Sub-Part B - Vehicle Description

1.0 GENERAL OVERVIEW

OIW is planning to manufacture the prototype street car for the City of Portland in accordance with the RFP requirements while meeting or exceeding all technical specifications and conditions outlined on the Technical Specification of the RFP.

The proposed prototype vehicle is based on the existing Portland street car vehicle concept and design, and it will be domestically manufactured in Oregon in full compliance with the Buy-America provisions.

The new vehicle code name is "Type 10 T3" and uses the existing Skoda design for the majority of the vehicle constructional groups, and, slightly modified design for the electrical traction system as well as for the rest of the electrical and control systems. The traction control system utilizes Skoda Electric components in place of the existing Portland street car Elin components. The Skoda Electric equipment and the slightly re-designed traction system provide the advantage of using the SKiiP technology (please see section 11 of this RFP reply) and reduces the thermal stresses on the system/components. The rest of the electrical system (non-traction) preserves the positive features of the current Portland street car electrical system while enhancing the communication between different "entities" of the system by combining the use of CAN modules with the use of relays in full compliance with the requirements. The direct effect (advantages) of this system is reduced numbers of wires/cables, faster response time between systems and a better/easier diagnostic process. Also, the maintenance diagnostic of traction converters, auxiliary inverters, low voltage power supply unit and vehicle control system will be available from only one connecting point on the vehicle and from one tool and software environment.

The main objective for the proposed vehicle design and subsequent manufacturing plan is to preserve the positive features of the existing Portland street car vehicle, while addressing any issues and/or desired improvements. Additionally, the proposed vehicle will be fully compliant with the Buy-America provision as per the requirements of the RFP.

The overall strategy of the prototype concept is to maintain the same design as the current Portland street car where possible and to minimize any changes in design due to use of U.S. components. We plan to deliver a fully Buy-America compliant product by sourcing and manufacturing many of the components from the U.S.

In addition to the base line design and components, OIW could offer (at the sole discretion of the customer) optional or improved features on several areas of the vehicle's design. The improvements are optional and will be considered only if the customer feels they will be beneficial to the overall program. OIW will seek the participation and input from the customer regarding any improvements and optional features.

The Type 10 T3 street car is a four-axle, double-ended, three-section, low floor vehicle with a standard track gauge of 1435 mm and is very similar to the current Portland Stretcar. The vehicle is equipped with two motorized, two-axle trucks capable of providing 100% track adhesion. The two motorized trucks ensure the required dynamic, running, and braking performance of the vehicle in all modes, during all weather conditions.

The vehicle consists of two end car sections with the floor positioned at the designed level of 780 mm above top of rail (TOR). The middle section is located in between the end sections and the floor is designed at a level of 350 mm above TOR. Both end car sections are mounted on motorized trucks. The low floor middle section is equipped on each side with two double-panel doors and one gap-bridging platform device positioned near the center of the vehicle. The middle section of the vehicle has space to accommodate two wheelchairs. The end car sections are equipped with a single-panel door on one side of the vehicle.

Each end of the vehicle has a fully equipped operator's position (driver's cab). This allows for easy and safe operation of the vehicle in either direction. Operating control and performance is equal in both directions. The vehicle is designed for single unit operating service. Should towing of the vehicle be required in the event of an emergency, both ends are equipped with a manually controlled, folding coupler.

The vehicle is fully compatible with the Portland street car local area environment, including its right-of-way, station platforms, maintenance facility, existing vehicles and operating conditions. The vehicle is fitted with a wheel profile in accordance with figure 2-2 of the "Tri-Met Light Rail Vehicle Technical Specification." Furthermore, it is designed to operate on following rail types: 115 RE, RI-59 and RI-52 of standard track gauge.

The vehicle propulsion system consists of two traction inverters based on Insulated Gate Bipolar Transistor (IGBT) technology mounted on the roof of the vehicle, and four asynchronous traction motors mounted on the vehicle trucks. The vehicle is equipped with two functionally independent, but coordinated regenerative propulsion systems. Nominal power (750 V DC) is supplied from the overhead contact line. The vehicle has a balancing speed of 48 km/h on level tangent track over the entire range of wheel wear, at nominal line voltage and mean passenger loading at AW2. Maximum operating speed of the vehicle with fully worn wheels is 70 km/h.

The entire vehicle (including the operator cabs) is equipped with an automatically controlled, roof-mounted heating, ventilating and air conditioning (HVAC) system. On the passenger compartments, the HVAC units distribute the air into two lateral upper channels, while driver's cabs are heated and cooled by distributing the air into ceiling vents with adjustable outlets. In addition, floor-mounted electric heaters fitted in the passenger compartment are automatically switched on when the car operates in heating mode. These floor mounted heaters are located under the lower sidewall covers in order to protect the occupants of the vehicle from their hot exterior surfaces when in use. The operator's cab is further ventilated, heated and defogged by means of manually controlled air heater system. This system allows the defrosting and demisting of both the windshield and side windows.

Throughout the vehicle design and manufacturing, the latest working knowledge gained and verified through operational service of other similar vehicles will be applied to the Portland Streetcar. The vehicle is designed and manufactured in accordance with the appropriate standards such as (but not limited to) ANSI, ASTM, DIN, EN, IEC, IEEE, ISO, UIC or other applicable standards.

During the manufacturing phase of the vehicle, the OIW/Skoda Team will utilize all of the appropriate technologies and testing procedures to ensure all features and performance parameters specified in the Technical Specification are met or exceeded.

For additional description of the prototype street car general concept, please see the Technical Specification attachment.

2.0 PROPOSED VEHICLE COMPATIBILITY WITH EXISTING PORTLAND STREETCAR VEHICLES

a. Compatibility of Major Vehicle Systems with Existing Portland Streetcar Systems

The major components strategy and supplier base consists of using the same or similar major components as the current Portland Streetcar, but manufactured and/or supplied from U.S., where possible. In addition we would like to address any requests from the city for component improvements and availability. On the supplier base we propose to maintain the successful and high reputation suppliers, in order to provide our customer with a high quality product and minimize/eliminate any risk; the suppliers will provide components from their U.S. branch/facility and fully Buy-America compliant, where possible. Typically, we asked the current major component suppliers to provide us a product that is fully Buy-America compliant and fully compatible with the current Portland street car. Additionally, vendors supplying components utilized on the Type 10 T3 vehicle will provide Buy-America certificates and documentation showing that their product is compatible with the current Portland street car vehicles (where applicable) or compatibility plans. The main objective of this strategy is to maintain the same design for the body shell, where possible, and reduce to a minimum the changes to the current design for installation of the major components. Following is a brief description of the major components planned for the Type 10 T3 vehicle, their suppliers and compatibility of the system with the current Portland Streetcar (to date):

- Brakes – We plan to supply them from Knorr-Bremse. They will be fully Buy-America compliant and no changes will be required to the existing Portland street car vehicle for compatibility. In addition, the brake "package" from K-B will include the track brake also.

- HVAC - We plan to supply the system from Thermo-King or an alternate supplier with U.S. facility/production (Faiveley or Moran Ind.). They will be fully Buy-America compliant and the mounting dimensions are the same with the current HVAC units on the roof of the Portland cars. From a performance and function stand point the HVAC system will be fully compatible with the current system and will meet the RFP requirements.

- Pantograph – We plan to supply the component from Schunk or Faiveley/Lekov. The product will be Buy-America compliant. The objective set up for both these suppliers is to use the same mounting base dimensions and to be compatible with the existing Portland street car pantograph and roof structure mounting.

- Body shell – The body shell will be similar to the current Portland street car with slight modifications to the roof structure to accommodate the new Skoda Electric traction equipment. It will be fully Buy-America compliant. Structurally, the body shell will be the same or better than the current Portland body shell (potential increase in structural performances by using materials with better mechanical properties). The objective of the new street car program is to keep the design and configuration of the body shell same as the current Portland vehicle (exception is the roof structure).

- Operator's cab – The operator's cab will be similar to the current Portland street car vehicles and will use fully Buy-America compliant components. The objective for the driver's controls is to be compatible and compliant with the current Portland street car.

- Truck Assembly – The truck assembly will be manufactured in U.S. using a very experienced rail industry supplier. We plan to use Penn Machine as system integrator for the truck assembly. Penn Machine will manufacture the wheel-set and then assemble the rest of the components into one fully Buy-America compliant system. OIW is planning to manufacture the bogie frame and the rest of the components will be a combination of U.S. and foreign-supplied components. The design of the truck assembly will be the same as the current one used on the Portland street car.

- Communication system - The communication system will be similar to the current street car providing the same main features and design concepts as the current Portland street car vehicles. It will be a fully Buy-America system.

- Propulsion and Control System - Skoda Electric will supply the main components of the traction system. The main components included are the traction motors, the traction converters, the auxiliary inverters, the low voltage power supply, the brake resistors and the vehicle control system (VCU's, CAN modules and the driver's display).

- The following major components of the electrical system will be the same/fully compatible with the current Portland vehicle: traction motors, aux. power converters high-speed circuit breakers, knife switch, fare collection, TWC control, event recorder, informational system, dashboard, lighting and mechanical brake control. The new components of the electrical system are: the traction converters and the vehicle control. The braking resistors have the same design and same parameters as the current ones but a slightly different material is used.

- Interior and Exterior Fit Out – The components will be U.S. manufactured and/or supplied and will be fully Buy-America compliant. The components will be similar to the current Portland street car and will be compatible in function and performance by providing the same or improved features as the current vehicle. We plan to have interchangeability for the frequently replaceable items or systems (glass, trim, lights, stanchions, mirror, etc.).

- Doors – We plan to supply them from either Bode or Faiveley. They will be compatible with the existing Portland street car for interchangeability. The Bode doors will not be Buy-America compliant for prototype, but will be compliant for a larger/production order. The Faiveley doors will be fully Buy-America compliant.

- Bridgeplate – We plan to use the CTS bridgeplate or a combination between the CTS bridgeplate and the controls from the door supplier (Bode or Faiveley) for our new street car prototype vehicle. The CTS bridgeplate is currently used by the Portland cars and meets the RFP requirements (concept, design and size). The prototype bridgeplate will be fully compatible with the current product and will meet all specific requirement of the City.

- Bellows – We plan to use Hubner's bellows, produced/supplied from U.S.. In this way we will provide a fully compatible product with the current street car and will have a fully Buy-America compliant product.

For a full description of the major systems/components please see the Technical Specification attachment (check the specific chapter).

b. Wayside Compatibility, Including Rail Gauge, Bridgeplates Dimensions and Location, Floor Heights, Vehicle Width, Vehicle Length, Vehicle Dynamic Envelope.

The Type 10 T3 vehicle will be fully compatible with the existing way-sides and right-of-way since it will have the same design and overall dimensions as the existing Portland street car. The rail gauge for the Type 10 T3 vehicle is 1435 mm, and the bridgeplate size will be in accordance with the RFP requirements. All other main dimensions will be identical with respect to the current vehicle.

c. Compatibility with Maintenance Facility

The Type 10 T3 vehicle is nearly identically to the existing Portland street car vehicles and will be compatible with the current PSI maintenance facility. All of the Buy-America compliant components or systems utilized in the Type 10 03 vehicle will be fully compatible with the current maintenance facility as well.

3.0 CONCEPTUAL DESIGN DRAWINGS OF PROPOSED VEHICLE

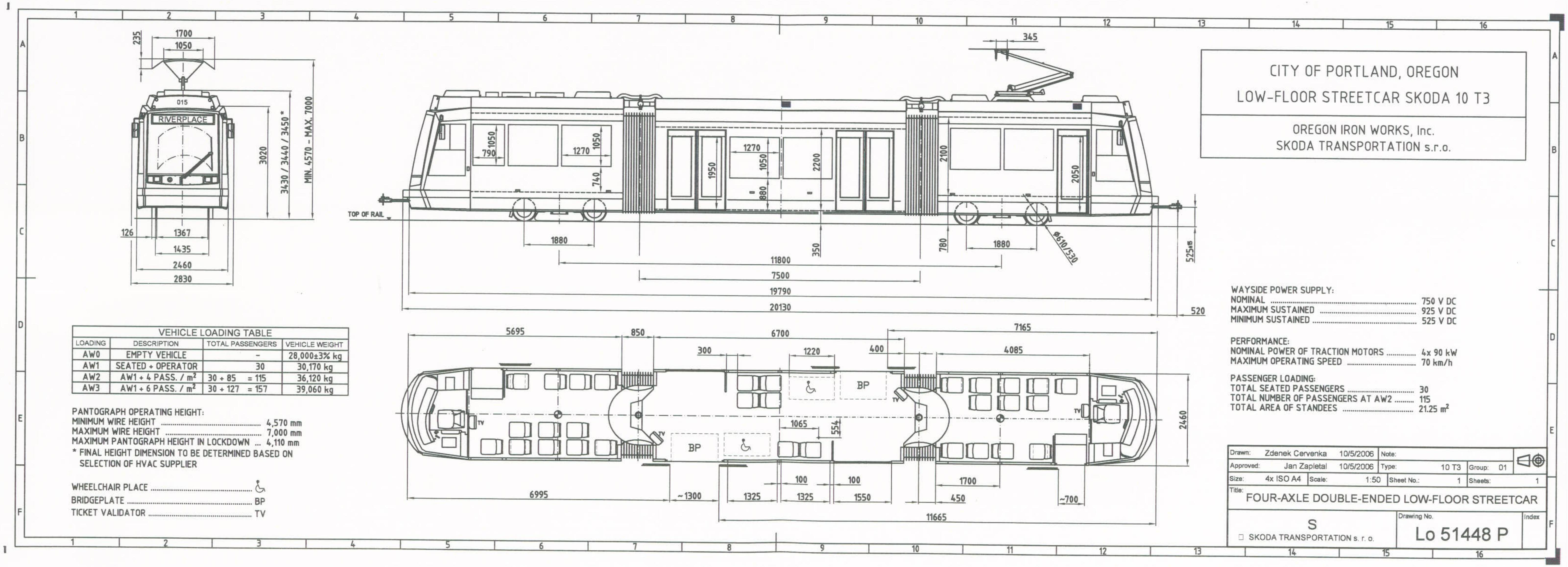
a. Preliminary Artist Renderings (45° Front / Side View)

The proposed prototype streetcar will appear identical to the existing Portland streetcar. Please see the following pictures:


003
RIVERPLACE

b. General Exterior and Interior Arrangement Plans

For the general exterior and interior arrangement plans, please see drawing LO 51448, which follows this page.



VEHICLE LOADING TABLE

LOADING	DESCRIPTION	TOTAL PASSENGERS	VEHICLE WEIGHT
AW0	EMPTY VEHICLE	–	28,000±3% kg
AW1	SEATED + OPERATOR	30	30,170 kg
AW2	AW1 + 4 PASS. / m²	30 + 85 = 115	36,120 kg
AW3	AW1 + 6 PASS. / m²	30 + 127 = 157	39,060 kg

PANTOGRAPH OPERATING HEIGHT:
MINIMUM WIRE HEIGHT .... 4,570 mm
MAXIMUM WIRE HEIGHT .... 7,000 mm
MAXIMUM PANTOGRAPH HEIGHT IN LOCKDOWN ... 4,110 mm
* FINAL HEIGHT DIMENSION TO BE DETERMINED BASED ON SELECTION OF HVAC SUPPLIER

WHEELCHAIR PLACE .... ♿
BRIDGEPLATE .... BP
TICKET VALIDATOR .... TV

WAYSIDE POWER SUPPLY:
NOMINAL .... 750 V DC
MAXIMUM SUSTAINED .... 925 V DC
MINIMUM SUSTAINED .... 525 V DC

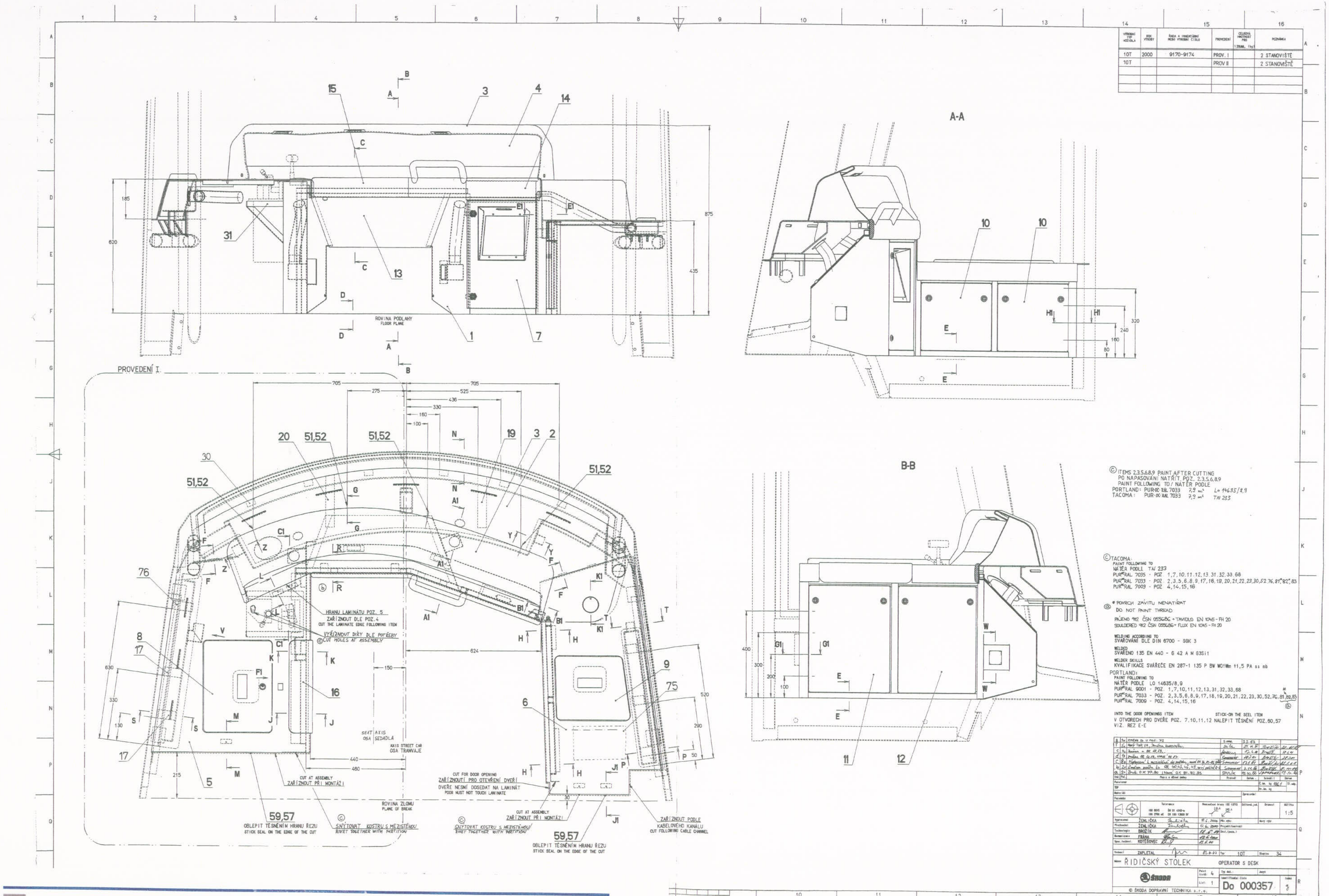
PERFORMANCE:
NOMINAL POWER OF TRACTION MOTORS .... 4x 90 kW
MAXIMUM OPERATING SPEED .... 70 km/h

