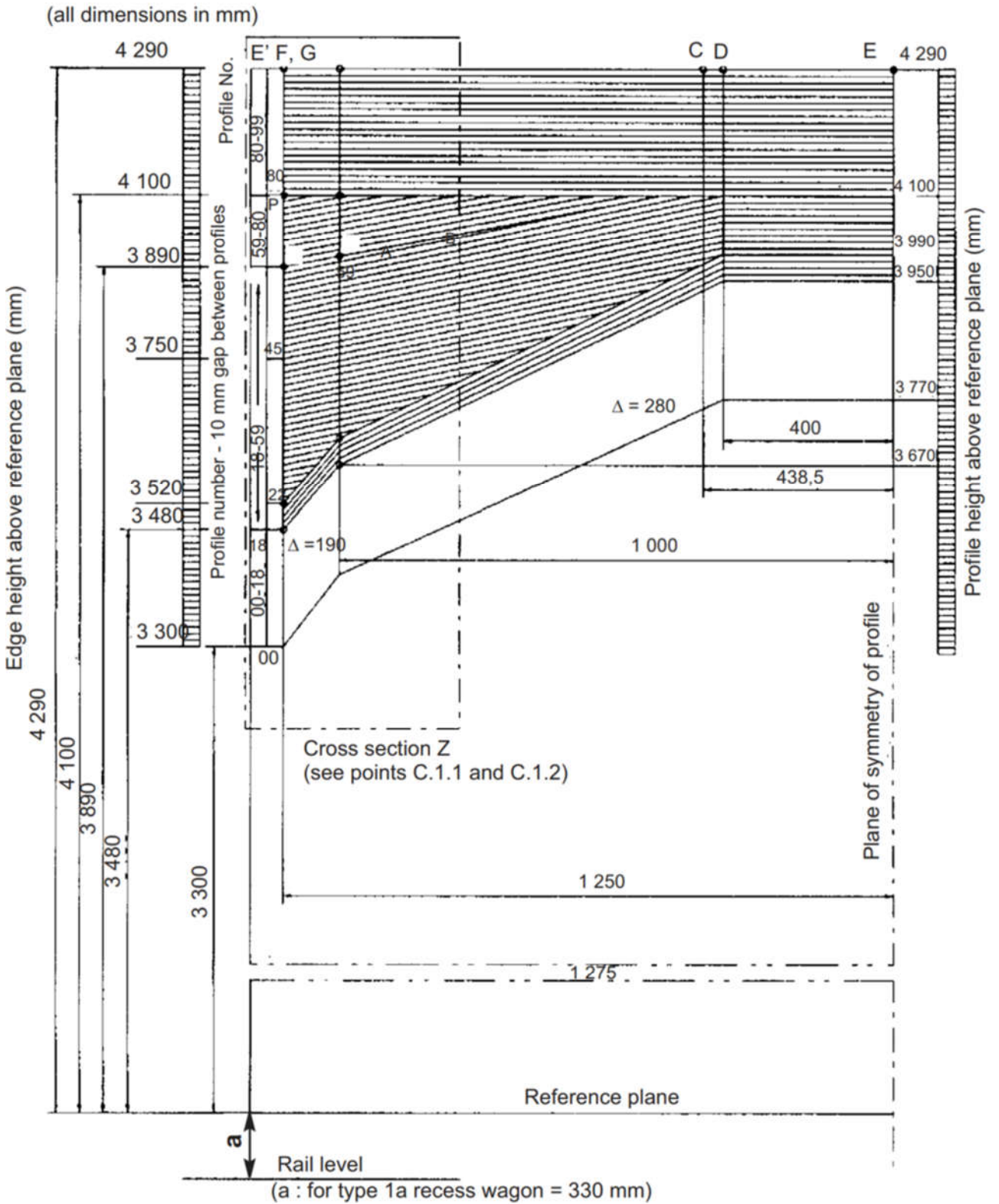


B.2.2 Cross section Z on CT profile – Profiles 341 to 389 and 410 to 429



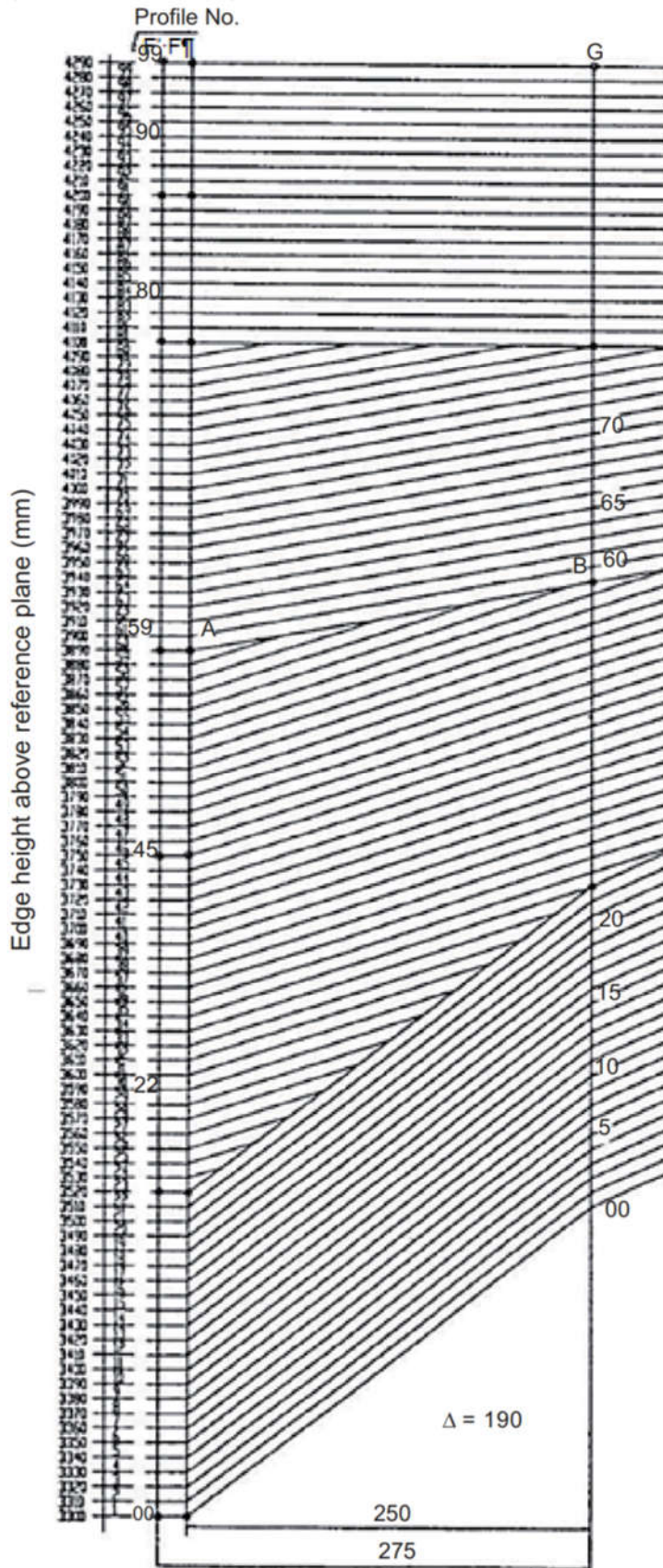
Annexe C - Combined transport profiles - Conditions for coding swap bodies and roller units

C.1 Conditions for coding swap bodies and roller units up to 2550mm maximum width

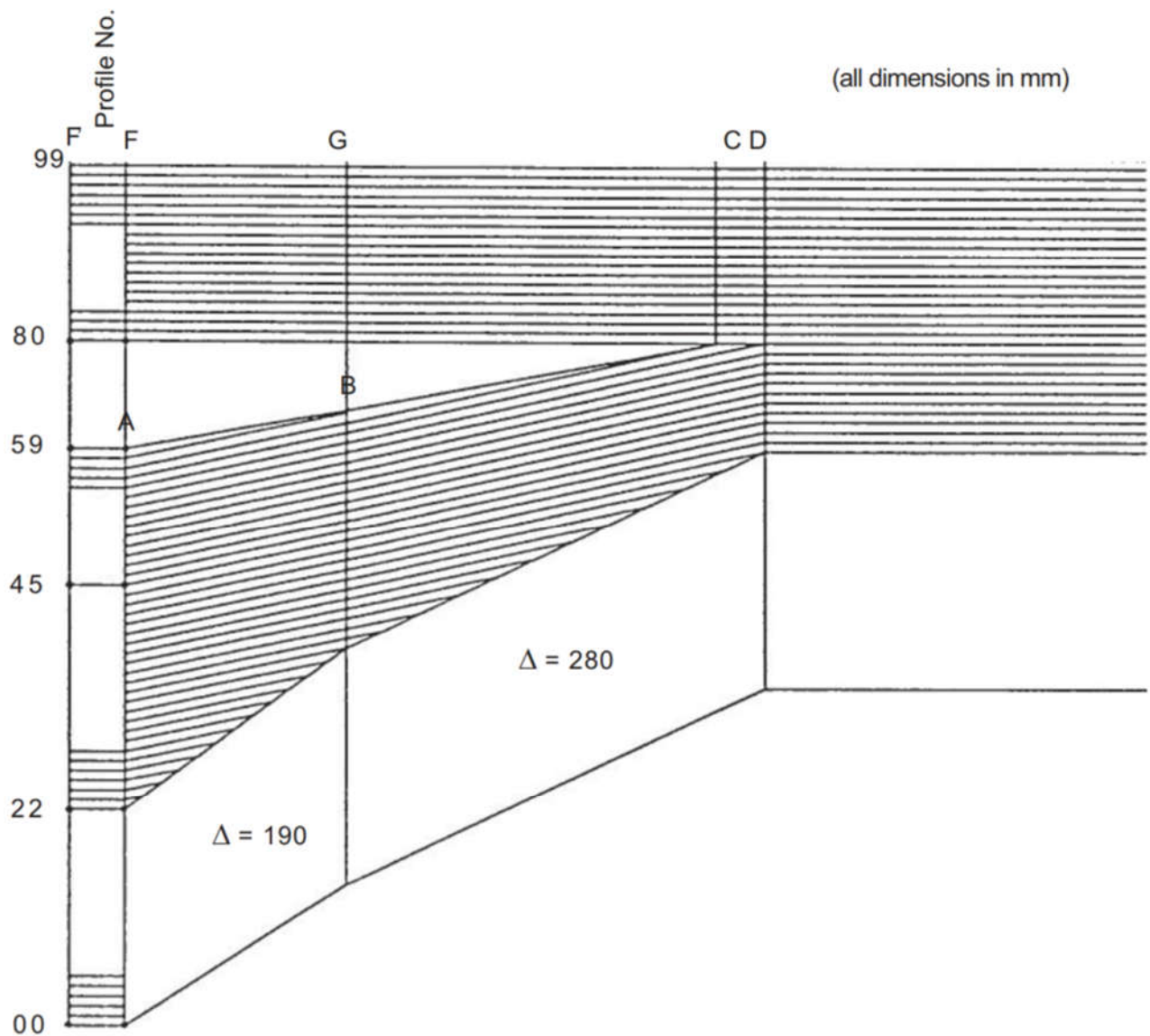


C.1.1 Cross section Z on CT profile

(all dimensions in mm)