PASSENGER LOADING:
TOTAL SEATED PASSENGERS 30
TOTAL NUMBER OF PASSENGERS AT AW2 115
TOTAL AREA OF STANDEES .... 21.25 m²

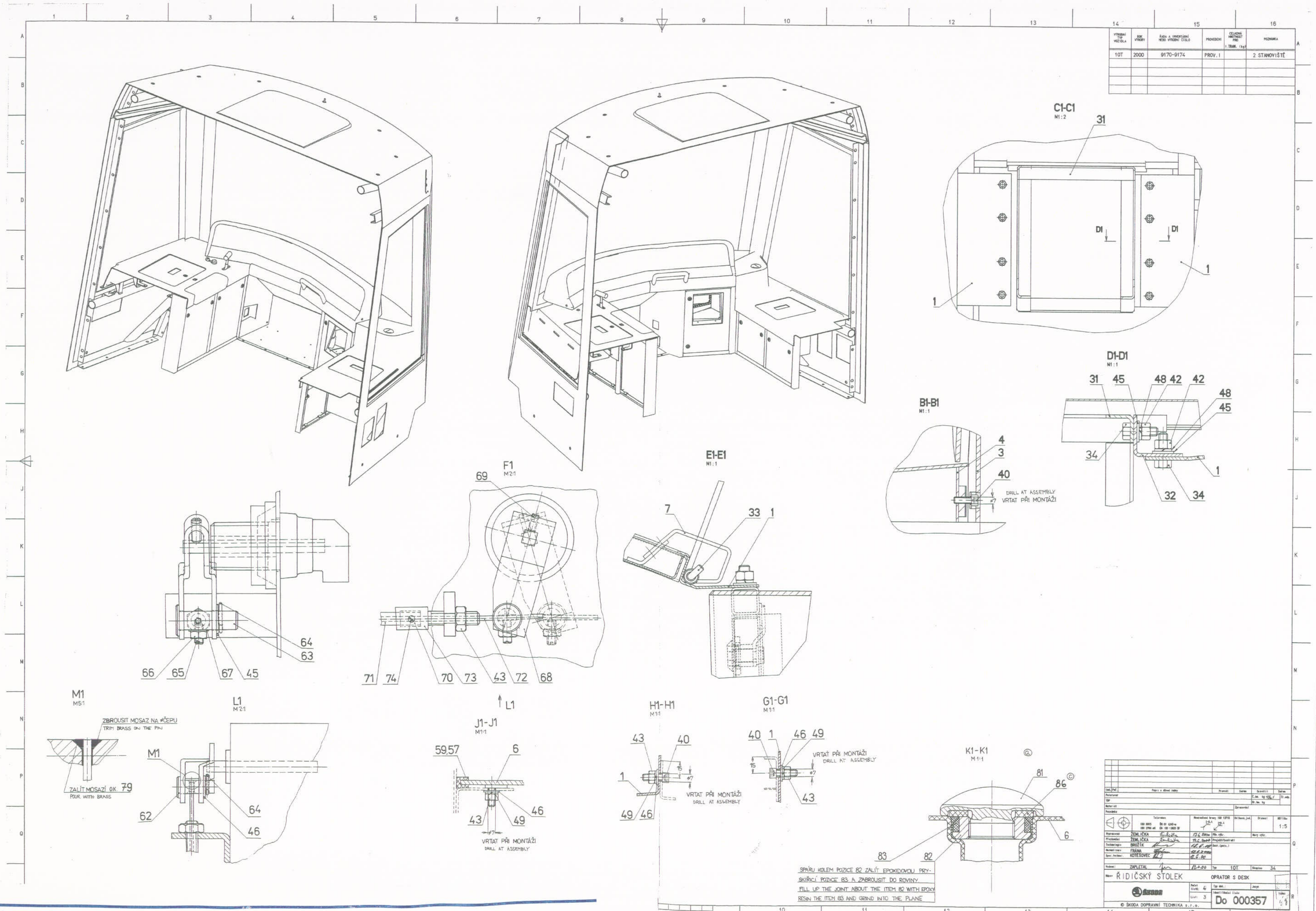
c. Floor Plan

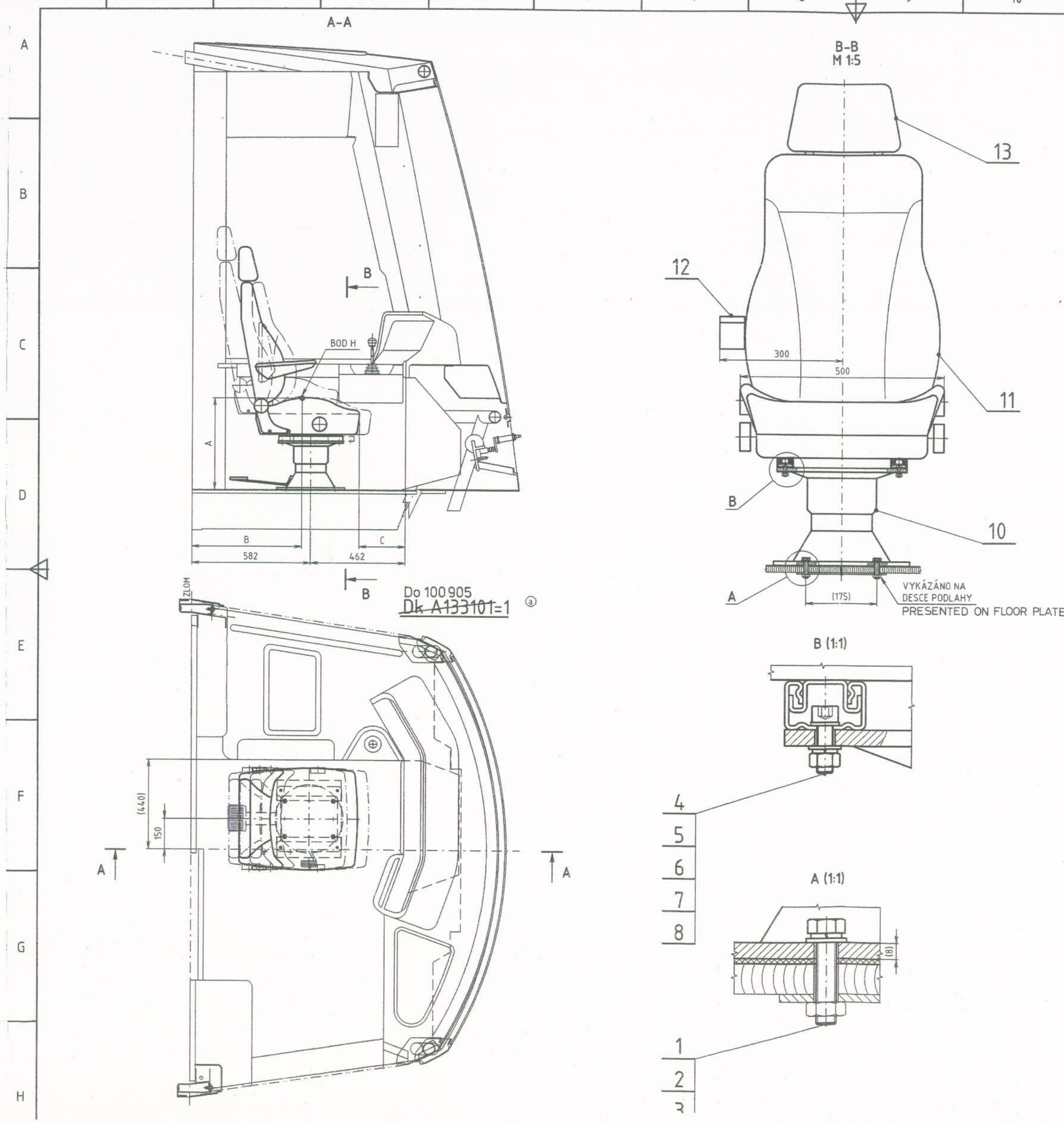
For the floor plan, please see following drawings, which follow this page:

- DO 000357 Sheet 1: Driver cab - Plan View (page 34)
- DO 000357 Sheet 2: Driver's cab - Isometric Views (page 35)
- DO 100905 Driver's Seat (page 36)
- DO 101597 Seating – End Cabs – Plan View (page 37)
- DO 101598 Seating – Center Cab – Plan View (page 38)



A-A
B-B
PROVEDENÍ I
ROVINA PODLAHY
FLOOR PLANE
HRANU LAMINÁTU POZ. 5
ZAŘÍZNOUT DLE POZ. 4
CUT THE LAMINATE EDGE FOLLOWING ITEM
VYŘÍZNOUT DÍRY DLE POTŘEBY
CUT HOLES AT ASSEMBLY
SEAT AXIS
OSA SEDADLA
AXIS STREET CAR
OSA TRAMVAJE
CUT AT ASSEMBLY
ZAŘÍZNOUT PŘI MONTÁŽI
CUT FOR DOOR OPENING
ZAŘÍZNOUT PRO OTEVŘENÍ DVEŘÍ
DVEŘE NESMÍ DOSEDAT NA LAMINÁT
DOOR MUST NOT TOUCH LAMINATE
ROVINA ZLOMU
PLANE OF BREAK
OBLEPIT TĚSNĚNÍM HRANU ŘEZU
STICK SEAL ON THE EDGE OF THE CUT
SNÝTOVAT KOSTRU S MEZISTĚNOU
RIVET TOGETHER WITH PARTITION
ZAŘÍZNOUT PODLE KABELOVÉHO KANÁLU
CUT FOLLOWING CABLE CHANNEL
10T | 2000 | 9170-9174 | PROV. I | 2 STANOVIŠTĚ
10T | PROV II | 2 STANOVIŠTĚ
ITEMS 2,3,5,6,8,9 PAINT AFTER CUTTING
PO NAPASOVÁNÍ NATŘÍT POZ. 2,3,5,6,8,9
PAINT FOLLOWING TO / NÁTĚR PODLE
PORTLAND: PUR-OC-RAL 7033 7,9 m² Lo 14635/8,9
TACOMA: PUR-OC-RAL 7033 7,9 m² TN 233
TACOMA:
PAINT FOLLOWING TO
NÁTĚR PODLE TN 233
PUR-RAL 7035 - POZ. 1,7,10,11,12,13,31,32,33,68
PUR-RAL 7033 - POZ. 2,3,5,6,8,9,17,18,19,20,21,22,23,30,52,76,81,82,83
PUR-RAL 7009 - POZ. 4,14,15,16
POVRCH ZÁVITU NENATÍRAT
DO NOT PAINT THREAD
PÁJENO 912 ČSN 055686 + TAVIDLO EN 1045 - FH 20
SOULDERED 912 ČSN 055686 + FLUX EN 1045 - FH 20
WELDING ACCORDING TO
SVAŘOVÁNÍ DLE DIN 6700 - SGK 3
WELDED
SVAŘENO 135 EN 440 - G 42 A M G3Si1
WELDER SKILLS
KVALIFIKACE SVÁŘEČE EN 287-1 135 P BW W01Wm t1,5 PA ss nb
PORTLAND:
PAINT FOLLOWING TO
NÁTĚR PODLE LO 14635/8,9
PUR-RAL 9001 - POZ. 1,7,10,11,12,13,31,32,33,68
PUR-RAL 7033 - POZ. 2,3,5,6,8,9,17,18,19,20,21,22,23,30,52,76,81,82,83
PUR-RAL 7009 - POZ. 4,14,15,16
INTO THE DOOR OPENINGS ITEM
STICK-ON THE SEEL ITEM
V OTVORECH PRO DVEŘE POZ. 7,10,11,12 NALEPIT TĚSNĚNÍ POZ. 60,57
VIZ. ŘEZ E-E
1:5
ŽEMLIČKA
ŽEMLIČKA
BROŽÍK
FRÁNA
KOTĚŠOVEC
ZAPLETAL
10T
34
ŘIDIČSKÝ STOLEK
OPERATOR S DESK
ŠKODA
Do 000357
© ŠKODA DOPRAVNÍ TECHNIKA s.r.o.


VÝROBNÍ TYP VOZIDLA | ROK VÝROBY | ŘADA A INVENTÁRNÍ NEBO VÝROBNÍ ČÍSLO | PROVEDENÍ | CELKOVÁ HMOTNOST PRO 1 TRAM. (kg) | POZNÁMKA
10T | 2000 | 9170-9174 | PROV. I | | 2 STANOVIŠTĚ
C1-C1
M1:2
D1-D1
M1:1
B1-B1
M1:1
DRILL AT ASSEMBLY
VRTAT PŘI MONTÁŽI
E1-E1
M1:1
F1
M2:1
M1
M5:1
ZBROUSIT MOSAZ NA ⌀ČEPU
TRIM BRASS ON THE PIN
ZALÍT MOSAZÍ OK
POUR WITH BRASS
L1
M2:1
J1-J1
M1:1
VRTAT PŘI MONTÁŽI
DRILL AT ASSEMBLY
H1-H1
M1:1
VRTAT PŘI MONTÁŽI
DRILL AT ASSEMBLY
G1-G1
M1:1
VRTAT PŘI MONTÁŽI
DRILL AT ASSEMBLY
K1-K1
M1:1
SPÁRU KOLEM POZICE 82 ZALÍT EPOXIDOVOU PRYSKYŘICÍ POZICE 83 A ZABROUSIT DO ROVINY
FILL UP THE JOINT ABOUT THE ITEM 82 WITH EPOXY RESIN THE ITEM 83 AND GRIND INTO THE PLANE
Vypracoval ŽEMLIČKA 12.6.2000
Přezkoušel ŽEMLIČKA 12.6.2000
Technologie BROŽÍK 12.6.00
Normalizace FRÁNA 12.6.2000
Spec. technol. KOTĚŠOVEC 12.6.00
Vedoucí ZAPLETAL 12.6.00
Typ 10T
Skupina 34
1:5
Název ŘIDIČSKÝ STOLEK
OPRATOR S DESK
ŠKODA
Počet listů: 4
List: 3
Identifikační číslo Do 000357
© ŠKODA DOPRAVNÍ TECHNIKA s.r.o.



VÝROBNÍ TYP VOZIDLA	ROK VÝROBY	ŘADA A INVENTÁRNÍ ČÍSLO NEBO VÝROBNÍ ČÍSLO	PROVEDENÍ	CELK. HMOTNOST PRO 1 tramvaj...[kg]	POZNÁMKA
03T0	1997	024	I	38,22	
03T0	1997	025	II	45,14	
03T1	1997/98	033÷036	II	45,14	
~~04T0~~	1998	047÷048	II	45,14	
03T2	1998	049÷051÷056	II	45,14	
03T3	1999	073÷077	II	45,14	
03T4	1999	078÷082	II	45,14	
10T0	2000		3	90,28	PORTLAND
10T1	2001	9175 - 9177	4	90,28	TACOMA
03T5	2000-01	9203 - 9207	2	45,14	4×OSTRAVA, 1× PLZEŇ

ASSEMBLY Do 100905=2 AND ITEM 9 AND 14 ARE DRAWN ON SHEET 2.

ⓐ PROVEDENÍ Do 100905=2 A POZ. 9 A 14 KRESLENY NA LISTU 2.

Provedení	A	B	C
=4	385-485	435-610	134-309
=3	385-485	435-610	134-309
=2	385-485	435-610	134-309
=1	452-552	434-594	170-330

ASSEMBLY LIST OF ITEMS IS NOT VALID VALID IS THE SEPARATE LIST IN THE BAAN SYSTEM

	=6	=5	=4	=3	=2	=1	Název - rozměr - polotovar	Číslo výkresu - Nákup / Norma, katalog, model, atd.	Mat. konečný / Mat. výchozí	Čistá hm. / Hrubá hm.	Poz.
ⓒ			2	-	-	-	SEDADLO S KOMPRESOREM-661 35 116 SEAT AND COMPRESSOR	DODÁ: C.I.E.B. KAHOVEC ID 82008484		45,0	16
ⓒ			-	2	-	-	SEDADLO S KOMPRESOREM-661 35 116 SEAT AND COMPRESSOR	DODÁ: C.I.E.B. KAHOVEC ID 82008483		45,0	15
ⓐ			-	-	1	-	SEDADLO S KOMPRESOREM 661 35 116 SEAT AND COMPRESSOR	ID 82001156 DODÁ: C.I.E.B. KAHOVEC		45.00	14
			-	-	-	1	OPĚRKA HLAVY HEAD SUPPORT	DODÁ: NORDEX		2.900	13
			-	-	-	1	LOKETNÍ OPĚRKA BE-GE STANDARD ELBOW SUPPORT	DODÁ: NORDEX		1.200	12
			-	-	-	1	SEDADLO ŘIDIČE BE-GE 98-00 OPERATOR SEAT	DODÁ: NORDEX		19.90	11
			-	-	-	1	STOJAN STAND ROTOLIFT 3	DODÁ: NORDEX		14.00	10
ⓐ			8	8	4	-	ŠROUB ISO 4014 - M10x60 - 8.8 - A3L BOLT			0.030	9
			-	-	-	4	PODLOŽKA 8 WASHER	ČSN 021740.05		0.001	8
			-	-	-	4	PODLOŽKA 8.4 WASHER	ČSN 021703.15		0.001	7
			-	-	-	4	PODLOŽKA 8.4 WASHER	ČSN 021702.15		0.001	6
			-	-	-	4	MATICE ISO 4032 - M8-6-A3L NUT			0.005	5
			-	-	-	4	ŠROUB M8x25 BOLT	ČSN 021143.25		0.015	4
			8	8	4	4	PODLOŽKA 10 WASHER	ČSN 021740.05		0.001	3
			8	8	4	4	PODLOŽKA 10.5 WASHER	ČSN 021702.15		0.003	2
			-	-	-	4	ŠROUB ISO 4017 - M10x45 - 8.8 - A3L BOLT			0.028	1

Provedení	=6	=5	=4	=3	=2	=1
			ⓒ	ⓑ		
Hmotnost ⓐ			90,28	90,28	39.003	38.234

Ind.	Počet	Popis změny	Provedl	Podpis	Datum	Schválil	Podpis	Datum	Čís. zm.
c	2	PROV. 4, NOVÉ 0.K. 15,16	STULÍK	[signature]	12.3.01	Brožík	[signature]	13.3.01	
b	1	PROV. 3	STULÍK	[signature]	28.1.2000				
a	6	Sedadlo řidiče KAHOVEC	Ryjáček	[signature]	2.9.1997				A055

TOLEROVÁNÍ ISO 8015, ISO 2768-mK

Celková hmotnost [kg]

Formát: A1	Vypracoval Ryjáček	20.6.1997	[signature]
	Kontroloval DROLLE	21.6.1997	[signature]
	Výr.proj.		
	Normalizace DUDOVÁ	21.6.1997	[signature]
	Spec.technol.		
Archiv:	Kvalita		
CAD: AutoCAD r.13 Profi+ 5.13	Schválil: MÜLLER	22.6.1997	[signature]

Sestava: (Pozn.:) =5L

Označení kusovníku:

Původní/nový dok.:

Typ: 03T | Skupina: ~~34~~ 93 | Měřítko: 1:10

KOLEJOVÁ DOPRAVA s.r.o., Voctářova 3, PRAHA 8

Název: OPERATOR SEAT SEDADLO ŘIDIČE

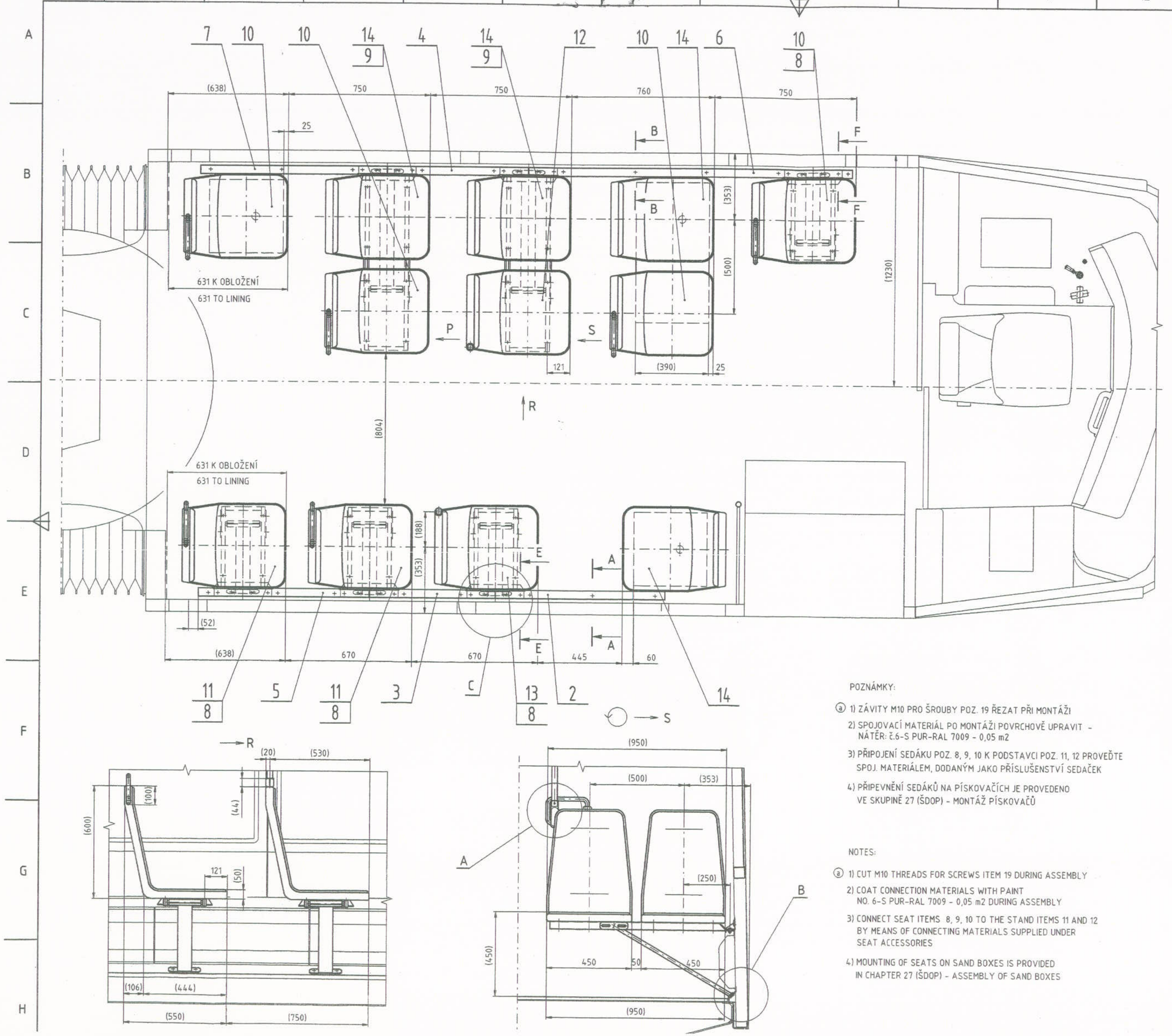
Číslo výkresu: ~~Dk A133101~~ b Do 100905 ⓐ C

Listů: 2 List: 1 Ind.