C.1.2 Cross section Z on CT profile – Profiles 22 to 59 and 80 to 99

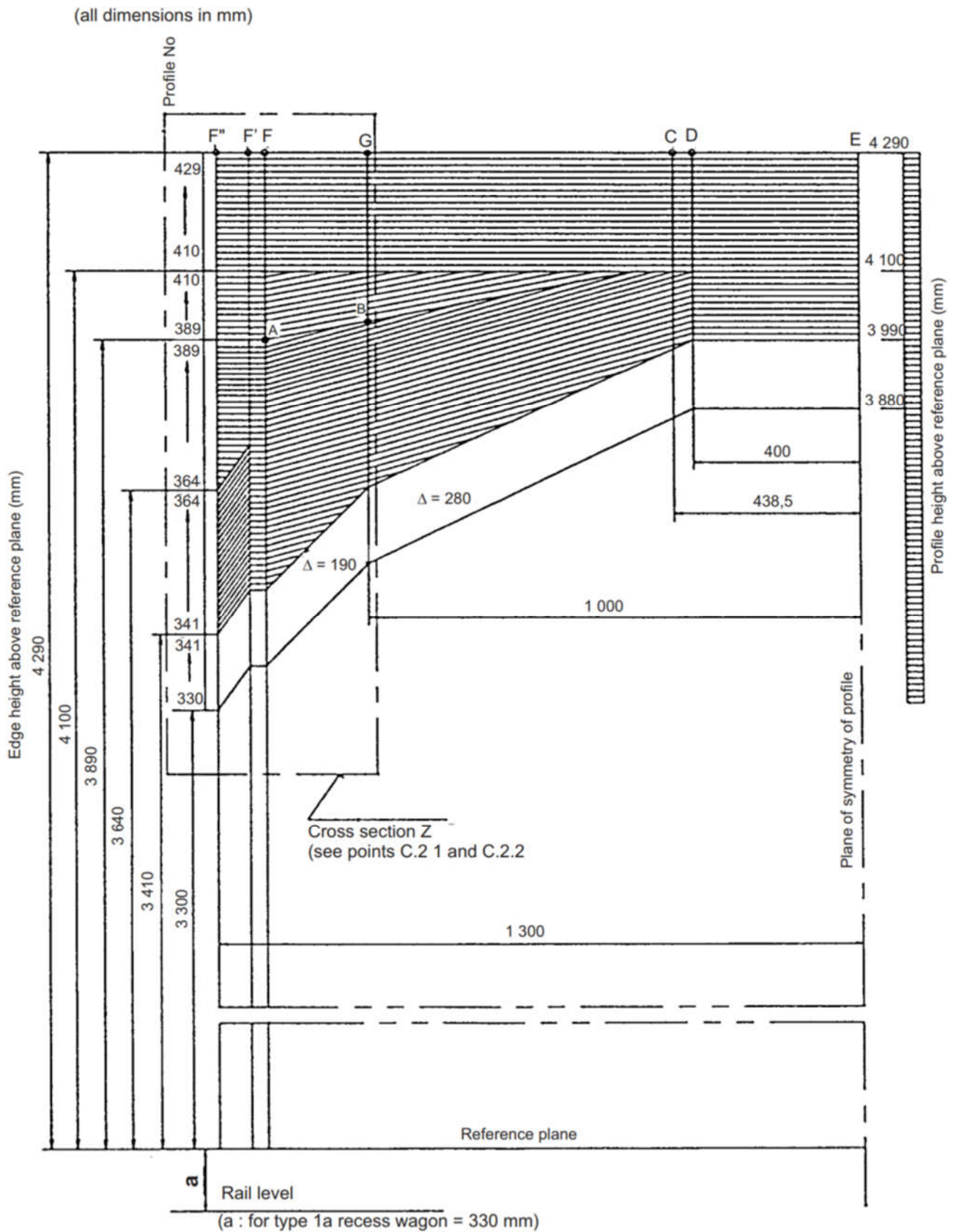


Incline P n°22 to 58 → determined by P n°45

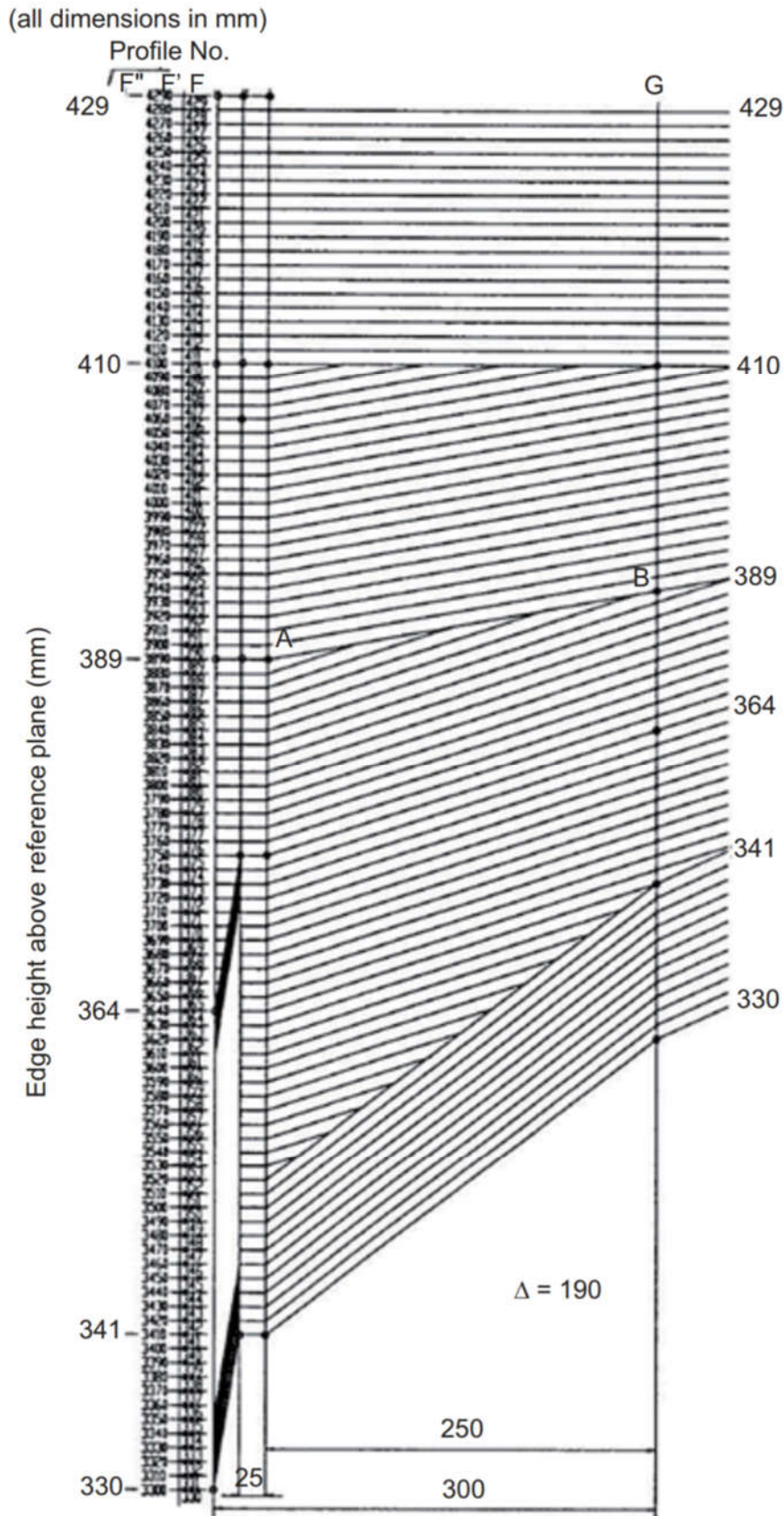
Incline P n°59 to 79 → determined by P n°59