Poznámka

Status:

Médium:



VÝROBNÍ TYP VOZIDLA	ROK VÝROBY	ŘADA A INVENTÁRNÍ ČÍSLO NEBO VÝROBNÍ ČÍSLO	PROVEDENÍ	CELK. HMOTNOST PRO 1 (kg)	POZNÁMKA

LIST Č.2 - DETAILY A, B, C — SHEET No.2 - DETAILS A, B, C
LIST Č.2 - ŘEZY A-A, B-B, E-E, F-F — SHEET No.2 - SECTIONS A-A, B-B, E-E, F-F
LIST Č.2 - POHLED P — SHEET No.2 - VIEW P

	Poč. kusů	Název - rozměr - polotovar	Číslo výkresu - Nákup / Norma, katalog, model, atd.	Mat. konečný / Mat. výchozí	Čistá hm. / Hrubá hm.	Poz.
						26
						25
ⓐ	12	PODLOŽKA 10 WASHER	ČSN 021741.05		0.002	24
ⓐ	12	PODLOŽKA B 10.5 WASHER	ČSN 021702.15		0.004	23
ⓐ	24	PODLOŽKA 12 WASHER	ČSN 021741.05		0.004	22
ⓐ	24	MATICE ISO 4032 M12-8-A3L NUT			0.014	21
ⓐ	12	ŠROUB ISO 4017 M10x25-8.8-A2L BOLT			0.026	20
ⓐ	24	ŠROUB ISO 4017 M12x30-8.8-A3L BOLT			0.043	19
ⓐ						18
ⓐ	18	MATICE ISO 4032 M8-8-A2L NUT			0.006	17
ⓐ	18	PODLOŽKA 8 WASHER	ČSN 021741.05		0.004	16
ⓐ						15
	4	SEDÁK VARIANT SEAT	310 8000 0000 2 AIR ČEŇKOV a.s.		9.200	14
	1	SEDÁK VARIANT SEAT	311 8005 0000 2 AIR ČEŇKOV a.s.		9.200	13
	1	SEDÁK VARIANT SEAT	311 8004 0000 2 AIR ČEŇKOV a.s.		9.200	12
	2	SEDÁK VARIANT SEAT	311 8002 0000 2 AIR ČEŇKOV a.s.		9.200	11
	4	SEDÁK VARIANT SEAT	311 8001 0000 2 AIR ČEŇKOV a.s.		9.200	10
	2	PODSTAVEC STAND	319 8620 0000 2 AIR ČEŇKOV a.s.		7.200	9
	4	PODSTAVEC STAND	319 8610 0000 2 AIR ČEŇKOV a.s.		7.200	8
	1	LIŠTA LINING	Dk P50505 Do 201962		0.800	7
	1	LIŠTA LINING	Dk P50504 Do 201961		1.170	6
	1	LIŠTA LINING	Dk P50503 Do 201960		0.750	5
	1	LIŠTA LINING	Dk P50502:2 Do 305188:2		0.480	4
	1	LIŠTA LINING	Dk P50502:1 Do 305188:1		0.420	3
	1	LIŠTA LINING	Dk P50501 Do 201959		0.800	2
	18	ÚCHYT FASTENER	Dk A450210 Do 404164		0.025	1

Ind.	Počet	Popis změny	Provedl	Podpis	Datum	Schválil	Podpis	Datum	Čís. zm.
a	13	změna uchycení sedáků	M.Vitha	[signature]	6.6.00				P054

POZNÁMKY:

ⓐ 1) ZÁVITY M10 PRO ŠROUBY POZ. 19 ŘEZAT PŘI MONTÁŽI

2) SPOJOVACÍ MATERIÁL PO MONTÁŽI POVRCHOVĚ UPRAVIT - NÁTĚR: č.6-S PUR-RAL 7009 - 0,05 m2

3) PŘIPOJENÍ SEDÁKU POZ. 8, 9, 10 K PODSTAVCI POZ. 11, 12 PROVEĎTE SPOJ. MATERIÁLEM, DODANÝM JAKO PŘÍSLUŠENSTVÍ SEDAČEK

4) PŘIPEVNĚNÍ SEDÁKŮ NA PÍSKOVAČÍCH JE PROVEDENO VE SKUPINĚ 27 (ŠDOP) - MONTÁŽ PÍSKOVAČŮ

NOTES:

ⓐ 1) CUT M10 THREADS FOR SCREWS ITEM 19 DURING ASSEMBLY

2) COAT CONNECTION MATERIALS WITH PAINT NO. 6-S PUR-RAL 7009 - 0,05 m2 DURING ASSEMBLY

3) CONNECT SEAT ITEMS 8, 9, 10 TO THE STAND ITEMS 11 AND 12 BY MEANS OF CONNECTING MATERIALS SUPPLIED UNDER SEAT ACCESSORIES

4) MOUNTING OF SEATS ON SAND BOXES IS PROVIDED IN CHAPTER 27 (ŠDOP) - ASSEMBLY OF SAND BOXES

TOLEROVÁNÍ ISO 8015, ISO 2768-mK, EN ISO 13920-BF — Celková hmotnost [kg] 160.483

Formát: A1 — Vypracoval M.Vitha 15.12.99; Kontroloval Drolle 29.12.99; Výr.proj. Brožík 11.1.00; Normalizace Dudová 28.12.99; Spec.technol.; Kvalita; Schválil: Müller 12/99

CAD: AutoCAD r.14 Profi 6.3

Sestava: (Pozn.:) ⓐ ČLÁNEK KRAJNÍ END SECTION

Označení kusovníku:
Původní/nový dok.:

Typ: 10T — Skupina: 91 — Měřítko: 1:10

KOLEJOVÁ DOPRAVA s.r.o., Voctářova 3, PRAHA 8

Název: UMÍSTĚNÍ SEDADEL
LAYOUT OF SEATS

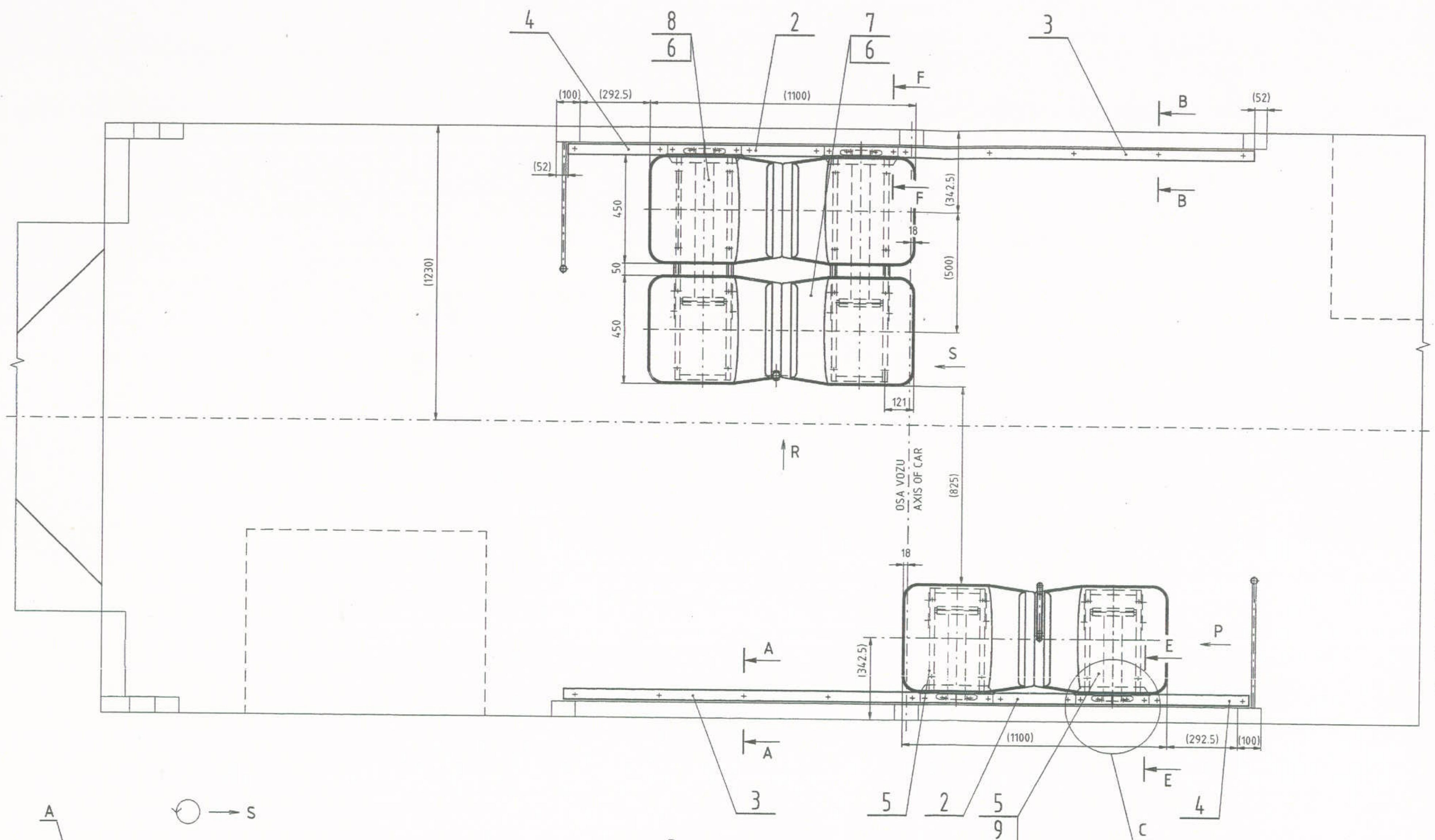
Číslo výkresu: ~~Dk P50101~~ Do 101597 — Listů: 2 List: 1 — Ind. a

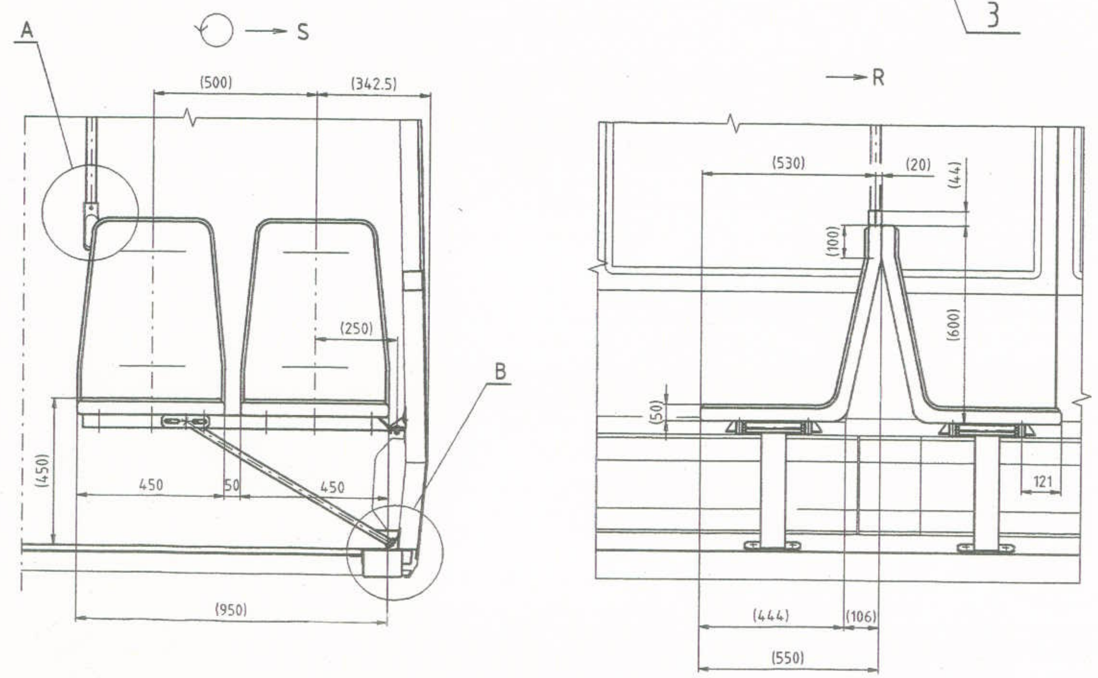
Status:
Médium:

VÝROBNÍ TYP VOZIDLA	ROK VÝROBY	ŘADA A INVENTÁRNÍ ČÍSLO NEBO VÝROBNÍ ČÍSLO	PROVEDENÍ	CELK. HMOTNOST PRO 1..........(kg)	POZNÁMKA

LIST Č.2 - DETAILY A, B, C
LIST Č.2 - ŘEZY A-A, B-B, E-E, F-F
LIST Č.2 - POHLED P

SHEET No.2 - DETAILS A, B, C
SHEET No.2 - SECTIONS A-A, B-B, E-E, F-F
SHEET No.2 - VIEW P





POZNÁMKY:

ⓐ 1) ZÁVITY M10 PRO ŠROUBY POZ. 15 ŘEZAT PŘI MONTÁŽI

2) SPOJOVACÍ MATERIÁL PO MONTÁŽI POVRCHOVĚ UPRAVIT - NÁTĚR: č.6-S PUR-RAL 7009 - 0,07 m2

3) PŘIPOJENÍ SEDÁKU POZ. 5, 6 K PODSTAVCI 7, 8 PROVEĎTE SPOJ. MATERIÁLEM, DODANÝM JAKO PŘÍSLUŠENSTVÍ SEDAČEK

NOTES:

ⓐ 1) CUT M10 THREADS FOR SCREWS ITEM 15 DURING ASSEMBLY

2) COAT CONNECTION MATERIALS WITH PAINT NO. 6-S PUR-RAL 7009 - 0,05 m2 DURING ASSEMBLY

3) CONNECT SEAT ITEMS 5 AND 6 TO THE STAND ITEMS 7 AND 8 BY MEANS OF CONNECTING MATERIALS SUPPLIED UNDER SEAT ACCESSORIES

	Poč. kusů	Název - rozměr - polotovar	Číslo výkresu - Nákup / Norma, katalog, model, atd.	Mat. konečný / Mat. výchozí	Čistá hm. / Hrubá hm.	Poz.
						21
						20
ⓐ	8	PODLOŽKA 10 WASHER	ČSN 021741.05		0.002	19
ⓐ	8	PODLOŽKA B 10.5 WASHER	ČSN 021702.15		0.004	18
ⓐ	16	PODLOŽKA 12 WASHER	ČSN 021741.05		0.004	17
ⓐ	16	MATICE ISO 4032 M12-8-A3L NUT			0.014	16
ⓐ	8	ŠROUB ISO 4017 M10x25-8.8-A2L BOLT			0.026	15
ⓐ	16	ŠROUB ISO 4017 M12x30-8.8-A3L BOLT			0.043	14
ⓐ						13
ⓐ	18	MATICE ISO 4032 M8-8-A2L NUT			0.006	12
ⓐ	18	PODLOŽKA 8 WASHER	ČSN 021741.05		0.002	11
ⓐ						10
	1	SEDÁK VARIANT SEAT	312 8012 0000 2 AIR ČENKOV a.s.		18.400	9
	1	SEDÁK VARIANT SEAT	313 8010 0000 2 AIR ČENKOV a.s.		18.400	8
	1	SEDÁK VARIANT SEAT	312 8015 0000 2 AIR ČENKOV a.s.		18.400	7
	2	PODSTAVEC STAND	319 8620 0000 2 AIR ČENKOV a.s.		7.200	6
	2	PODSTAVEC STAND	319 8610 0000 2 AIR ČENKOV a.s.		7.200	5
	2	LIŠTA LINING	Dk P50507 Do 305189		0.380	4
	2	LIŠTA LINING	Dk P50506 Do 201963		1.100	3
	2	LIŠTA LINING	Dk P50502:3 Do 305188:3		0.380	2
	18	ÚCHYT FASTENER	Dk A450210 Do 404164		0.025	1

Ind.	Počet	Popis změny	Provedl	Podpis	Datum	Schválil	Podpis	Datum	Čís. zm.
a	13	změna uchycení sedáků	M.Vitha	[signature]	6.6.00				P054

TOLEROVÁNÍ ISO 8015, ISO 2768-mK, EN ISO 13920-BF

Celková hmotnost [kg] 89.531

Formát: A1

Vypracoval	M.Vitha	15.12.99	[signature]
Kontroloval	Drolle	29.12.99	[signature]
Výr.proj.	Brožík	11.1.00	
Normalizace	Dudová	28.12.99	[signature]
Spec.technol.			
Kvalita			
Schválil:	Müller	12/99	[signature]

Vyd. dok.: Uk. dok.: Archiv: CAD: AutoCAD r.14 Profi 6.3

Sestava: (Pozn.) ⓐ
ČLÁNEK STŘEDNÍ
MIDDLE SECTION

Označení kusovníku:
Původní/nový dok.:

Typ: 10T | Skupina: 91 | Měřítko: 1:10

KOLEJOVÁ DOPRAVA s.r.o., Voctářova 3, PRAHA 8

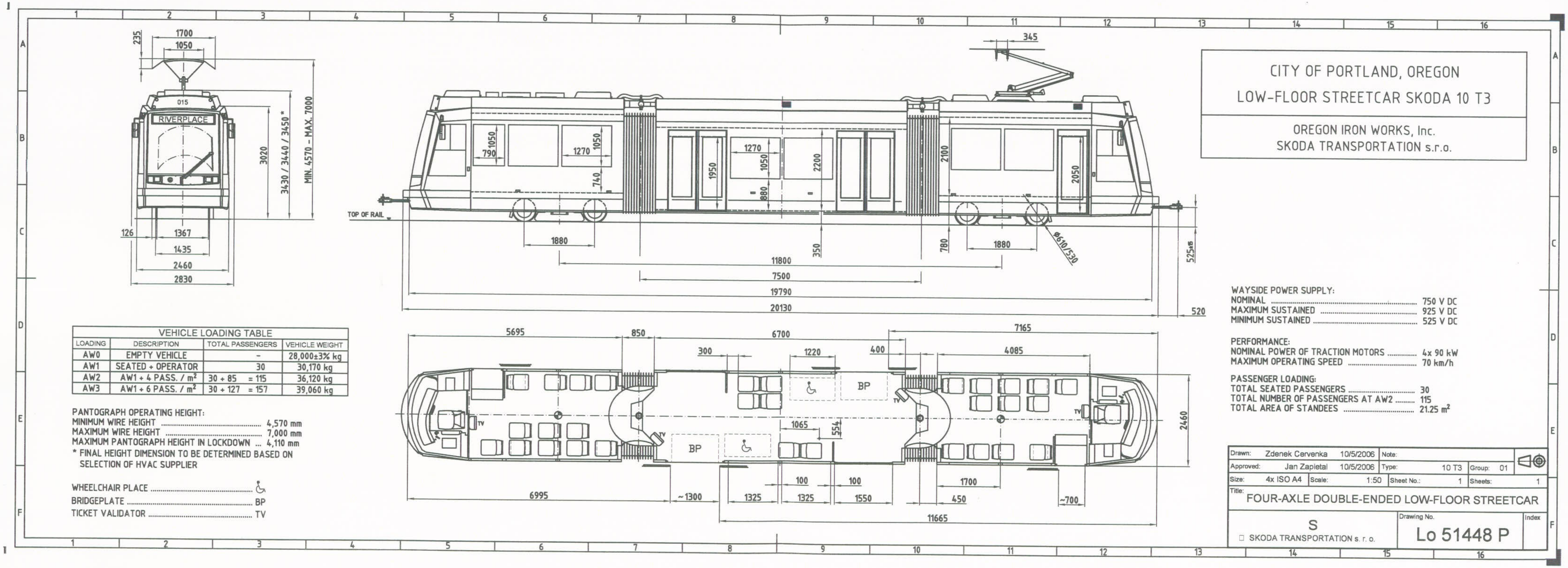
Název: UMÍSTĚNÍ SEDADEL
LAYOUT OF SEATS

Číslo výkresu: ~~Dk P50102~~ a
Do 101598 a
Listů: 2 List: 1 Ind.

Status:
Médium:

d. Exterior Side and End Elevations

For the exterior side and end elevations, please see drawing LO 51448, which follows this page.



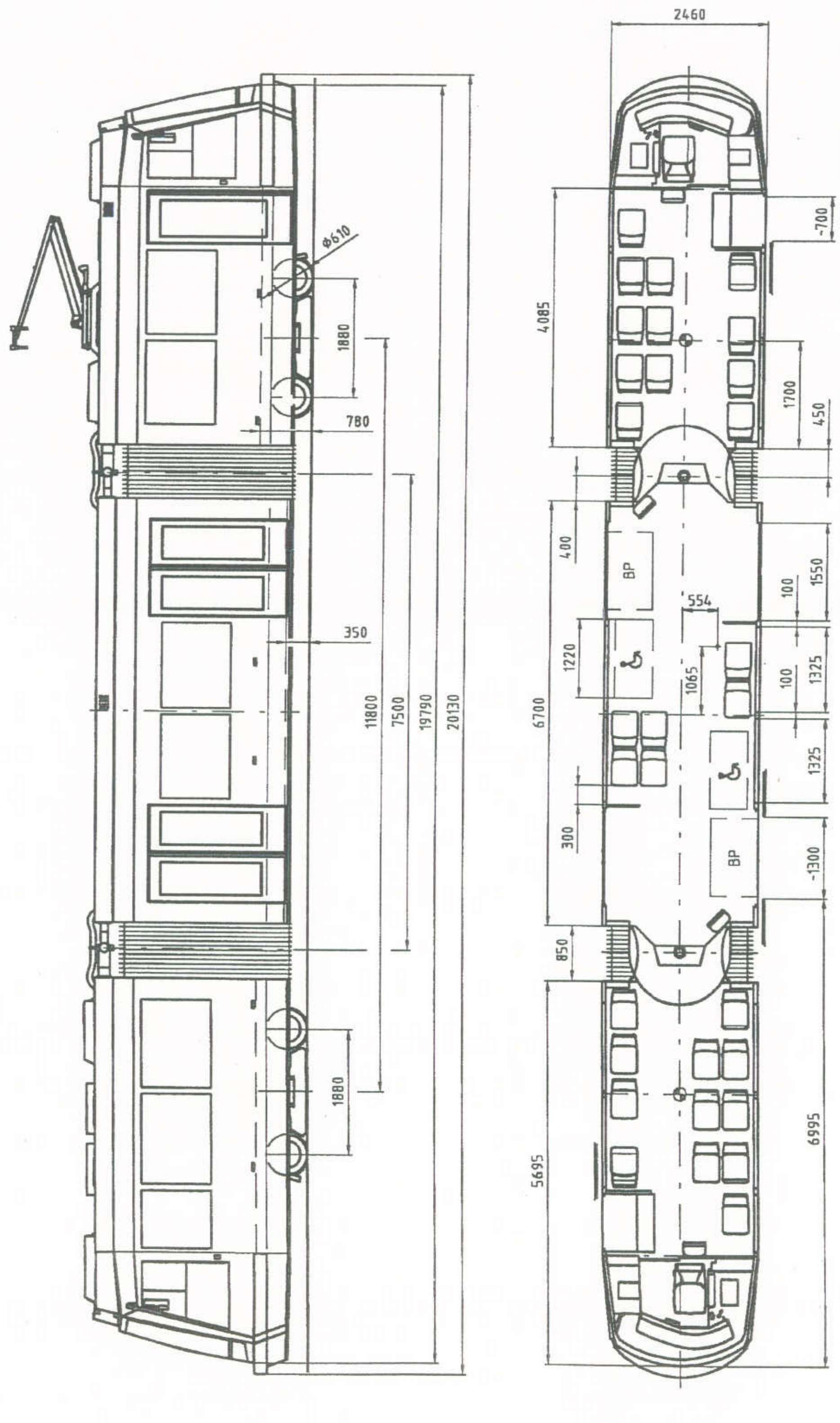
VEHICLE LOADING TABLE			
LOADING	DESCRIPTION	TOTAL PASSENGERS	VEHICLE WEIGHT
AW0	EMPTY VEHICLE	-	28,000±3% kg
AW1	SEATED + OPERATOR	30	30,170 kg
AW2	AW1 + 4 PASS. / m²	30 + 85 = 115	36,120 kg
AW3	AW1 + 6 PASS. / m²	30 + 127 = 157	39,060 kg

e. Dynamic Envelope Diagrams

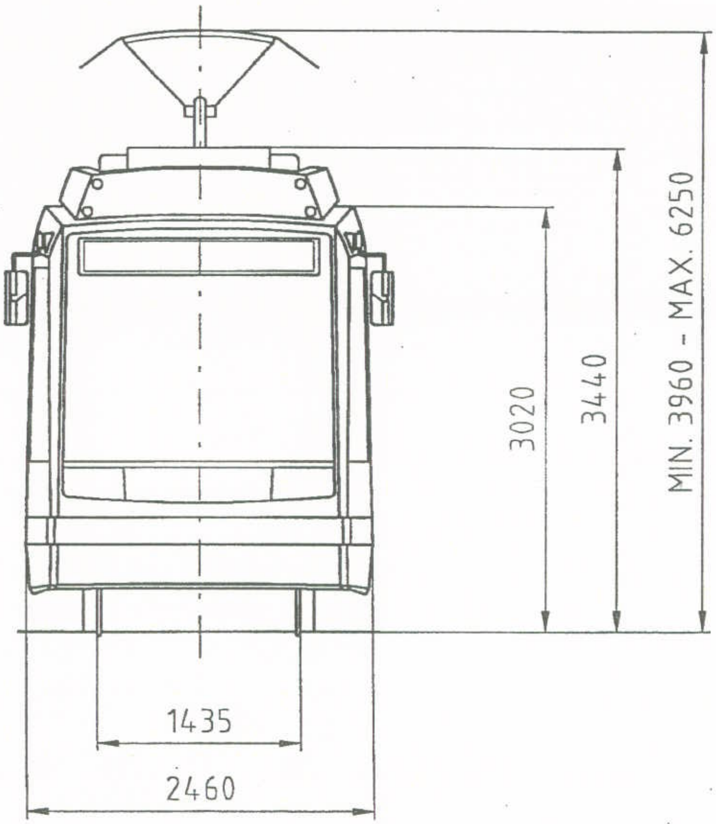
***Dynamic envelope comments:** the original RFP requirement for the pantograph maximum height is 7,000 mm. Later, (9/19/06), Addendum # 4 and the mail received from the customer provides the dynamic envelope for the street car with the maximum pantograph height at 6,250 mm. Our proposal (and component from supplier) could/will meet the 7,000 mm requested thru the original RFP. However, the dynamic envelope provided by us at this paragraph meets the requirements of the Addendum # 4 (6,250 mm). Since the vehicle we propose is the same with the current Portland one (with slight changes) the dynamic envelope provided for this paragraph is the same as the one for the current Portland vehicle (and requested in addendum # 4). If the decision will be made to actually change the maximum pantograph height to 7,000 mm, OIW-Skoda team will provide the customer with a new dynamic envelope in accordance with this dimension.

For the dynamic envelope, please see 28 page chart, which follows this page (pages 42-69).

ŠKODA	Layout and Curve Offsets	



ŠKODA	Layout and Curve Offsets	



Total pages:28 Page No.2

VEHICLE DYNAMIC ENVELOPE CLEARANCE PROGRAM - HORIZONTAL OFFSETS & DISPLACEMENTS

DATA INPUT — ZADANÉ HODNOTY

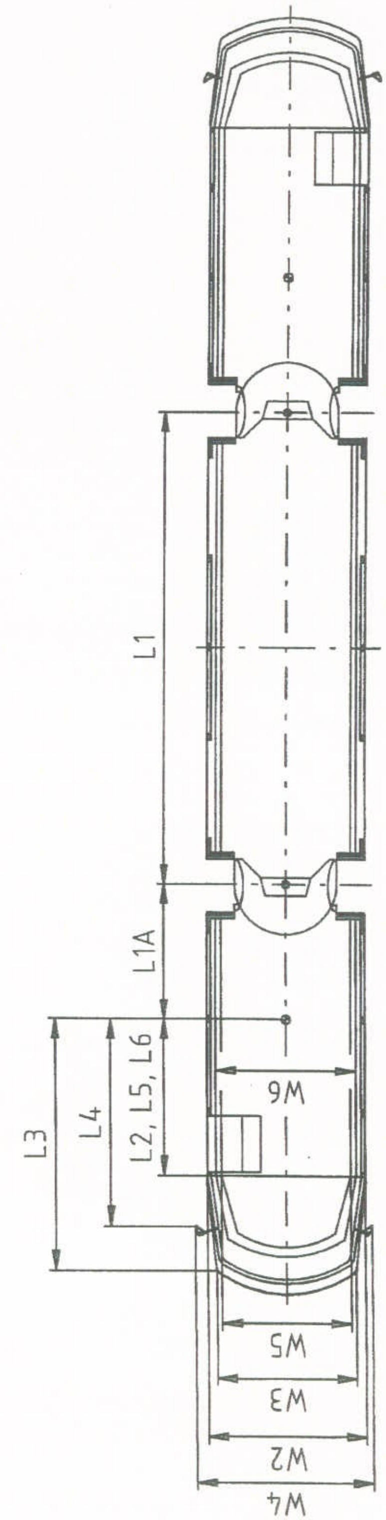
	Front End Truck Axel Spacing	1 880	[mm]	- rozvor předního podvozku
	Back End Truck Axel Spacing	1 880	[mm]	- rozvor zadního podvozku
L1	- Pivot Centers Length	7 500	[mm]	- vzdálenost otočných kloubů skříně
L1A	- Articulation Centers	2 150	[mm]	- vzdálenost otočných kloubů skříně od osy podvozku
L2	- Body Corner Length	2 385	[mm]	- vzdálenost zlomu skříně
L3	- Front End Length	3 810	[mm]	- rozvor podvozku (pro potřeby výpočtu)
L4	- Mirror Length	3 155	[mm]	- vzdálenost zrcátek
L5	- Roof Eguipment Length	2 385	[mm]	- vzdálenost střešní nadstavby
L6	- Roof Shroud	2 385	[mm]	- nosná střecha
W2	- Body Corner Width	2 460	[mm]	- šířka zlomu skříně
W3	- Front End Width	2 176	[mm]	- šířka čela
W4	- Mirror Width	2 830	[mm]	- šířka zrcátek
W5	- Roof Eguipment Width	2 009	[mm]	- šířka střešní nadstavby
W6	- Roof Shroud	2 180	[mm]	- nosná střecha
	Pantograph Sway	76	[mm]	- boční výkyv pantografu (celkem)

LATERAL MOTION — PŘÍČNÉ POSUVY

Wheel flange wear	8	[mm]	- opotřebení okolku
Rail wear	16	[mm]	- opotřebení kolejnice
Rail gauge tolerance (half)	3	[mm]	- tolerance rozchodu koleje (polovina)
Wheel gauge tolerance (half)	2	[mm]	- tolerance rozchodu dvojkolí (polovina)
Nominal sideplay	19	[mm]	- jmenovitá vůle (polovina)
Lateral suspension motion	20	[mm]	- příčný posuv vypružení
Total	68	[mm]	

SKEW — VYBOČENÍ

	Lateral motion	68	[mm]	- příčný posuv
D2	- Body Corner Skew	68	[mm]	- vybočení zlomu skříně
D3	- Front End Skew	68	[mm]	- vybočení čela
D4	- Mirror Skew	68	[mm]	- vybočení zrcátek
D5	- Roof Eguipment Skew	68	[mm]	- vybočení střešní nadstavby
D6	- Roof Shroud	68	[mm]	- oplechování střechy

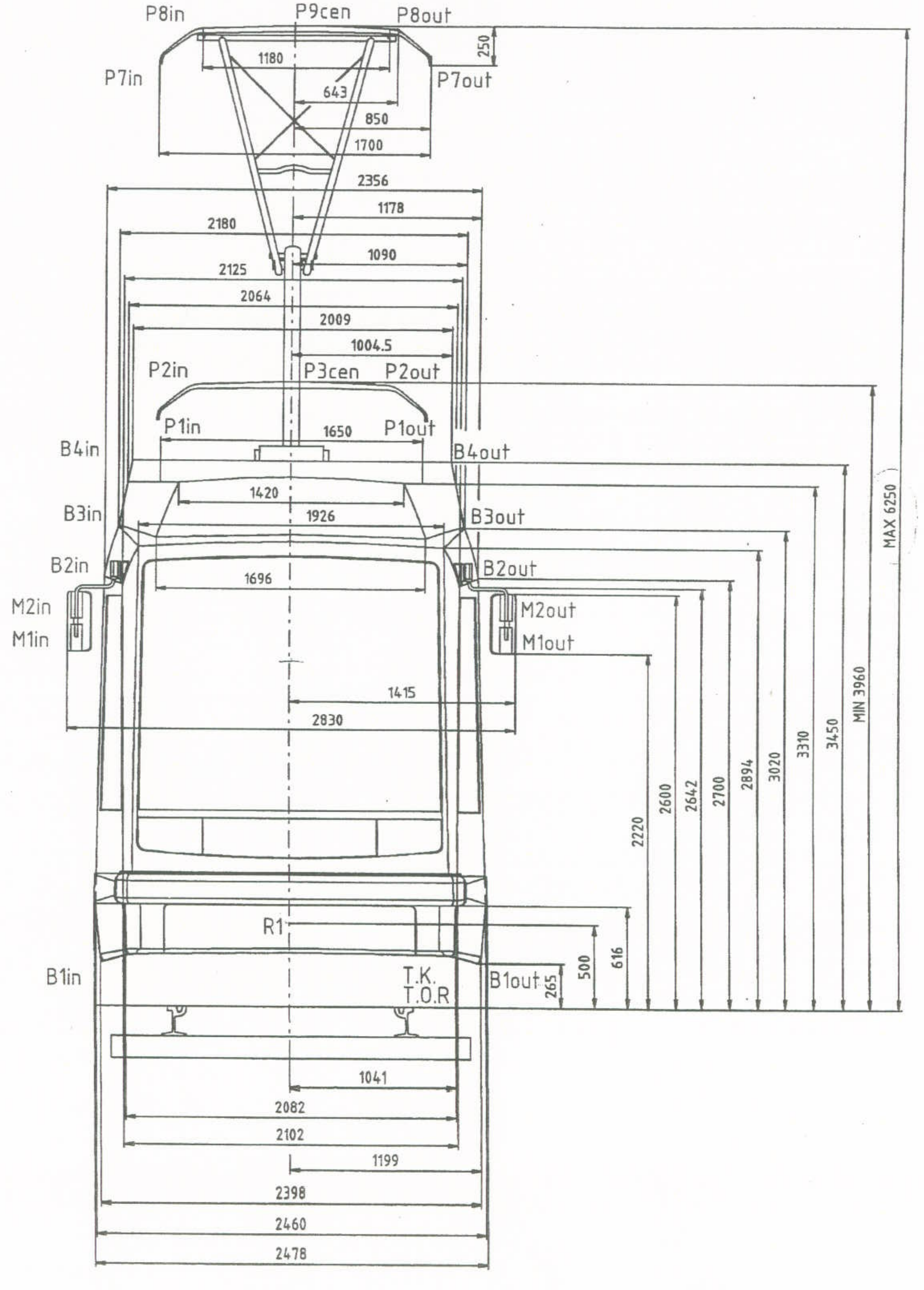

L1
L1A
L2, L5, L6
L4
L3
W6
W5
W3
W2
W4

HORIZONTAL OFFSETS & DISPLACEMENTS

Radius	d1	d2	d3	d	D1	D15	D16	Body Corner		Front End		Mirror		Roof Equip		Roof Shroud	
[mm]	F End Truck	B End Truck	Center	Mid				D2in	D2out	D3in	D3out	D4in	D4out	D5in	D5out	D6in	D6out
20 000	22,1	22,1	93,3	259,8	1 557,8	1 332,3	1 417,8	1 169	1 409,6	797,7	1 475,7	1 238,9	1 692,3	945,3	1 185,5	1 030,1	1 270,5
25 000	17,7	17,7	74,7	207,3	1 505,3	1 279,8	1 365,3	1 196,2	1 388,6	871,8	1 415,3	1 290,4	1 653,2	971,9	1 164	1 056,9	1 249,2
30 000	14,7	14,7	62,3	172,6	1 470,6	1 245,1	1 330,6	1 214	1 374,2	920,6	1 374	1 324,1	1 626,4	989,3	1 149,4	1 074,5	1 234,7
35 000	12,6	12,6	53,4	147,8	1 445,8	1 220,3	1 305,8	1 226,5	1 363,8	955,2	1 344	1 347,7	1 606,8	1 001,5	1 138,8	1 086,8	1 224,1
40 000	11	11	46,7	129,3	1 427,3	1 201,8	1 287,3	1 235,7	1 355,9	980,9	1 321,3	1 365,2	1 592	1 010,7	1 130,8	1 096	1 216,1
45 000	9,8	9,8	41,5	114,9	1 412,9	1 187,4	1 272,9	1 242,9	1 349,7	1 000,8	1 303,4	1 378,8	1 580,3	1 017,7	1 124,5	1 103,1	1 209,9
50 000	8,8	8,8	37,4	103,3	1 401,3	1 175,8	1 261,3	1 248,5	1 344,7	1 016,6	1 289,1	1 389,5	1 570,9	1 023,3	1 119,4	1 108,7	1 204,8
75 000	5,9	5,9	24,9	68,9	1 366,9	1 141,4	1 226,9	1 265,3	1 329,4	1 063,7	1 245,4	1 421,3	1 542,2	1 040	1 104	1 125,4	1 189,5
100 000	4,4	4,4	18,7	51,6	1 349,6	1 124,1	1 209,6	1 273,6	1 321,7	1 087,1	1 223,4	1 436,9	1 527,6	1 048,2	1 096,2	1 133,7	1 181,7
150 000	2,9	2,9	12,5	34,4	1 332,4	1 106,9	1 192,4	1 281,8	1 313,9	1 110,2	1 201,1	1 452,5	1 512,9	1 056,4	1 088,4	1 141,8	1 173,9
200 000	2,2	2,2	9,3	25,8	1 323,8	1 098,3	1 183,8	1 285,9	1 309,9	1 121,7	1 189,9	1 460,1	1 505,5	1 060,4	1 084,4	1 145,9	1 169,9
250 000	1,8	1,8	7,5	20,6	1 318,6	1 093,1	1 178,6	1 288,3	1 307,6	1 128,6	1 183,1	1 464,7	1 501	1 062,8	1 082,1	1 148,3	1 167,6
400 000	1,1	1,1	4,7	12,9	1 310,9	1 085,4	1 170,9	1 292	1 304	1 138,9	1 173	1 471,6	1 494,3	1 066,5	1 078,5	1 152	1 164
600 000	0,7	0,7	3,1	8,6	1 306,6	1 081,1	1 166,6	1 294	1 302	1 144,6	1 167,3	1 475,4	1 490,5	1 068,5	1 076,5	1 154	1 162
800 000	0,6	0,6	2,3	6,5	1 304,5	1 079	1 164,5	1 295	1 301	1 147,5	1 164,5	1 477,3	1 488,7	1 069,5	1 075,5	1 155	1 161
1 000 000	0,4	0,4	1,9	5,2	1 303,2	1 077,7	1 163,2	1 295,6	1 300,4	1 149,2	1 162,8	1 478,5	1 487,5	1 070,1	1 074,9	1 155,6	1 160,4
2 500 000	0,2	0,2	0,7	2,1	1 300,1	1 074,6	1 160,1	1 297	1 299	1 153,3	1 158,7	1 481,2	1 484,8	1 071,5	1 073,5	1 157	1 159
5 000 000	0,1	0,1	0,4	1	1 299	1 073,5	1 159	1 297,5	1 298,5	1 154,6	1 157,4	1 482,1	1 483,9	1 072	1 073	1 157,5	1 158,5
Tangent	0	0	0	0	1 298	1 072,5	1 158	1 298	1 298	1 156	1 156	1 483	1 483	1 072,5	1 072,5	1 158	1 158

HORIZONTAL OFFSETS & DISPLACEMENTS

Radius [mm]	MAXin	MAXout	MAXin Mirror	MAXout Mirror	MAXin Roof Equip	MAXout Roof Equip	MAXin Roof Shroud	MAXout Roof Shroud
20 000	-1 557,8	1 475,7	-1 557,8	1 692,3	-1 332,3	1 185,5	-1 417,8	1 270,5
25 000	-1 505,3	1 415,3	-1 505,3	1 653,2	-1 279,8	1 164	-1 365,3	1 249,2
30 000	-1 470,6	1 374,2	-1 470,6	1 626,4	-1 245,1	1 149,4	-1 330,6	1 234,7
35 000	-1 445,8	1 363,8	-1 445,8	1 606,8	-1 220,3	1 138,8	-1 305,8	1 224,1
40 000	-1 427,3	1 355,9	-1 427,3	1 592	-1 201,8	1 130,8	-1 287,3	1 216,1
45 000	-1 412,9	1 349,7	-1 412,9	1 580,3	-1 187,4	1 124,5	-1 272,9	1 209,9
50 000	-1 401,3	1 344,7	-1 401,3	1 570,9	-1 175,8	1 119,4	-1 261,3	1 204,8
75 000	-1 366,9	1 329,4	-1 421,3	1 542,2	-1 141,4	1 104	-1 226,9	1 189,5
100 000	-1 349,6	1 321,7	-1 436,9	1 527,6	-1 124,1	1 096,2	-1 209,6	1 181,7
150 000	-1 332,4	1 313,9	-1 452,5	1 512,9	-1 106,9	1 088,4	-1 192,4	1 173,9
200 000	-1 323,8	1 309,9	-1 460,1	1 505,5	-1 098,3	1 084,4	-1 183,8	1 169,9
250 000	-1 318,6	1 307,6	-1 464,7	1 501	-1 093,1	1 082,1	-1 178,6	1 167,6
400 000	-1 310,9	1 304	-1 471,6	1 494,3	-1 085,4	1 078,5	-1 170,9	1 164
600 000	-1 306,6	1 302	-1 475,4	1 490,5	-1 081,1	1 076,5	-1 166,6	1 162
800 000	-1 304,5	1 301	-1 477,3	1 488,7	-1 079	1 075,5	-1 164,5	1 161
1 000 000	-1 303,2	1 300,4	-1 478,5	1 487,5	-1 077,7	1 074,9	-1 163,2	1 160,4
2 500 000	-1 300,1	1 299	-1 481,2	1 484,8	-1 074,6	1 073,5	-1 160,1	1 159
5 000 000	-1 299	1 298,5	-1 482,1	1 483,9	-1 073,5	1 073	-1 159	1 158,5
Tangent	-1 298	1 298	-1 483	1 483	-1 072,5	1 072,5	-1 158	1 158