Incline P n°80 to 99 → determined by P n°80

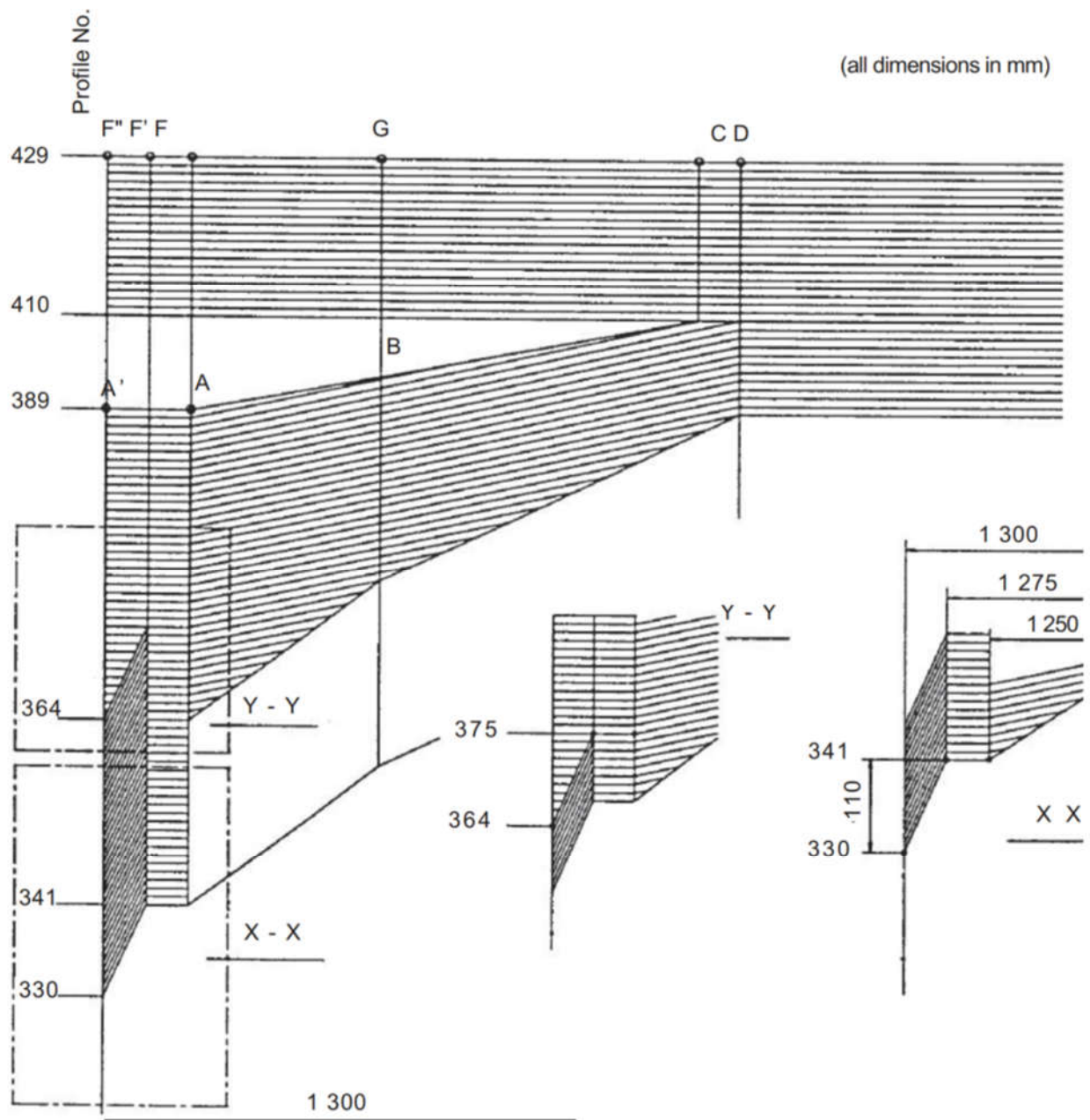
C.2 Conditions for coding swap bodies and roller units with a width greater than 2550mm and below or equal to 2600mm