P8in
P9cen
P8out
P7in
P7out
1180
643
850
1700
250
2356
1178
2180
2125
1090
2064
2009
1004.5
P2in
P3cen
P2out
P1in
1650
P1out
B4in
B4out
1420
B3in
1926
B3out
B2in
B2out
1696
M2in
M2out
M1in
M1out
1415
2830
R1
B1in
T.K.
T.O.R
B1out
265
500
616
2220
2600
2642
2700
2894
3020
3310
3450
MIN 3960
MAX 6250
1041
2082
2102
1199
2398
2460
2478

STATIC LRV ROLL CENTER

	X	Y
	mm	mm
R1	0	500

STATIC LRV BODY POINTS

	X	Y			X	Y
	mm	mm			mm	mm
B1out	1 199	265		B1in	-1 199	265
B2out	1 178	2 700		B2in	-1 178	2 700
B3out	1 090	3 020		B3in	-1 090	3 020
B4out	1 004,5	3 450		B4in	-1 004,5	3 450

STATIC LRV MIRRORS POINTS

	X	Y			X	Y
	mm	mm			mm	mm
M1out	1 415	2 200		M1in	-1 415	2 200
M2out	1 415	2 600		M2in	-1 415	2 600

STATIC LRV PANTOGRAPH POINTS

	X	Y			X	Y
	mm	mm			mm	mm
P1out	850	3 710		P1in	-850	3 710
P2out	643	3 960		P2in	-643	3 960
P3cen	0	3 960				
P4out	850	4 855		P4in	-850	4 855
P5out	643	5 105		P5in	-643	5 105
P6cen	0	5 105				
P7out	850	6 000		P7in	-850	6 000
P8out	643	6 250		P8in	-643	6 250
P9cen	0	6 250				

SUPERELEVATION & CROSS LEVEL FOR EACH TABLE

Table Number	Super Elevation	Cross Level		Table Number	Super Elevation	Cross Level
1	0	0		4	0	21,5
2	0	7,2		5	0	28,7 2%
3	0	14,4				

Track Gauge:	1 435	mm	Rol Angle:	3 Degrees
Rail Head Width	69	mm	Mirror Roll Angle:	3 Degrees

TABLE 1A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 0,0 mm (0,0% Slope)
Superelevation = 0,0 mm

Radius	R1 CEN		B1 OUT		M1 OUT		M2 OUT		B2 OUT		B3 OUT		B4 OUT	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	0	500	1 486,3	202,6	1 779,3	2 123,6	**1 800,3**	2 671,2	1 589,2	2 758,6	1 400,9	3 073,6	1 338,5	3 498,5
25	0	500	1 425,9	202,6	1 740,2	2 123,6	**1 761,2**	2 671,2	1 528,8	2 758,6	1 379,6	3 073,6	1 317,1	3 498,5
30	0	500	1 384,9	202,6	1 713,4	2 123,6	**1 734,3**	2 671,2	1 487,8	2 758,6	1 365,1	3 073,6	1 302,4	3 498,5
35	0	500	1 374,5	202,6	1 693,9	2 123,6	**1 714,8**	2 671,2	1 477,3	2 758,6	1 354,5	3 073,6	1 291,8	3 498,5
40	0	500	1 366,6	202,6	1 679	2 123,6	**1 700**	2 671,2	1 469,4	2 758,6	1 346,5	3 073,6	1 283,8	3 498,5
45	0	500	1 360,3	202,6	1 667,3	2 123,6	**1 688,3**	2 671,2	1 463,2	2 758,6	1 340,3	3 073,6	1 277,5	3 498,5
50	0	500	1 355,3	202,6	1 657,9	2 123,6	**1 678,9**	2 671,2	1 458,2	2 758,6	1 335,2	3 073,6	1 272,4	3 498,5
75	0	500	1 340,1	202,6	1 629,2	2 123,6	**1 650,2**	2 671,2	1 442,9	2 758,6	1 319,9	3 073,6	1 257	3 498,5
100	0	500	1 332,3	202,6	1 614,7	2 123,6	**1 635,6**	2 671,2	1 435,2	2 758,6	1 312,1	3 073,6	1 249,3	3 498,5
150	0	500	1 324,5	202,6	1 600	2 123,6	**1 620,9**	2 671,2	1 427,4	2 758,6	1 304,3	3 073,6	1 241,4	3 498,5
200	0	500	1 320,6	202,6	1 592,5	2 123,6	**1 613,5**	2 671,2	1 423,4	2 758,6	1 300,3	3 073,6	1 237,5	3 498,5
250	0	500	1 318,2	202,6	1 588,1	2 123,6	**1 609**	2 671,2	1 421,1	2 758,6	1 298	3 073,6	1 235,1	3 498,5
400	0	500	1 314,6	202,6	1 581,3	2 123,6	**1 602,3**	2 671,2	1 417,5	2 758,6	1 294,4	3 073,6	1 231,5	3 498,5
600	0	500	1 312,6	202,6	1 577,6	2 123,6	**1 598,5**	2 671,2	1 415,5	2 758,6	1 292,4	3 073,6	1 229,5	3 498,5
800	0	500	1 311,7	202,6	1 575,7	2 123,6	**1 596,6**	2 671,2	1 414,5	2 758,6	1 291,4	3 073,6	1 228,5	3 498,5
1 000	0	500	1 311,1	202,6	1 574,6	2 123,6	**1 595,5**	2 671,2	1 413,9	2 758,6	1 290,8	3 073,6	1 227,9	3 498,5
2 500	0	500	1 309,6	202,6	1 571,8	2 123,6	**1 592,8**	2 671,2	1 412,5	2 758,6	1 289,4	3 073,6	1 226,5	3 498,5
5 000	0	500	1 309,1	202,6	1 570,9	2 123,6	**1 591,9**	2 671,2	1 412	2 758,6	1 288,9	3 073,6	1 226	3 498,5
Tangent	0	500	1 308,7	202,6	1 570	2 123,6	**1 591**	2 671,2	1 411,5	2 758,6	1 288,4	3 073,6	1 225,5	3 498,5

TABLE 1A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 0,0 mm (0,0% Slope)

Superelevation = 0,0 mm

Radius	P3 CEN		P1 OUT		P2 OUT		P4 OUT		P5 OUT		P7 OUT		P8 OUT	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
25	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
30	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
35	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
40	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
45	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
50	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
75	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
100	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
150	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
200	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
250	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
400	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
600	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
800	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
1 000	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
2 500	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
5 000	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8
Tangent	-287,1	3 960	1 122,8	3 750,1	929,2	3 988,9	1 182,8	4 893,5	989,1	5 132,3	1 242,7	6 036,9	1 049,1	6 275,8

TABLE 1B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 0,0 mm (0,0% Slope)
Superelevation = 0,0 mm

Radius	P6 CEN		B1 IN		M1 IN		M2 IN		B2 IN		B3 IN		B4 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-347	5 105	-1 568,4	202,6	-1 644,8	2 123,6	-1 665,7	2 671,2	-1 671,3	2 758,6	-1 548,2	3 073,6	-1 485,3	3 498,5
25	-347	5 105	-1 516	202,6	-1 592,4	2 123,6	-1 613,3	2 671,2	-1 618,9	2 758,6	-1 495,7	3 073,6	-1 432,8	3 498,5
30	-347	5 105	-1 481,2	202,6	-1 557,6	2 123,6	-1 578,5	2 671,2	-1 584,1	2 758,6	-1 460,9	3 073,6	-1 398,1	3 498,5
35	-347	5 105	-1 456,4	202,6	-1 532,8	2 123,6	-1 553,8	2 671,2	-1 559,3	2 758,6	-1 436,2	3 073,6	-1 373,3	3 498,5
40	-347	5 105	-1 437,9	202,6	-1 514,3	2 123,6	-1 535,2	2 671,2	-1 540,8	2 758,6	-1 417,6	3 073,6	-1 354,8	3 498,5
45	-347	5 105	-1 423,5	202,6	-1 499,9	2 123,6	-1 520,8	2 671,2	-1 526,4	2 758,6	-1 403,2	3 073,6	-1 340,4	3 498,5
50	-347	5 105	-1 412	202,6	-1 488,4	2 123,6	-1 509,3	2 671,2	-1 514,9	2 758,6	-1 391,7	3 073,6	-1 328,9	3 498,5
75	-347	5 105	-1 377,5	202,6	-1 508,3	2 123,6	-1 529,2	2 671,2	-1 480,4	2 758,6	-1 357,2	3 073,6	-1 294,4	3 498,5
100	-347	5 105	-1 360,3	202,6	-1 524	2 123,6	-1 544,9	2 671,2	-1 463,2	2 758,6	-1 340	3 073,6	-1 277,1	3 498,5
150	-347	5 105	-1 343,1	202,6	-1 539,5	2 123,6	-1 560,4	2 671,2	-1 445,9	2 758,6	-1 322,8	3 073,6	-1 259,9	3 498,5
200	-347	5 105	-1 334,5	202,6	-1 547,2	2 123,6	-1 568,1	2 671,2	-1 437,3	2 758,6	-1 314,2	3 073,6	-1 251,3	3 498,5
250	-347	5 105	-1 329,3	202,6	-1 551,8	2 123,6	-1 572,7	2 671,2	-1 432,2	2 758,6	-1 309	3 073,6	-1 246,2	3 498,5
400	-347	5 105	-1 321,6	202,6	-1 558,6	2 123,6	-1 579,6	2 671,2	-1 424,4	2 758,6	-1 301,3	3 073,6	-1 238,4	3 498,5
600	-347	5 105	-1 317,3	202,6	-1 562,5	2 123,6	-1 583,4	2 671,2	-1 420,1	2 758,6	-1 297	3 073,6	-1 234,1	3 498,5
800	-347	5 105	-1 315,1	202,6	-1 564,4	2 123,6	-1 585,3	2 671,2	-1 418	2 758,6	-1 294,8	3 073,6	-1 232	3 498,5
1 000	-347	5 105	-1 313,8	202,6	-1 565,5	2 123,6	-1 586,4	2 671,2	-1 416,7	2 758,6	-1 293,6	3 073,6	-1 230,7	3 498,5
2 500	-347	5 105	-1 310,7	202,6	-1 568,2	2 123,6	-1 589,2	2 671,2	-1 413,6	2 758,6	-1 290,5	3 073,6	-1 227,6	3 498,5
5 000	-347	5 105	-1 309,7	202,6	-1 569,1	2 123,6	-1 590,1	2 671,2	-1 412,6	2 758,6	-1 289,4	3 073,6	-1 226,5	3 498,5
Tangent	-347	5 105	-1 308,7	202,6	-1 570	2 123,6	-1 591	2 671,2	-1 411,5	2 758,6	-1 288,4	3 073,6	-1 225,5	3 498,5

TABLE 1B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 0,0 mm (0,0% Slope)

Superelevation = 0,0 mm

Radius	P9 CEN		P1 IN		P2 IN		P4 IN		P5 IN		P7 IN		P8 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
25	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
30	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
35	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
40	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
45	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
50	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
75	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
100	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
150	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
200	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
250	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
400	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
600	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
800	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
1 000	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
2 500	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
5 000	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8
Tangent	-406,9	6 250	-1 122,8	3 750,1	-929,2	3 988,9	-1 182,8	4 893,5	-989,1	5 132,3	-1 242,7	6 036,9	-1 049,1	6 275,8

TABLE 2A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 7,2 mm (0,5% Slope)

Superelevation = 0,0 mm

Radius [m]	R1 CEN		B1 OUT		M1 OUT		M2 OUT		B2 OUT		B3 OUT		B4 OUT	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-2,4	503,6	1 487,9	192	1 789,4	2 111,5	1 812,3	2 682,3	1 601,7	2 768,7	1 415	3 082,6	1 354,7	3 507
25	-2,4	503,6	1 427,4	192,3	1 750,3	2 111,7	1 773,2	2 682,1	1 541,3	2 768,4	1 393,7	3 082,5	1 333,2	3 506,9
30	-2,4	503,6	1 386,4	192,5	1 723,5	2 111,8	1 746,3	2 682	1 500,3	2 768,2	1 379,1	3 082,4	1 318,6	3 506,9
35	-2,4	503,6	1 376	192,5	1 704	2 111,9	1 726,8	2 681,9	1 489,9	2 768,1	1 368,6	3 082,3	1 308	3 506,9
40	-2,4	503,6	1 368,1	192,6	1 689,1	2 112	1 712	2 681,8	1 482	2 768,1	1 360,6	3 082,3	1 300	3 506,9
45	-2,4	503,6	1 361,9	192,6	1 677,4	2 112	1 700,3	2 681,7	1 475,7	2 768,1	1 354,3	3 082,3	1 293,7	3 506,9
50	-2,4	503,6	1 356,9	192,6	1 668	2 112,1	1 690,9	2 681,7	1 470,7	2 768,1	1 349,3	3 082,3	1 288,6	3 506,9
75	-2,4	503,6	1 341,6	192,7	1 639,4	2 112,2	1 662,2	2 681,6	1 455,5	2 768	1 334	3 082,3	1 273,2	3 506,9
100	-2,4	503,6	1 333,9	192,7	1 624,8	2 112,3	1 647,6	2 681,5	1 447,7	2 767,9	1 326,2	3 082,3	1 265,4	3 506,9
150	-2,4	503,6	1 326,1	192,8	1 610,1	2 112,4	1 632,9	2 681,5	1 439,9	2 767,9	1 318,4	3 082,3	1 257,6	3 506,9
200	-2,4	503,6	1 322,1	192,8	1 602,6	2 112,4	1 625,5	2 681,5	1 436	2 767,9	1 314,4	3 082,3	1 253,6	3 506,9
250	-2,4	503,6	1 319,8	192,8	1 598,2	2 112,4	1 621	2 681,5	1 433,6	2 767,9	1 312	3 082,3	1 251,2	3 506,9
400	-2,4	503,6	1 316,2	192,8	1 591,4	2 112,5	1 614,3	2 681,5	1 430,1	2 767,9	1 308,5	3 082,3	1 247,7	3 506,9
600	-2,4	503,6	1 314,2	192,8	1 587,7	2 112,5	1 610,5	2 681,5	1 428,1	2 767,8	1 306,5	3 082,3	1 245,7	3 506,9
800	-2,4	503,6	1 313,2	192,8	1 585,8	2 112,5	1 608,6	2 681,5	1 427,1	2 767,8	1 305,5	3 082,3	1 244,7	3 506,9
1 000	-2,4	503,6	1 312,6	192,8	1 584,7	2 112,5	1 607,5	2 681,5	1 426,5	2 767,8	1 304,9	3 082,3	1 244,1	3 506,9
2 500	-2,4	503,6	1 311,2	192,9	1 581,9	2 112,5	1 604,8	2 681,5	1 425	2 767,8	1 303,4	3 082,3	1 242,6	3 506,9
5 000	-2,4	503,6	1 310,7	192,9	1 581	2 112,5	1 603,9	2 681,5	1 424,6	2 767,8	1 303	3 082,3	1 242,2	3 506,9
Tangent	-2,4	503,6	1 310,2	192,9	1 580,1	2 112,5	1 603	2 681,5	1 424,1	2 767,8	1 302,5	3 082,3	1 241,7	3 506,9

TABLE 2A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 7,2 mm (0,5% Slope)

Superelevation = 0,0 mm

Radius	P3 CEN		P1 OUT		P2 OUT		P4 OUT		P5 OUT		P7 OUT		P8 OUT	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
25	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
30	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
35	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
40	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
45	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
50	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
75	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
100	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
150	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
200	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
250	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
400	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
600	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
800	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
1 000	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
2 500	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
5 000	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4
Tangent	-306	3 963,5	1 140,3	3 757,4	947,9	3 995,2	1 205,7	4 900,5	1 013,3	5 138,3	1 271	6 043,6	1 078,6	6 281,4

TABLE 2B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 7,2 mm (0,5% Slope)

Superelevation = 0,0 mm

Radius	P6 CEN		B1 IN		M1 IN		M2 IN		B2 IN		B3 IN		B4 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-368,9	5 108,5	-1 570	191,6	-1 654,9	2 112,2	-1 677,8	2 681,6	**-1 683,8**	2 769,1	-1 562,3	3 083,3	-1 501,5	3 507,7
25	-368,9	5 108,5	-1 517,5	191,9	-1 602,5	2 112,4	-1 625,3	2 681,4	**-1 631,4**	2 768,8	-1 509,8	3 083	-1 449	3 507,4
30	-368,9	5 108,5	-1 482,8	192	-1 567,7	2 112,6	-1 590,5	2 681,2	**-1 596,6**	2 768,7	-1 475	3 082,9	-1 414,2	3 507,3
35	-368,9	5 108,5	-1 458	192,2	-1 542,9	2 112,7	-1 565,8	2 681,1	**-1 571,9**	2 768,5	-1 450,3	3 082,7	-1 389,5	3 507,2
40	-368,9	5 108,5	-1 439,4	192,2	-1 524,4	2 112,8	-1 547,2	2 681	**-1 553,3**	2 768,4	-1 431,7	3 082,6	-1 370,9	3 507,1
45	-368,9	5 108,5	-1 425	192,3	-1 510	2 112,8	-1 532,8	2 680,9	**-1 538,9**	2 768,4	-1 417,3	3 082,6	-1 356,5	3 507
50	-368,9	5 108,5	-1 413,5	192,4	-1 498,5	2 112,9	-1 521,3	2 680,9	**-1 527,4**	2 768,3	-1 405,8	3 082,5	-1 345	3 506,9
75	-368,9	5 108,5	-1 379,1	192,5	-1 518,4	2 112,8	**-1 541,3**	2 681	-1 492,9	2 768,2	-1 371,3	3 082,4	-1 310,5	3 506,8
100	-368,9	5 108,5	-1 361,8	192,6	-1 534,1	2 112,7	**-1 556,9**	2 681,1	-1 475,7	2 768,1	-1 354,1	3 082,3	-1 293,3	3 506,7
150	-368,9	5 108,5	-1 344,6	192,7	-1 549,6	2 112,7	**-1 572,4**	2 681,1	-1 458,5	2 768	-1 336,9	3 082,2	-1 276,1	3 506,6
200	-368,9	5 108,5	-1 336	192,7	-1 557,3	2 112,6	**-1 580,1**	2 681,2	-1 449,9	2 768	-1 328,3	3 082,2	-1 267,5	3 506,6
250	-368,9	5 108,5	-1 330,8	192,8	-1 561,9	2 112,6	**-1 584,7**	2 681,2	-1 444,7	2 767,9	-1 323,1	3 082,1	-1 262,3	3 506,5
400	-368,9	5 108,5	-1 323,1	192,8	-1 568,8	2 112,6	**-1 591,6**	2 681,2	-1 437	2 767,9	-1 315,4	3 082,1	-1 254,6	3 506,5
600	-368,9	5 108,5	-1 318,8	192,8	-1 572,6	2 112,5	**-1 595,4**	2 681,2	-1 432,7	2 767,9	-1 311,1	3 082,1	-1 250,3	3 506,5
800	-368,9	5 108,5	-1 316,6	192,8	-1 574,5	2 112,5	**-1 597,3**	2 681,2	-1 430,5	2 767,9	-1 308,9	3 082,1	-1 248,1	3 506,5
1 000	-368,9	5 108,5	-1 315,4	192,8	-1 575,6	2 112,5	**-1 598,4**	2 681,3	-1 429,2	2 767,9	-1 307,6	3 082,1	-1 246,8	3 506,5
2 500	-368,9	5 108,5	-1 312,3	192,8	-1 578,3	2 112,5	**-1 601,2**	2 681,3	-1 426,1	2 767,8	-1 304,6	3 082	-1 243,7	3 506,5
5 000	-368,9	5 108,5	-1 311,2	192,9	-1 579,2	2 112,5	**-1 602,1**	2 681,3	-1 425,1	2 767,8	-1 303,5	3 082	-1 242,7	3 506,5
Tangent	-368,9	5 108,5	-1 310,2	192,9	-1 580,1	2 112,5	-1 603	2 681,3	-1 424,1	2 767,8	-1 302,5	3 082	-1 241,7	3 506,4

TABLE 2B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 7,2 mm (0,5% Slope)

Superelevation = 0,0 mm

Radius	P9 CEN		P1 IN		P2 IN		P4 IN		P5 IN		P7 IN		P8 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
25	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
30	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
35	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
40	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
45	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
50	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
75	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
100	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
150	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
200	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
250	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
400	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
600	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
800	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
1 000	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
2 500	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
5 000	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4
Tangent	-434,3	6 253,5	-1 140,3	3 757,4	-947,9	3 995,2	-1 205,7	4 900,5	-1 013,3	5 138,3	-1 271	6 043,6	-1 078,6	6 281,4