C.2.1 Cross section Z on CT profile

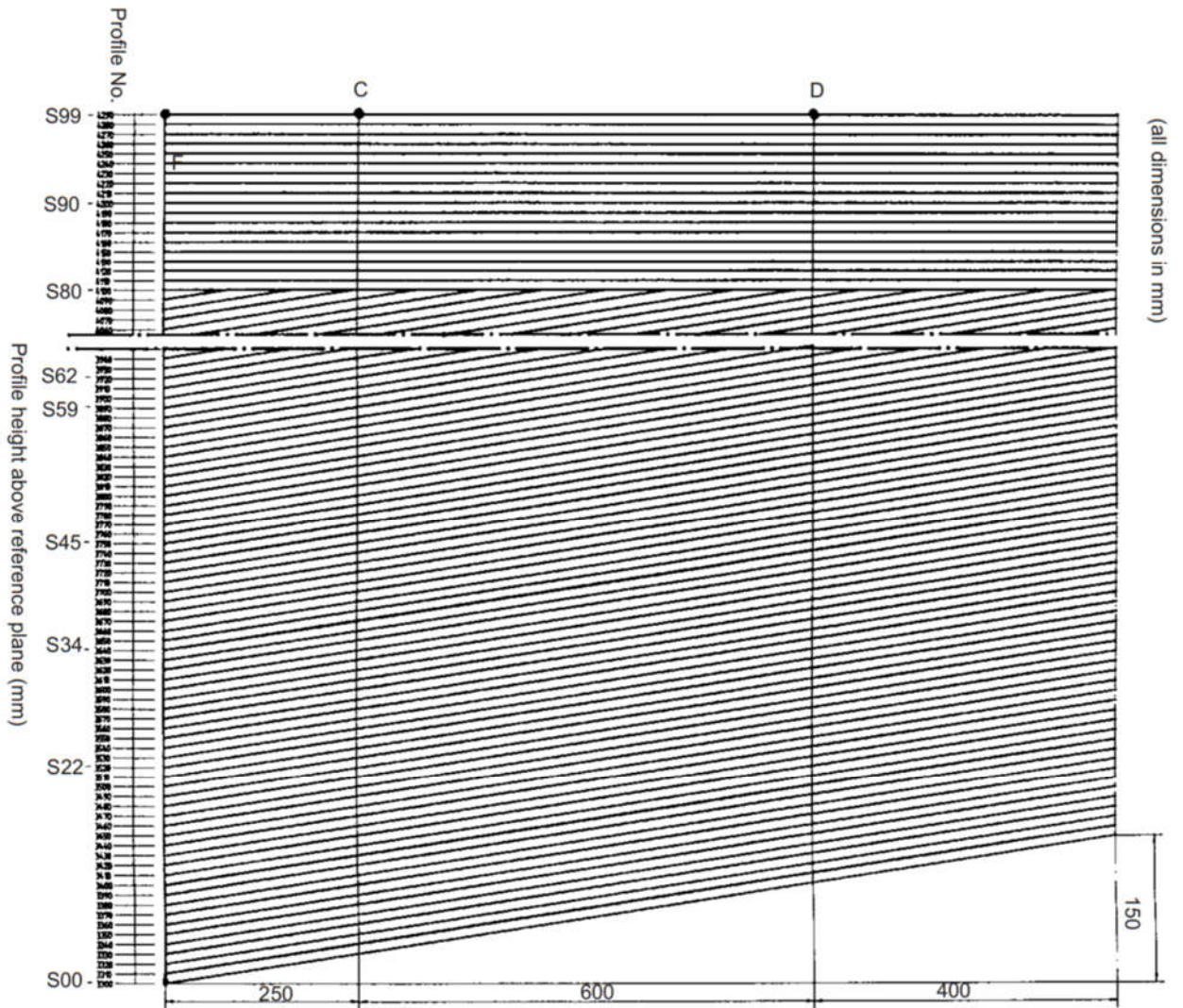


C.2.2 Cross section Z on CT profile – Profiles 341 to 389 and 410 to 429

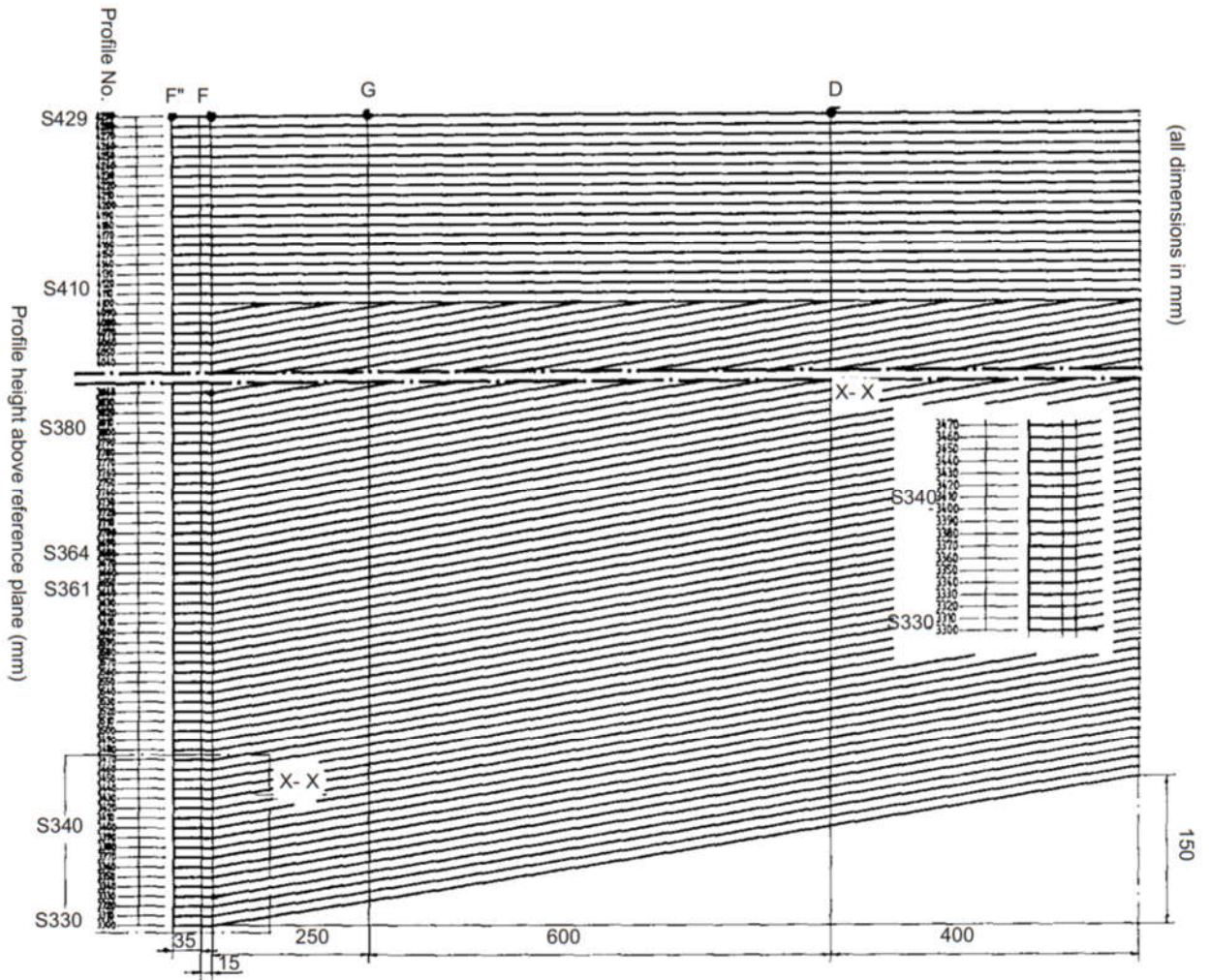


Annexe D – Special combined transport profiles (S)