TABLE 3A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 14,4 mm (1,0% Slope)
Superelevation = 0,0 mm

Radius	R1 CEN		B1 OUT		M1 OUT		M2 OUT		B2 OUT		B3 OUT		B4 OUT	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-4,8	507,2	1 489,3	181,4	1 799,5	2 099,4	1 824,2	2 693,3	1 614,2	2 778,7	1 429	3 091,5	1 370,8	3 515,4
25	-4,8	507,2	1 428,9	182	1 760,4	2 099,7	1 785,1	2 692,9	1 553,8	2 778,1	1 407,7	3 091,3	1 349,3	3 515,2
30	-4,8	507,2	1 387,9	182,4	1 733,6	2 100	1 758,3	2 692,7	1 512,8	2 777,7	1 393,2	3 091,1	1 334,7	3 515,1
35	-4,8	507,2	1 377,5	182,5	1 714	2 100,2	1 738,8	2 692,5	1 502,4	2 777,6	1 382,7	3 091	1 324,1	3 515,1
40	-4,8	507,2	1 369,6	182,6	1 699,2	2 100,3	1 723,9	2 692,4	1 494,5	2 777,5	1 374,7	3 091	1 316,1	3 515,1
45	-4,8	507,2	1 363,4	182,6	1 687,5	2 100,4	1 712,2	2 692,2	1 488,2	2 777,4	1 368,4	3 091	1 309,8	3 515,1
50	-4,8	507,2	1 358,3	182,7	1 678,1	2 100,5	1 702,8	2 692,2	1 483,2	2 777,4	1 363,3	3 091	1 304,7	3 515,1
75	-4,8	507,2	1 343,1	182,8	1 649,4	2 100,8	1 674,1	2 691,9	1 468	2 777,3	1 348	3 091	1 289,3	3 515,1
100	-4,8	507,2	1 335,4	182,9	1 634,8	2 100,9	1 659,6	2 691,7	1 460,2	2 777,2	1 340,2	3 091	1 281,5	3 515,1
150	-4,8	507,2	1 327,6	183	1 620,1	2 101,1	1 644,9	2 691,7	1 452,4	2 777,1	1 332,4	3 091	1 273,7	3 515,1
200	-4,8	507,2	1 323,6	183	1 612,7	2 101,1	1 637,4	2 691,7	1 448,5	2 777,1	1 328,5	3 091	1 269,7	3 515,1
250	-4,8	507,2	1 321,2	183	1 608,2	2 101,2	1 633	2 691,7	1 446,1	2 777	1 326,1	3 091	1 267,4	3 515,1
400	-4,8	507,2	1 317,7	183,1	1 601,5	2 101,3	1 626,2	2 691,7	1 442,6	2 777	1 322,5	3 091	1 263,8	3 515,1
600	-4,8	507,2	1 315,7	183,1	1 597,7	2 101,3	1 622,5	2 691,7	1 440,6	2 777	1 320,5	3 091	1 261,8	3 515,1
800	-4,8	507,2	1 314,7	183,1	1 595,8	2 101,3	1 620,6	2 691,7	1 439,6	2 777	1 319,5	3 091	1 260,8	3 515,1
1 000	-4,8	507,2	1 314,1	183,1	1 594,7	2 101,3	1 619,5	2 691,7	1 439	2 777	1 318,9	3 091	1 260,2	3 515,1
2 500	-4,8	507,2	1 312,7	183,1	1 592	2 101,3	1 616,7	2 691,7	1 437,5	2 777	1 317,5	3 091	1 258,8	3 515,1
5 000	-4,8	507,2	1 312,2	183,1	1 591,1	2 101,4	1 615,8	2 691,7	1 437	2 777	1 317	3 091	1 258,3	3 515,1
Tangent	-4,8	507,2	1 311,7	183,1	1 590,2	2 101,4	1 614,9	2 691,7	1 436,6	2 777	1 316,5	3 091	1 257,8	3 515,1

TABLE 3A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 14,4 mm (1,0% Slope)
Superelevation = 0,0 mm

Radius	P3 CEN		P1 OUT		P2 OUT		P4 OUT		P5 OUT		P7 OUT		P8 OUT	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
25	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
30	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
35	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
40	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
45	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
50	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
75	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
100	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
150	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
200	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
250	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
400	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
600	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
800	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
1 000	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
2 500	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
5 000	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9
Tangent	-324,8	3 967	1 157,7	3 764,6	966,5	4 001,3	1 228,5	4 907,4	1 037,4	5 144,1	1 299,3	6 050,2	1 108,2	6 286,9

TABLE 3B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 14,4 mm (1,0% Slope)
Superelevation = 0,0 mm

Radius	P6 CEN		B1 IN		M1 IN		M2 IN		B2 IN		B3 IN		B4 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-390,8	5 111,9	-1 571,5	180,7	-1 665	2 100,7	-1 689,7	2 692	-1 696,3	2 779,4	-1 576,3	3 092,9	-1 517,6	3 516,8
25	-390,8	5 111,9	-1 519	181,2	-1 612,5	2 101,2	-1 637,3	2 691,5	-1 643,9	2 778,9	-1 523,9	3 092,4	-1 465,1	3 516,3
30	-390,8	5 111,9	-1 484,2	181,5	-1 577,7	2 101,5	-1 602,5	2 691,2	-1 609,1	2 778,6	-1 489,1	3 092	-1 430,3	3 515,9
35	-390,8	5 111,9	-1 459,5	181,7	-1 553	2 101,7	-1 577,7	2 691	-1 584,4	2 778,4	-1 464,3	3 091,8	-1 405,6	3 515,7
40	-390,8	5 111,9	-1 440,9	181,9	-1 534,4	2 101,9	-1 559,2	2 690,8	-1 565,8	2 778,2	-1 445,8	3 091,6	-1 387	3 515,5
45	-390,8	5 111,9	-1 426,5	182	-1 520	2 102	-1 544,8	2 690,6	-1 551,4	2 778,1	-1 431,4	3 091,5	-1 372,6	3 515,4
50	-390,8	5 111,9	-1 415	182,2	-1 508,5	2 102,1	-1 533,3	2 690,5	-1 539,9	2 777,9	-1 419,9	3 091,4	-1 361,1	3 515,3
75	-390,8	5 111,9	-1 380,5	182,5	-1 528,5	2 102	-1 553,2	2 690,7	-1 505,4	2 777,6	-1 385,4	3 091,1	-1 326,7	3 514,9
100	-390,8	5 111,9	-1 363,3	182,6	-1 544,1	2 101,8	-1 568,9	2 690,9	-1 488,2	2 777,4	-1 368,2	3 090,9	-1 309,4	3 514,8
150	-390,8	5 111,9	-1 346,1	182,8	-1 559,6	2 101,7	-1 584,4	2 691	-1 471	2 777,3	-1 351	3 090,7	-1 292,2	3 514,6
200	-390,8	5 111,9	-1 337,5	182,9	-1 567,3	2 101,6	-1 592,1	2 691,1	-1 462,4	2 777,2	-1 342,3	3 090,6	-1 283,6	3 514,5
250	-390,8	5 111,9	-1 332,3	182,9	-1 571,9	2 101,5	-1 596,7	2 691,1	-1 457,2	2 777,2	-1 337,2	3 090,6	-1 278,4	3 514,5
400	-390,8	5 111,9	-1 324,6	183	-1 578,8	2 101,5	-1 603,6	2 691,2	-1 449,5	2 777,1	-1 329,4	3 090,5	-1 270,7	3 514,4
600	-390,8	5 111,9	-1 320,3	183,1	-1 582,6	2 101,4	-1 607,4	2 691,2	-1 445,2	2 777	-1 325,1	3 090,5	-1 266,4	3 514,4
800	-390,8	5 111,9	-1 318,1	183,1	-1 584,5	2 101,4	-1 609,3	2 691,3	-1 443	2 777	-1 323	3 090,5	-1 264,3	3 514,4
1 000	-390,8	5 111,9	-1 316,9	183,1	-1 585,6	2 101,4	-1 610,4	2 691,3	-1 441,7	2 777	-1 321,7	3 090,5	-1 263	3 514,3
2 500	-390,8	5 111,9	-1 313,8	183,1	-1 588,4	2 101,4	-1 613,1	2 691,3	-1 438,6	2 777	-1 318,6	3 090,4	-1 259,9	3 514,3
5 000	-390,8	5 111,9	-1 312,7	183,1	-1 589,3	2 101,4	-1 614	2 691,3	-1 437,6	2 777	-1 317,6	3 090,4	-1 258,8	3 514,3
Tangent	-390,8	5 111,9	-1 311,7	183,1	-1 590,2	2 101,4	-1 614,9	2 691,3	-1 436,6	2 777	-1 316,5	3 090,4	-1 257,8	3 514,3

TABLE 3B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 14,4 mm (1,0% Slope)

Superelevation = 0,0 mm

Radius	P9 CEN		P1 IN		P2 IN		P4 IN		P5 IN		P7 IN		P8 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
25	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
30	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
35	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
40	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
45	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
50	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
75	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
100	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
150	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
200	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
250	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
400	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
600	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
800	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
1 000	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
2 500	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
5 000	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9
Tangent	-461,7	6 256,9	-1 157,7	3 764,6	-966,5	4 001,3	-1 228,5	4 907,4	-1 037,4	5 144,1	-1 299,3	6 050,2	-1 108,2	6 286,9

TABLE 4A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 21,5 mm (1,5% Slope)
Superelevation = 0,0 mm

Radius	R1 CEN		B1 OUT		M1 OUT		M2 OUT		B2 OUT		B3 OUT		B4 OUT	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-7,2	510,7	1 490,8	170,9	1 809,5	2 087,2	**1 836,1**	2 704,3	1 626,7	2 788,6	1 443	3 100,3	1 386,9	3 523,7
25	-7,2	510,7	1 430,4	171,7	1 770,4	2 087,7	**1 797**	2 703,7	1 566,3	2 787,7	1 421,7	3 100	1 365,4	3 523,4
30	-7,2	510,7	1 389,4	172,3	1 743,5	2 088,1	**1 770,2**	2 703,3	1 525,3	2 787,1	1 407,2	3 099,8	1 350,8	3 523,3
35	-7,2	510,7	1 379	172,5	1 724	2 088,4	**1 750,7**	2 703,1	1 514,8	2 787	1 396,7	3 099,6	1 340,2	3 523,3
40	-7,2	510,7	1 371	172,6	1 709,2	2 088,6	**1 735,8**	2 702,8	1 506,9	2 786,8	1 388,7	3 099,6	1 332,1	3 523,3
45	-7,2	510,7	1 364,8	172,7	1 697,5	2 088,8	**1 724,1**	2 702,7	1 500,7	2 786,8	1 382,4	3 099,6	1 325,8	3 523,3
50	-7,2	510,7	1 359,8	172,7	1 688,1	2 088,9	**1 714,7**	2 702,5	1 495,7	2 786,7	1 377,3	3 099,6	1 320,8	3 523,3
75	-7,2	510,7	1 344,5	173	1 659,4	2 089,3	**1 686**	2 702,1	1 480,4	2 786,5	1 362	3 099,6	1 305,4	3 523,3
100	-7,2	510,7	1 336,8	173,1	1 644,8	2 089,5	**1 671,5**	2 701,9	1 472,7	2 786,4	1 354,2	3 099,6	1 297,6	3 523,3
150	-7,2	510,7	1 329	173,2	1 630,1	2 089,7	**1 656,8**	2 701,9	1 464,9	2 786,2	1 346,4	3 099,6	1 289,8	3 523,3
200	-7,2	510,7	1 325,1	173,2	1 622,7	2 089,8	**1 649,3**	2 701,9	1 460,9	2 786,2	1 342,5	3 099,6	1 285,8	3 523,3
250	-7,2	510,7	1 322,7	173,3	1 618,2	2 089,9	**1 644,9**	2 701,9	1 458,6	2 786,2	1 340,1	3 099,6	1 283,4	3 523,3
400	-7,2	510,7	1 319,1	173,3	1 611,5	2 090	**1 638,1**	2 701,9	1 455	2 786,1	1 336,5	3 099,6	1 279,9	3 523,3
600	-7,2	510,7	1 317,1	173,4	1 607,7	2 090,1	**1 634,4**	2 701,9	1 453	2 786,1	1 334,5	3 099,6	1 277,9	3 523,3
800	-7,2	510,7	1 316,1	173,4	1 605,8	2 090,1	**1 632,5**	2 701,9	1 452	2 786,1	1 333,5	3 099,6	1 276,9	3 523,3
1 000	-7,2	510,7	1 315,5	173,4	1 604,7	2 090,1	**1 631,4**	2 701,9	1 451,4	2 786,1	1 332,9	3 099,6	1 276,3	3 523,3
2 500	-7,2	510,7	1 314,1	173,4	1 602	2 090,1	**1 628,6**	2 701,9	1 450	2 786	1 331,5	3 099,6	1 274,8	3 523,3
5 000	-7,2	510,7	1 313,6	173,4	1 601,1	2 090,2	**1 627,7**	2 701,9	1 449,5	2 786	1 331	3 099,6	1 274,4	3 523,3
Tangent	-7,2	510,7	1 313,1	173,4	1 600,2	2 090,2	**1 626,8**	2 701,9	1 449	2 786	1 330,5	3 099,6	1 273,9	3 523,3

TABLE 4A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 21,5 mm (1,5% Slope)

Superelevation = 0,0 mm

Radius	P3 CEN		P1 OUT		P2 OUT		P4 OUT		P5 OUT		P7 OUT		P8 OUT	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
25	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
30	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
35	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
40	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
45	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
50	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
75	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
100	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
150	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
200	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
250	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
400	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
600	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
800	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
1 000	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
2 500	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
5 000	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3
Tangent	-343,7	3 970,4	1 175	3 771,7	985,1	4 007,4	1 251,3	4 914,2	1 061,4	5 149,8	1 327,6	6 056,6	1 137,7	6 292,3

TABLE 4B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 21,5 mm (1,5% Slope)

Superelevation = 0,0 mm

Radius	P6 CEN		B1 IN		M1 IN		M2 IN		B2 IN		B3 IN		B4 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-412,7	5 115,2	-1 572,9	169,7	-1 675	2 089,1	-1 701,6	2 702,4	-1 708,8	2 789,7	-1 590,3	3 102,4	-1 533,6	3 525,8
25	-412,7	5 115,2	-1 520,5	170,4	-1 622,5	2 089,8	-1 649,2	2 701,6	-1 656,3	2 789	-1 537,8	3 101,7	-1 481,2	3 525
30	-412,7	5 115,2	-1 485,7	170,9	-1 587,7	2 090,3	-1 614,4	2 701,1	-1 621,6	2 788,5	-1 503,1	3 101,2	-1 446,4	3 524,5
35	-412,7	5 115,2	-1 460,9	171,3	-1 563	2 090,7	-1 589,6	2 700,8	-1 596,8	2 788,1	-1 478,3	3 100,8	-1 421,6	3 524,2
40	-412,7	5 115,2	-1 442,4	171,6	-1 544,4	2 091	-1 571,1	2 700,5	-1 578,3	2 787,9	-1 459,8	3 100,6	-1 403,1	3 523,9
45	-412,7	5 115,2	-1 428	171,8	-1 530	2 091,2	-1 556,7	2 700,3	-1 563,9	2 787,7	-1 445,4	3 100,3	-1 388,7	3 523,7
50	-412,7	5 115,2	-1 416,5	171,9	-1 518,5	2 091,3	-1 545,2	2 700,1	-1 552,3	2 787,5	-1 433,9	3 100,2	-1 377,2	3 523,5
75	-412,7	5 115,2	-1 382	172,4	-1 538,5	2 091,1	-1 565,1	2 700,4	-1 517,9	2 787	-1 399,4	3 099,7	-1 342,7	3 523
100	-412,7	5 115,2	-1 364,8	172,7	-1 554,1	2 090,8	-1 580,8	2 700,6	-1 500,6	2 786,8	-1 382,2	3 099,4	-1 325,5	3 522,8
150	-412,7	5 115,2	-1 347,6	172,9	-1 569,6	2 090,6	-1 596,3	2 700,8	-1 483,4	2 786,5	-1 364,9	3 099,2	-1 308,3	3 522,5
200	-412,7	5 115,2	-1 338,9	173	-1 577,3	2 090,5	-1 604	2 701	-1 474,8	2 786,4	-1 356,3	3 099,1	-1 299,7	3 522,4
250	-412,7	5 115,2	-1 333,8	173,1	-1 581,9	2 090,4	-1 608,6	2 701	-1 469,7	2 786,3	-1 351,2	3 099	-1 294,5	3 522,3
400	-412,7	5 115,2	-1 326	173,2	-1 588,8	2 090,3	-1 615,5	2 701,1	-1 461,9	2 786,2	-1 343,4	3 098,9	-1 286,8	3 522,2
600	-412,7	5 115,2	-1 321,7	173,3	-1 592,6	2 090,3	-1 619,3	2 701,2	-1 457,6	2 786,1	-1 339,1	3 098,8	-1 282,5	3 522,2
800	-412,7	5 115,2	-1 319,6	173,3	-1 594,5	2 090,2	-1 621,2	2 701,2	-1 455,5	2 786,1	-1 337	3 098,8	-1 280,3	3 522,1
1 000	-412,7	5 115,2	-1 318,3	173,3	-1 595,6	2 090,2	-1 622,3	2 701,2	-1 454,2	2 786,1	-1 335,7	3 098,8	-1 279	3 522,1
2 500	-412,7	5 115,2	-1 315,2	173,4	-1 598,4	2 090,2	-1 625	2 701,3	-1 451,1	2 786	-1 332,6	3 098,7	-1 275,9	3 522,1
5 000	-412,7	5 115,2	-1 314,2	173,4	-1 599,3	2 090,2	-1 625,9	2 701,3	-1 450	2 786	-1 331,6	3 098,7	-1 274,9	3 522,1
Tangent	-412,7	5 115,2	-1 313,1	173,4	-1 600,2	2 090,2	-1 626,8	2 701,3	-1 449	2 786	-1 330,5	3 098,7	-1 273,9	3 522,1

TABLE 4B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 21,5 mm (1,5% Slope)

Superelevation = 0,0 mm

Radius	P9 CEN		P1 IN		P2 IN		P4 IN		P5 IN		P7 IN		P8 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
25	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
30	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
35	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
40	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
45	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
50	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
75	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
100	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
150	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
200	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
250	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
400	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
600	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
800	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
1 000	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
2 500	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
5 000	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3
Tangent	-489	6 260,1	-1 175	3 771,7	-985,1	4 007,4	-1 251,3	4 914,2	-1 061,4	5 149,8	-1 327,6	6 056,6	-1 137,7	6 292,3

TABLE 5A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 28,7 mm (2,0% Slope)

Superelevation = 0,0 mm

Radius	R1 CEN		B1 OUT		M1 OUT		M2 OUT		B2 OUT		B3 OUT		B4 OUT	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-9,7	514,3	1 492,2	160,3	1 819,4	2 074,9	**1 847,9**	2 715,2	1 639	2 798,4	1 456,9	3 109,1	1 402,9	3 531,9
25	-9,7	514,3	1 431,8	161,5	1 780,3	2 075,7	**1 808,8**	2 714,4	1 578,6	2 797,3	1 435,6	3 108,7	1 381,4	3 531,5
30	-9,7	514,3	1 390,8	162,2	1 753,5	2 076,2	**1 782**	2 713,9	1 537,6	2 796,5	1 421,1	3 108,4	1 366,8	3 531,4
35	-9,7	514,3	1 380,3	162,4	1 733,9	2 076,6	**1 762,5**	2 713,6	1 527,2	2 796,3	1 410,6	3 108,2	1 356,2	3 531,4
40	-9,7	514,3	1 372,4	162,6	1 719,1	2 076,8	**1 747,6**	2 713,3	1 519,3	2 796,1	1 402,6	3 108,2	1 348,2	3 531,4
45	-9,7	514,3	1 366,2	162,7	1 707,4	2 077,1	**1 736**	2 713,1	1 513,1	2 796	1 396,3	3 108,2	1 341,9	3 531,4
50	-9,7	514,3	1 361,2	162,8	1 698	2 077,2	**1 726,6**	2 712,9	1 508,1	2 795,9	1 391,3	3 108,2	1 336,8	3 531,4
75	-9,7	514,3	1 345,9	163,1	1 669,3	2 077,8	**1 697,9**	2 712,3	1 492,8	2 795,6	1 376	3 108,2	1 321,4	3 531,4
100	-9,7	514,3	1 338,2	163,2	1 654,8	2 078,1	**1 683,3**	2 712,1	1 485,1	2 795,5	1 368,2	3 108,2	1 313,6	3 531,4
150	-9,7	514,3	1 330,4	163,4	1 640	2 078,4	**1 668,6**	2 712	1 477,3	2 795,3	1 360,4	3 108,2	1 305,8	3 531,4
200	-9,7	514,3	1 326,5	163,5	1 632,6	2 078,5	**1 661,2**	2 712	1 473,3	2 795,2	1 356,4	3 108,2	1 301,8	3 531,4
250	-9,7	514,3	1 324,1	163,5	1 628,2	2 078,6	**1 656,7**	2 712	1 471	2 795,2	1 354	3 108,2	1 299,5	3 531,4
400	-9,7	514,3	1 320,5	163,6	1 621,4	2 078,7	**1 650**	2 712	1 467,4	2 795,1	1 350,5	3 108,2	1 295,9	3 531,4
600	-9,7	514,3	1 318,5	163,6	1 617,7	2 078,8	**1 646,2**	2 712	1 465,4	2 795,1	1 348,5	3 108,2	1 293,9	3 531,4
800	-9,7	514,3	1 317,5	163,6	1 615,8	2 078,8	**1 644,3**	2 712	1 464,4	2 795,1	1 347,5	3 108,2	1 292,9	3 531,4
1 000	-9,7	514,3	1 316,9	163,6	1 614,7	2 078,8	**1 643,2**	2 712	1 463,8	2 795,1	1 346,9	3 108,2	1 292,3	3 531,4
2 500	-9,7	514,3	1 315,5	163,7	1 611,9	2 078,9	**1 640,5**	2 712	1 462,4	2 795	1 345,4	3 108,2	1 290,9	3 531,4
5 000	-9,7	514,3	1 315	163,7	1 611	2 078,9	**1 639,6**	2 712	1 461,9	2 795	1 345	3 108,2	1 290,4	3 531,4
Tangent	-9,7	514,3	1 314,5	163,7	1 610,1	2 078,9	**1 638,7**	2 712	1 461,4	2 795	1 344,5	3 108,2	1 289,9	3 531,4

TABLE 5A - VEHICLE DYNAMIC ENVELOPE - OUTSIDE OF CURVE

Cross Level Variation = 28,7 mm (2,0% Slope)

Superelevation = 0,0 mm

Radius [m]	P3 CEN X	P3 CEN Y	P1 OUT X	P1 OUT Y	P2 OUT X	P2 OUT Y	P4 OUT X	P4 OUT Y	P5 OUT X	P5 OUT Y	P7 OUT X	P7 OUT Y	P8 OUT X	P8 OUT Y
20	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
25	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
30	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
35	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
40	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
45	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
50	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
75	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
100	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
150	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
200	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
250	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
400	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
600	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
800	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
1 000	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
2 500	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
5 000	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5
Tangent	-362,6	3 973,6	1 192,3	3 778,8	1 003,7	4 013,4	1 274,1	4 920,8	1 085,4	5 155,4	1 355,8	6 062,9	1 167,2	6 297,5

TABLE 5B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 28,7 mm (2,0% Slope)

Superelevation = 0,0 mm

Radius	P6 CEN		B1 IN		M1 IN		M2 IN		B2 IN		B3 IN		B4 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-434,5	5 118,4	-1 574,3	158,7	-1 684,9	2 077,5	-1 713,4	2 712,6	-1 721,1	2 800	-1 604,2	3 111,9	-1 549,6	3 534,7
25	-434,5	5 118,4	-1 521,8	159,7	-1 632,5	2 078,5	-1 661	2 711,6	-1 668,7	2 799	-1 551,8	3 110,9	-1 497,2	3 533,7
30	-434,5	5 118,4	-1 487,1	160,4	-1 597,7	2 079,2	-1 626,2	2 711	-1 633,9	2 798,3	-1 517	3 110,2	-1 462,4	3 533
35	-434,5	5 118,4	-1 462,3	160,9	-1 572,9	2 079,6	-1 601,5	2 710,5	-1 609,2	2 797,8	-1 492,3	3 109,7	-1 437,7	3 532,5
40	-434,5	5 118,4	-1 443,8	161,2	-1 554,4	2 080	-1 582,9	2 710,1	-1 590,6	2 797,5	-1 473,7	3 109,4	-1 419,1	3 532,2
45	-434,5	5 118,4	-1 429,4	161,5	-1 540	2 080,3	-1 568,5	2 709,9	-1 576,2	2 797,2	-1 459,3	3 109,1	-1 404,7	3 531,9
50	-434,5	5 118,4	-1 417,9	161,7	-1 528,5	2 080,5	-1 557	2 709,6	-1 564,7	2 797	-1 447,8	3 108,9	-1 393,2	3 531,7
75	-434,5	5 118,4	-1 383,4	162,4	-1 548,4	2 080,1	-1 577	2 710	-1 530,3	2 796,3	-1 413,3	3 108,2	-1 358,7	3 531
100	-434,5	5 118,4	-1 366,2	162,7	-1 564,1	2 079,8	-1 592,6	2 710,3	-1 513	2 796	-1 396,1	3 107,9	-1 341,5	3 530,7
150	-434,5	5 118,4	-1 348,9	163	-1 579,6	2 079,5	-1 608,1	2 710,6	-1 495,8	2 795,7	-1 378,9	3 107,6	-1 324,3	3 530,4
200	-434,5	5 118,4	-1 340,3	163,2	-1 587,3	2 079,4	-1 615,8	2 710,8	-1 487,2	2 795,5	-1 370,3	3 107,4	-1 315,7	3 530,2
250	-434,5	5 118,4	-1 335,2	163,3	-1 591,9	2 079,3	-1 620,4	2 710,9	-1 482,1	2 795,4	-1 365,1	3 107,3	-1 310,5	3 530,1
400	-434,5	5 118,4	-1 327,4	163,4	-1 598,7	2 079,1	-1 627,3	2 711	-1 474,3	2 795,3	-1 357,4	3 107,2	-1 302,8	3 530
600	-434,5	5 118,4	-1 323,1	163,5	-1 602,5	2 079,1	-1 631,1	2 711,1	-1 470	2 795,2	-1 353,1	3 107,1	-1 298,5	3 529,9
800	-434,5	5 118,4	-1 321	163,6	-1 604,4	2 079	-1 633	2 711,1	-1 467,9	2 795,1	-1 350,9	3 107,1	-1 296,3	3 529,9
1 000	-434,5	5 118,4	-1 319,7	163,6	-1 605,6	2 079	-1 634,1	2 711,1	-1 466,6	2 795,1	-1 349,6	3 107	-1 295,1	3 529,8
2 500	-434,5	5 118,4	-1 316,6	163,6	-1 608,3	2 079	-1 636,9	2 711,2	-1 463,5	2 795,1	-1 346,5	3 107	-1 292	3 529,8
5 000	-434,5	5 118,4	-1 315,6	163,7	-1 609,2	2 078,9	-1 637,8	2 711,2	-1 462,4	2 795	-1 345,5	3 106,9	-1 290,9	3 529,7
Tangent	-434,5	5 118,4	-1 314,5	163,7	-1 610,1	2 078,9	-1 638,7	2 711,2	-1 461,4	2 795	-1 344,5	3 106,9	-1 289,9	3 529,7

TABLE 5B - VEHICLE DYNAMIC ENVELOPE - INSIDE OF CURVE

Cross Level Variation = 28,7 mm (2,0% Slope)

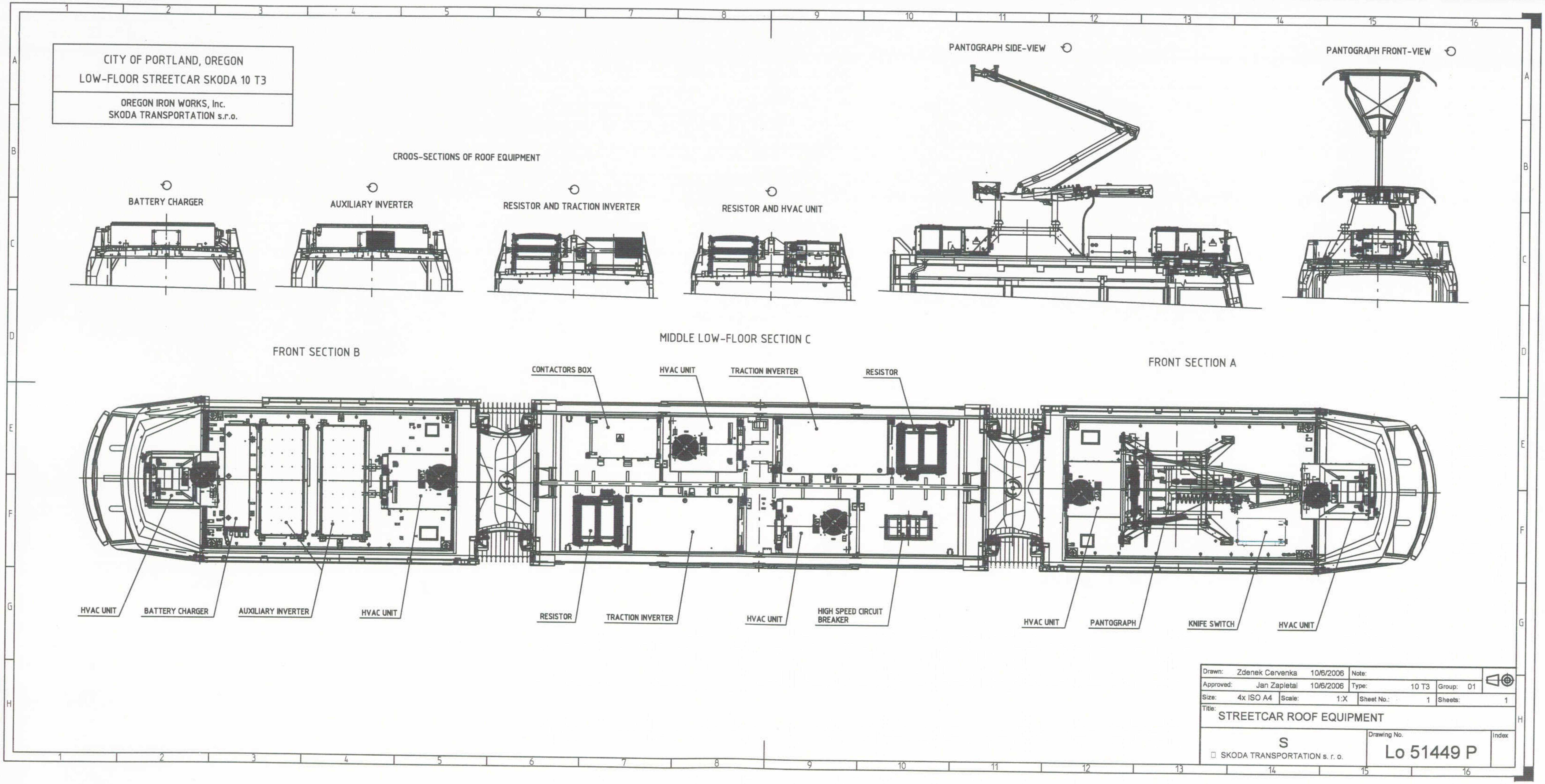
Superelevation = 0,0 mm

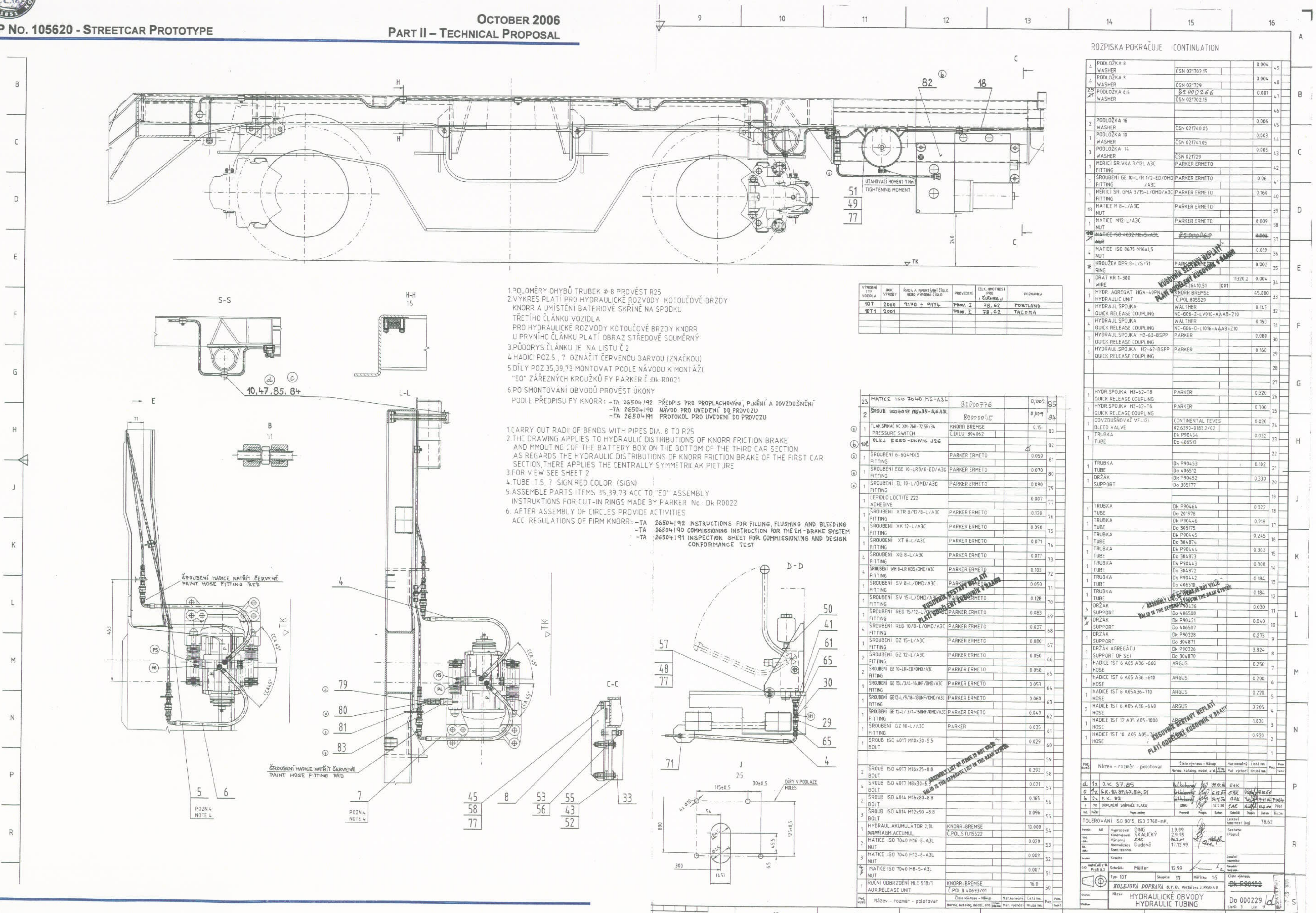
Radius	P9 CEN		P1 IN		P2 IN		P4 IN		P5 IN		P7 IN		P8 IN	
[m]	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
20	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
25	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
30	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
35	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
40	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
45	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
50	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
75	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
100	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
150	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
200	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
250	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
400	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
600	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
800	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
1 000	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
2 500	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
5 000	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5
Tangent	-516,3	6 263,2	-1 192,3	3 778,8	-1 003,7	4 013,4	-1 274,1	4 920,8	-1 085,4	5 155,4	-1 355,8	6 062,9	-1 167,2	6 297,5

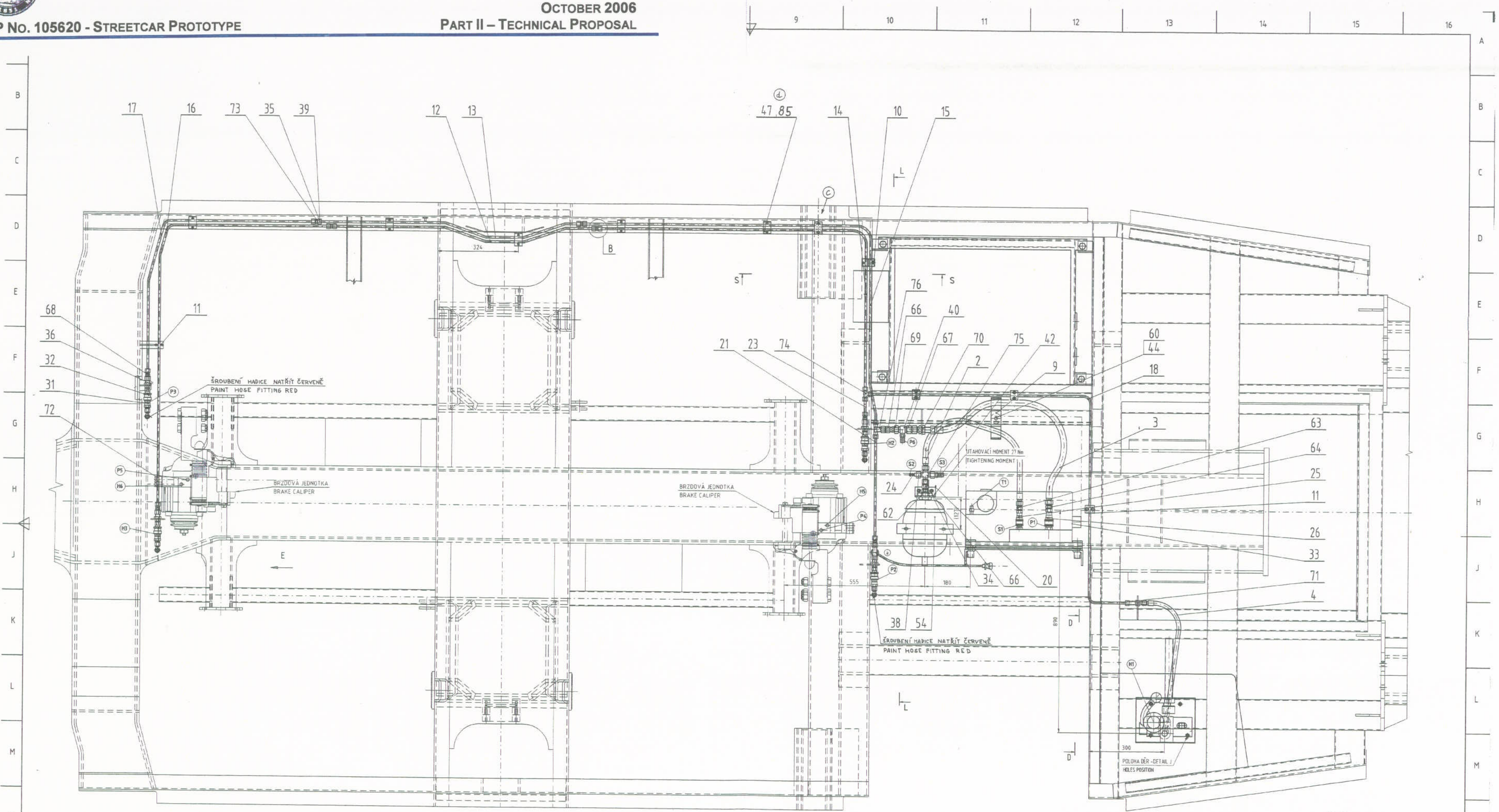
f. Roof and Undercar Arrangement Drawings

For the roof and undercar arrangements, see the referenced drawings that follow this page (pages 71 – 76).