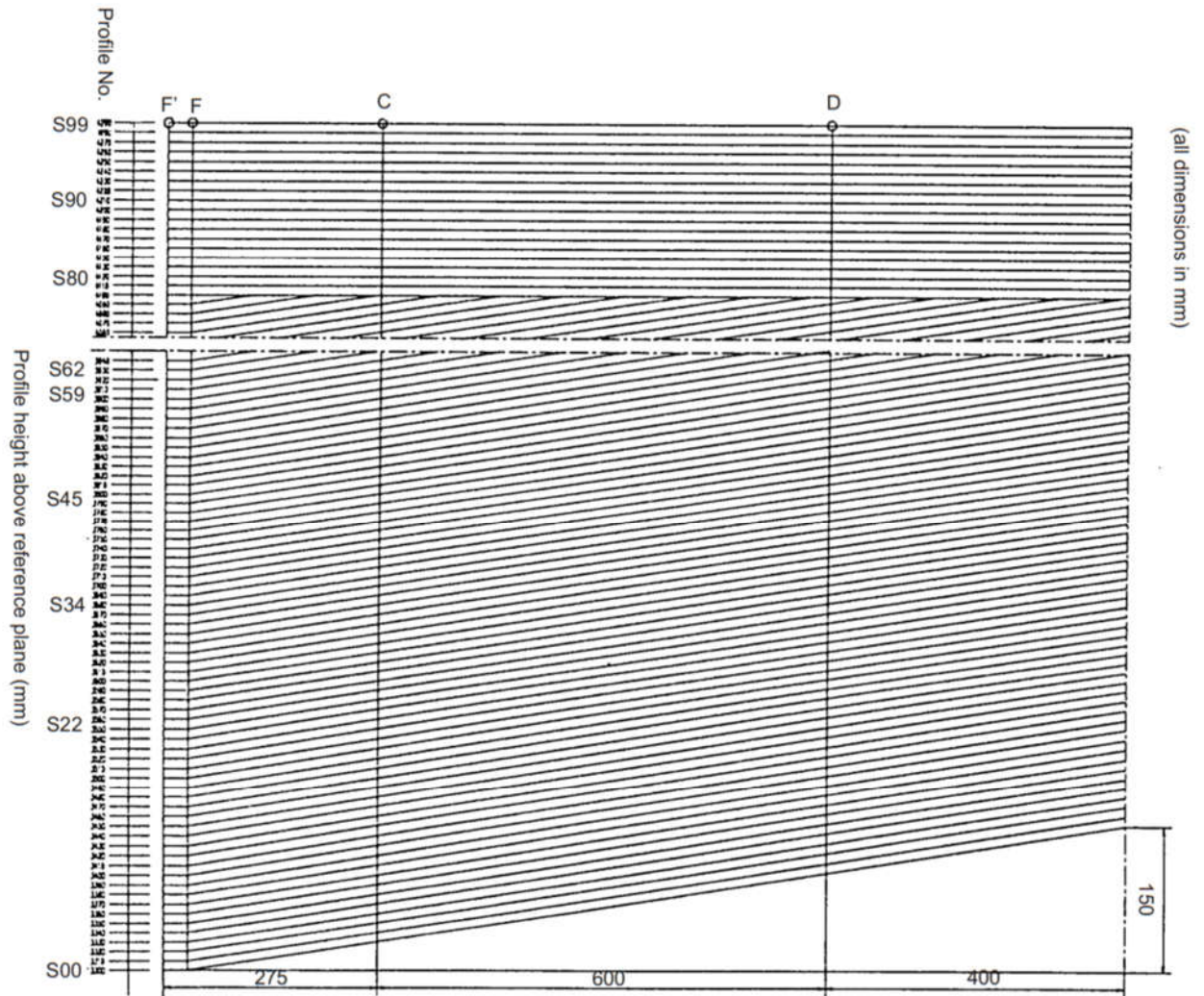
D.1 Alternative conditions for coding semi-trailers for special flat-roof profile – Maximum width 2500mm



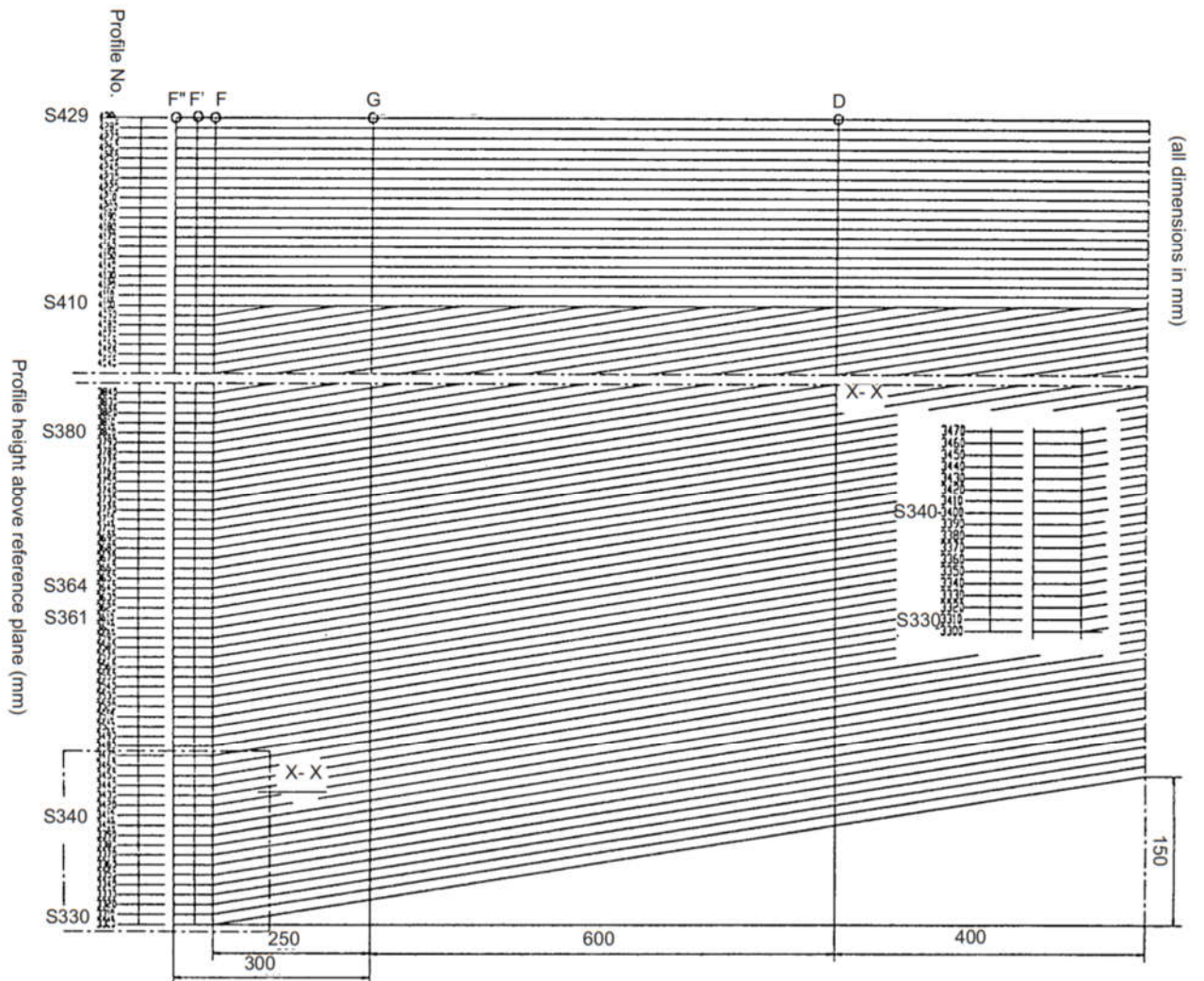
D.2 Alternative conditions for coding semi-trailers for special flat-roof profile –Width greater than 2500mm and less or equal to 2600mm



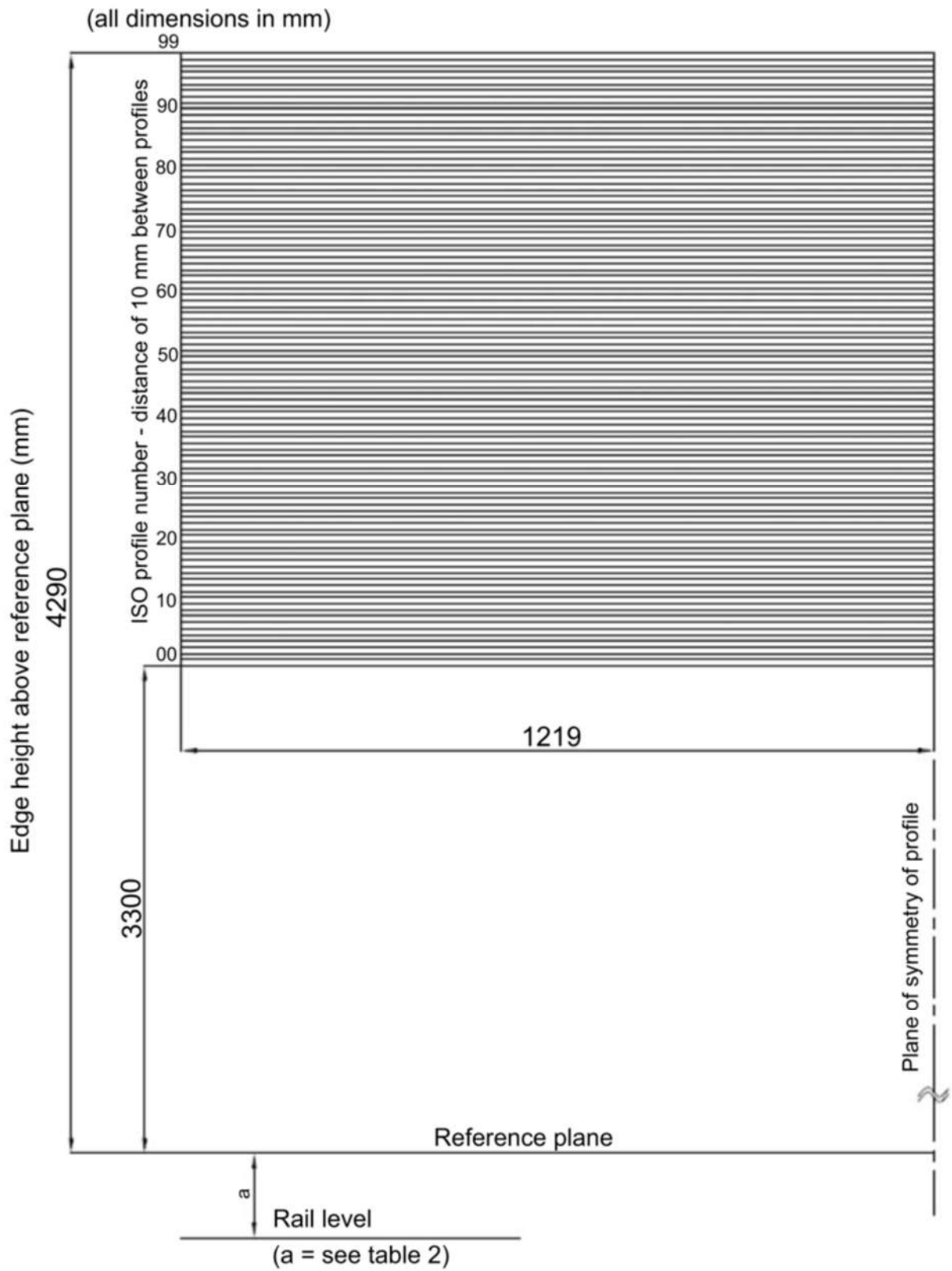
D.3 Alternative conditions for coding swap bodies and roller units for special flat-roof profile – Maximum width 2550mm



D.4 Alternative conditions for coding swap bodies and roller units for special flat-roof profile –Width greater than 2550mm and less or equal to 2600mm



Annexe E – Combined transport profiles – Profiles for ISO coding (conveyance of ISO containers of width 2438mm)



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The source of tables 1 and 2, appendixes A to E and the codification principles expressed in point 2 of this document is:

UIC IRS 50596-6 – 1st edition, 2018-7: “Conditions for coding intermodal loading units in combined transport, combined transport lines and wagons.”

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