- LO 51449 — Roof Equipment
- DO 000229 — Sheet 1 Trucks
- DO 000229 — Sheet 2 hydraulic tubing
- DO 000291 — Trucks
- DO 101702 — High voltage bogie cables
- DO 101703 — Low voltage bogie cables


CITY OF PORTLAND, OREGON
LOW-FLOOR STREETCAR SKODA 10 T3
OREGON IRON WORKS, Inc.
SKODA TRANSPORTATION s.r.o.
CROOS-SECTIONS OF ROOF EQUIPMENT
BATTERY CHARGER
AUXILIARY INVERTER
RESISTOR AND TRACTION INVERTER
RESISTOR AND HVAC UNIT
PANTOGRAPH SIDE-VIEW
PANTOGRAPH FRONT-VIEW
FRONT SECTION B
MIDDLE LOW-FLOOR SECTION C
FRONT SECTION A
CONTACTORS BOX
HVAC UNIT
TRACTION INVERTER
RESISTOR
HVAC UNIT
BATTERY CHARGER
AUXILIARY INVERTER
HVAC UNIT
RESISTOR
TRACTION INVERTER
HVAC UNIT
HIGH SPEED CIRCUIT BREAKER
HVAC UNIT
PANTOGRAPH
KNIFE SWITCH
HVAC UNIT
Drawn: Zdenek Cervenka 10/6/2006
Approved: Jan Zapletal 10/6/2006
Size: 4x ISO A4
Scale: 1:X
Note:
Type: 10 T3
Group: 01
Sheet No.: 1
Sheets: 1
Title: STREETCAR ROOF EQUIPMENT
SKODA TRANSPORTATION s. r. o.
Drawing No. Lo 51449 P
Index


ROZPISKA POKRAČUJE CONTINUATION
1.POLOMĚRY OHYBŮ TRUBEK ⌀ 8 PROVÉST R25
2.VÝKRES PLATÍ PRO HYDRAULICKÉ ROZVODY KOTOUČOVÉ BRZDY KNORR A UMÍSTĚNÍ BATERIOVÉ SKŘÍNĚ NA SPODKU TŘETÍHO ČLÁNKU VOZIDLA PRO HYDRAULICKÉ ROZVODY KOTOUČOVÉ BRZDY KNORR U PRVNÍHO ČLÁNKU PLATÍ OBRAZ STŘEDOVĚ SOUMĚRNÝ
3.PŮDORYS ČLÁNKU JE NA LISTU Č 2
4.HADICI POZ.5 , 7 OZNAČIT ČERVENOU BARVOU (ZNAČKOU)
5.DÍLY POZ.35,39,73 MONTOVAT PODLE NÁVODU K MONTÁŽI "EO" ZÁŘEZNÝCH KROUŽKŮ FY PARKER Č Dk R0021
6.PO SMONTOVÁNÍ OBVODŮ PROVÉST ÚKONY PODLE PŘEDPISU FY KNORR: -TA 26504/92 PŘEDPIS PRO PROPLACHOVÁNÍ, PLNĚNÍ A ODVZDUŠNĚNÍ
-TA 26504190 NÁVOD PRO UVEDENÍ DO PROVOZU
-TA 26504191 PROTOKOL PRO UVEDENÍ DO PROVOZU
1.CARRY OUT RADII OF BENDS WITH PIPES DIA. 8 TO R25
2.THE DRAWING APPLIES TO HYDRAULIC DISTRIBUTIONS OF KNORR FRICTION BRAKE AND MMOUTING COF THE BATTERY BOX ON THE BOTTOM OF THE THIRD CAR SECTION AS REGARDS THE HYDRAULIC DISTRIBUTIONS OF KNORR FRICTION BRAKE OF THE FIRST CAR SECTION,THERE APPLIES THE CENTRALLY SYMMETRICAK PICTURE
3.FOR VIEW SEE SHEET 2
4.TUBE T.5, 7 SIGN RED COLOR (SIGN)
5.ASSEMBLE PARTS ITEMS 35,39,73 ACC TO "EO" ASSEMBLY INSTRUKTIONS FOR CUT-IN RINGS MADE BY PARKER No. Dk R0022
6. AFTER ASSEMBLY OF CIRCLES PROVIDE ACTIVITIES ACC. REGULATIONS OF FIRM KNORR: -TA 26504192 INSTRUCTIONS FOR FILLING, FLUSHING AND BLEEDING
-TA 26504190 COMMISSIONING INSTRUCTION FOR THE EH-BRAKE SYSTEM
-TA 26504191 INSPECTION SHEET FOR COMMISSIONING AND DESIGN CONFORMANCE TEST
S-S
H-H
L-L
C-C
D-D
ŠROUBENÍ HADICE NATŘÍT ČERVENĚ
PAINT HOSE FITTING RED
KOLEJOVÁ DOPRAVA s.r.o.
HYDRAULICKÉ OBVODY
HYDRAULIC TUBING
Do 000229



PŘEHLED PŘIPOJOVACÍCH MÍST

PŘIPOJENÍ	SMĚR 1	DÍL	SMĚR 2	DÍL
S1	HYDROAGREGÁT	PARKER H2-63-T6	AKUMULÁTOR	PARKER, H2-62-T6
S2	ATMOSFÉRA	CONTINENTAL TEVES, VE-12L	—	—
S3	MĚŘICÍ MÍSTO	PARKER, VKA 3/12L	—	—
P1	HYDROAGREGÁT	PARKER, H3-63-T8	BRZDOVÁ JEDNOTKA	PARKER, H3-62-T8
P2/3	HYDROAGREGÁT	WALTHER, NC-G06-2-LV010-AAAB-Z10	BRZDOVÁ JEDNOTKA	WALTHER, NC-G06-0-L1016-AAAB-Z10
P4/5	ATMOSFÉRA	KNORR-ODVZDUŠŇOV. VENTIL P	—	—
P6	MĚŘICÍ MÍSTO	PARKER ,GMA 3/15-L	—	—
H1	POMOCNÝ AGREGÁT	PARKER H1-63-T4	BRZDOVÁ JEDNOTKA	PARKER, H1-62-T4
H2/3	POMOCNÝ AGREGÁT	WALTHER, NC-G06-2-LV010-AAAB-Z10	BRZDOVÁ JEDNOTKA	WALTHER, NC-G06-0-L1016-AAAB-Z10
H5/6	ATMOSFÉRA	KNORR-ODVZDUŠŇOV. VENTIL H	—	—
T1	NÁDRŽ	PARKER, H1-63-T4	—	—

LIST OF CONNECTORS

JOINT	DIRECTION 1	PART	DIRECTION 2	PART
S1	HYDRAULIC UNIT	PARKER, H2-63-T6	DIAPHRAGM. ACUMMUL.	PARKER, H2-62-T6
S2	ATMOSPHERE	CONTINENTAL TEVES, VE-12L	—	—
S3	MEASURING POINT	PARKER, VKA 3/12L	—	—
P1	HYDRAULIC UNIT	PARKER, H3-63-T8	BRAKE CALIPER	PARKER, H3-62-T8
P2/3	HYDRAULIC UNIT	WALTHER, NC-G06-2-LV010-AAAB-Z10	BRAKE CALIPER	WALTHER, NC-G06-0-L1016-AAAB-Z10
P4/5	ATMOSPHERE	KNORR-DEAERATING VALVE P	—	—
P6	MEASURING POINT	PARKER ,GMA 3/15-L	—	—
H1	AUXILIARY UNIT	PARKER, H1-63-T4	BRAKE CALIPER	PARKER, H1-62-T4
H2/3	AUXILIARY UNIT	WALTHER, NC-G06-2-LV010-AAAB-Z10	BRAKE CALIPER	WALTHER, NC-G06-0-L1016-AAAB-Z10
H5/6	ATMOSPHERE	KNORR-DEAERATING VALVE H	—	—
T1	TANK	PARKER, H1-63-T4	—	—

LIST Č.1 - ŘEZY D-D, L-L, S-S
DETAILY B,J
POHLED E

SHEET No.1 - SECTIONS D-D, L-L, S-S
DETAILS B,J
VIEW E

TOLEROVÁNÍ ISO 8015, ISO 2768-mK, EN ISO 13920-BF

Formát: A0 — Vypracoval: DING 1.9.99 — Kontroloval: SKALICKÝ 2.9.99 — Výr. proj.: SAK 20.7.00 — Normalizace: Dudová 17.12.99 — Schválil: Müller 12.99

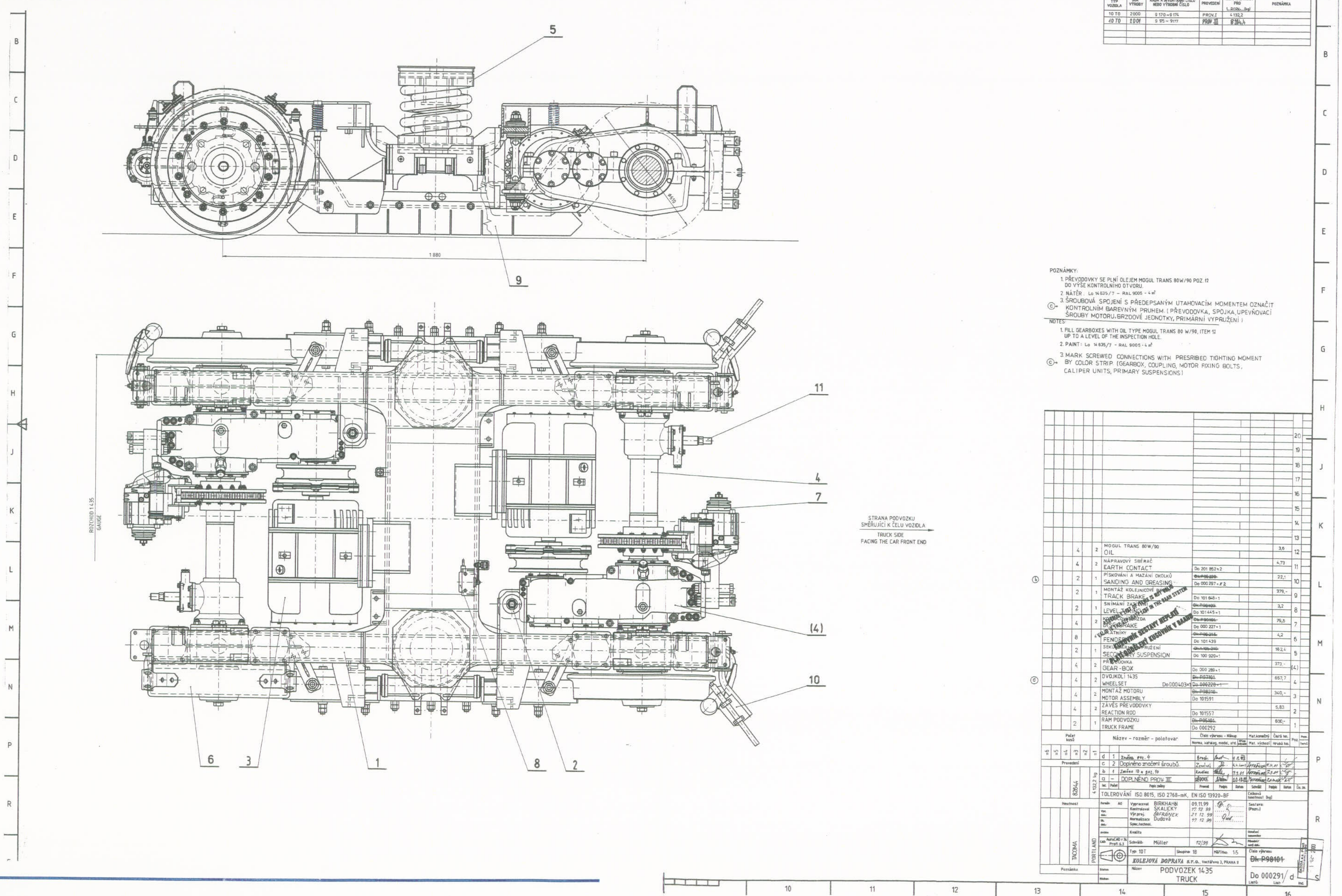
CAD: AutoCAD r.14 Profi 6.3

Typ: 10 T — Skupina: 17 — Měřítko: 1:5

KOLEJOVÁ DOPRAVA S.T.O., Voctářova 3, PRAHA 8

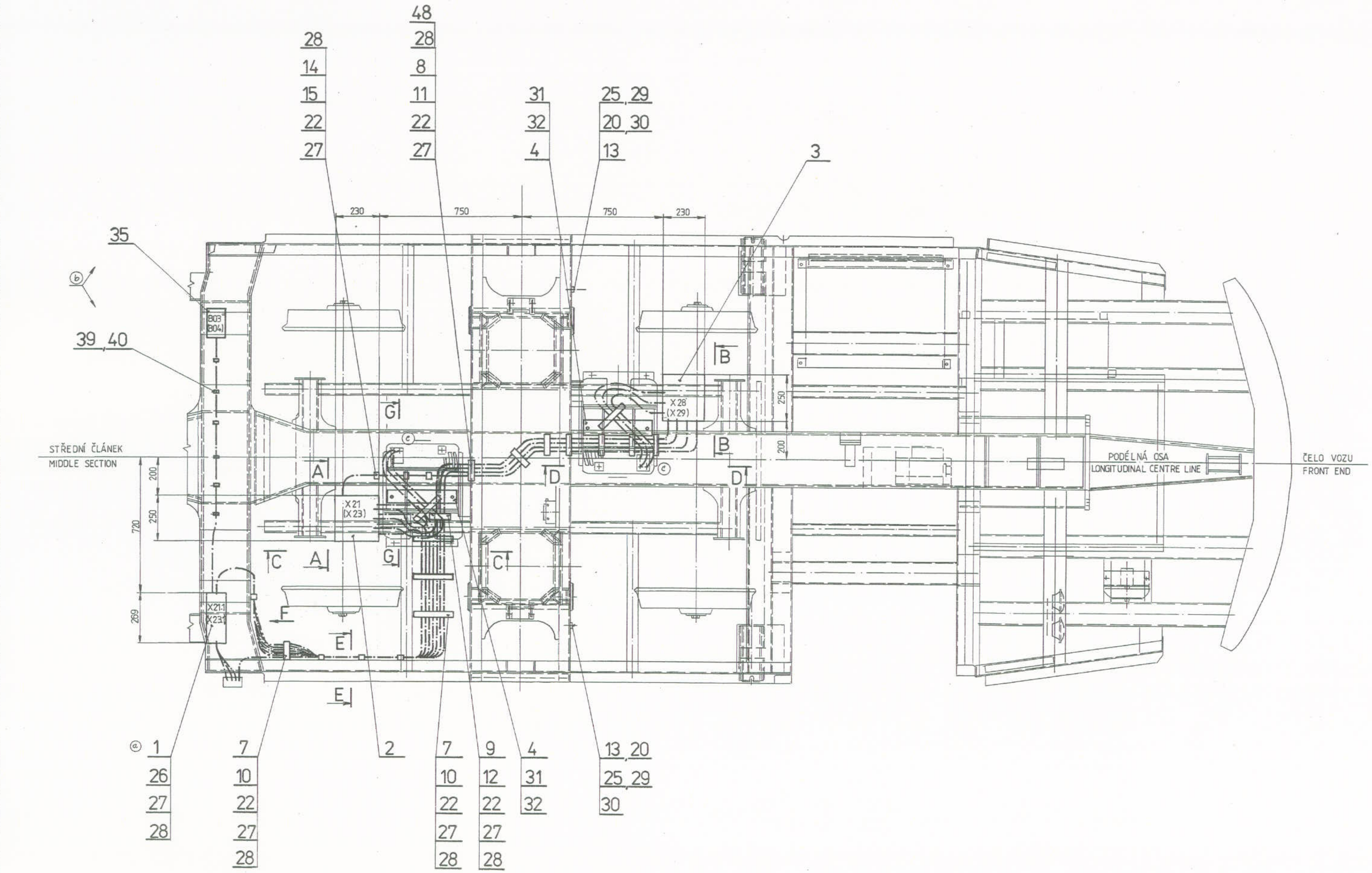
Název: HYDRAULICKÉ OBVODY
HYDRAULIC TUBING

Číslo výkresu: Do 000229/d — Listů: 3 — List: 2


5
9
1 880
ROZCHOD 1 435
GAUGE
11
4
7
(4)
10
6
3
1
8
2
STRANA PODVOZKU SMĚŘUJÍCÍ K ČELU VOZIDLA
TRUCK SIDE FACING THE CAR FRONT END
POZNÁMKY:
1. PŘEVODOVKY SE PLNÍ OLEJEM MOGUL TRANS 80W/90 POZ. 12 DO VÝŠE KONTROLNÍHO OTVORU.
2. NÁTĚR: Lo 14 635/7 – RAL 9005 - 4 m²
3. ŠROUBOVÁ SPOJENÍ S PŘEDEPSANÝM UTAHOVACÍM MOMENTEM OZNAČIT KONTROLNÍM BAREVNÝM PRUHEM. (PŘEVODOVKA, SPOJKA, UPEVŇOVACÍ ŠROUBY MOTORU, BRZDOVÉ JEDNOTKY, PRIMÁRNÍ VYPRUŽENÍ)
NOTES:
1. FILL GEARBOXES WITH OIL TYPE MOGUL TRANS 80 W/90, ITEM 12 UP TO A LEVEL OF THE INSPECTION HOLE.
2. PAINT: Lo 14 635/7 – RAL 9005 - 4 m²
3. MARK SCREWED CONNECTIONS WITH PRESRIBED TIGHTING MOMENT BY COLOR STRIP (GEARBOX, COUPLING, MOTOR FIXING BOLTS, CALIPER UNITS, PRIMARY SUSPENSIONS)
MOGUL TRANS 80W/90 OIL 3,6 12
NÁPRAVOVÝ SBĚRAČ EARTH CONTACT Do 201 852 = 2 4,73 11
PÍSKOVÁNÍ A MAZÁNÍ OKOLKŮ SANDING AND GREASING Do 000 297 = 2 22,1 10
MONTÁŽ KOLEJNICOVÉ BRZDY TRACK BRAKE Do 101 648 - 1 379,- 9
SNÍMÁNÍ ZATÍŽENÍ LEVEL TAKING Do 101 445 = 1 3,2 8
KOTOUČOVÁ BRZDA DISC BRAKE Do 000 227 = 1 79,5 7
BLATNÍKY FENDER Do 101 439 4,2 6
SEKUNDÁRNÍ VYPRUŽENÍ SECONDARY SUSPENSION Do 100 920 = 1 182,4 5
PŘEVODOVKA GEAR-BOX Do 000 289 = 1 373,- (4)
DVOJKOLÍ 1435 WHEELSET Do 000403 = 1 657,7 4
MONTÁŽ MOTORU MOTOR ASSEMBLY Do 101591 340,- 3
ZÁVĚS PŘEVODOVKY REACTION ROD Do 101557 5,83 2
RÁM PODVOZKU TRUCK FRAME Do 000292 600,- 1
Počet kusů
Název – rozměr – polotovar
Číslo výkresu – Nákup
Norma, katalog, model, atd.
Mat. konečný
Mat. výchozí
Čistá hm.
Hrubá hm.
Poz.
KUSOVNÍK SESTAVY NEPLATÍ
PLATÍ ODDĚLENÝ KUSOVNÍK V BAAN
d 1 Změna poz. 4
c 2 Doplněno značení šroubů
b 1 Změna 10 u poz. 10
a – DOPLNĚNO PROV. III
TOLEROVÁNÍ ISO 8015, ISO 2768-mK, EN ISO 13920-BF
BIRKHAHN
SKALICKÝ
Dudová
Müller
PORTLAND
TACOMA
KOLEJOVÁ DOPRAVA s.r.o.
PODVOZEK 1435
TRUCK
Do 000291/d

Výchozí typ vozidla	Rok výroby	Řada a inventární čísla	Provedení	TRAMVAJ	Poznámka
10T	2000	9170 ÷ 9174	PROV. I.	61,3	PORTLAND
10T	2001	9175 ÷ 9177	PROV. I.	67	TACOMA

Index	Počet	Popis změny	Provedl	Datum	Podpis	Schválil	Datum	Podpis
a	1x	ZMĚNA SVORKOVNICE 1	BEKOVÁ	24.8.2000	Beková	EDL	24.8.2000	[illegible]
b	2x	FILTR ELINU	BEKOVÁ	18.9.2000	Beková	LANG	18.9.2000	[illegible]
c	–	O.K. 44 ÷ 48	BEKOVÁ	5.2.2001	Beková	LANG	27.2.01	[illegible]
d	1x	O.K. 17, 21, 23	BEKOVÁ	6.6.2001	Beková	LANG	6.6.2001	[illegible]
e	–	ZMĚNA O.K.4	BEKOVÁ	2.5.2002	Beková	LANG	3.5.2002	[illegible]
f	–	ZMĚNA U POZ. 17 a 21	BEKOVÁ	10.7.02	Beková	LANG	10.7.02	[illegible]



POZNÁMKY:
NOTES:

1) ZAPOJENÍ VODIČŮ PODLE MONTÁŽNÍCH SCHEMAT.
– WIN CONNECTION ACCORDING TO ASSEMBLY DIAGRAMS.
2) ČÍSLA V ZÁVORKÁCH PLATÍ PRO ZADNÍ DÍL.
– NUMBRES IN BRACKET ARE VALID FOR END PART.
3) POZ. 19 POUŽIJTE PRO UZEMNĚNÍ MOTOR - PODVOZEK A SKŘÍŇ - SVORKOVNICE.
– ITEM 19 USE FOR MOTOR–BOGIE AND TRUCK–BOX OF TERMINAL.
4) POZ. 13 POUŽIJTE PRO UZEMNĚNÍ SKŘÍŇ – PODVOZEK.
– ITEM 13 USE FOR TRUCK - BOGIE.
5) POZ. 18, 33 POUŽIJTE KE KAŽDÉMU ZEM. NÁVARKU.
– ITEM 18, 33 USE FOR RATING PLATE.
6) POZ. 45÷47 POUŽIJTE DO SVORKOVNIC.
– ITEM 45÷47 USE FOR TERMINAL.

IV | III | II | I — Ks pro 1 PROV. | Název - rozměr | Mat. konečný / Mat. výchozí | Polotovar (číslo modelu, zápustky, apod.) | Třída odpadu | Č.hmot. / Hr.hmot. | Číslo výkresu | Poz. | Poznámka

Tolerování ISO 8015, ISO 2768-mK, ČSN 01 4240-m
Neoznačené hrany ISO 13715
DUŠEVNÍ VLASTNICTVÍ / INTELLECTUAL PROPERTY / GEISTIGE EIGENTUM / ИНТЕЛЛЕКТУАЛЬНАЯ СОБСТВЕННОСТЬ
ŠKODA DOPRAVNÍ TECHNIKA s.r.o.
Celková hmotnost kg: I II III IV

For. A1

Kreslil	Beková	8.3.2000	Beková
Přezkoušel	Beková	8.3.2000	Beková
Vyr. projednal	ŠAFRÁNEK	17.3.2000	Šafránek
Normalizoval	FRANA	17.3.2000	Frana
Kvalita			
Schválil	ING EDL		

Sestava (pozn.):

Typ 10T | Skup. 87 | Měř. 1:10

ŠKODA DOPRAVNÍ TECHNIKA s.r.o.

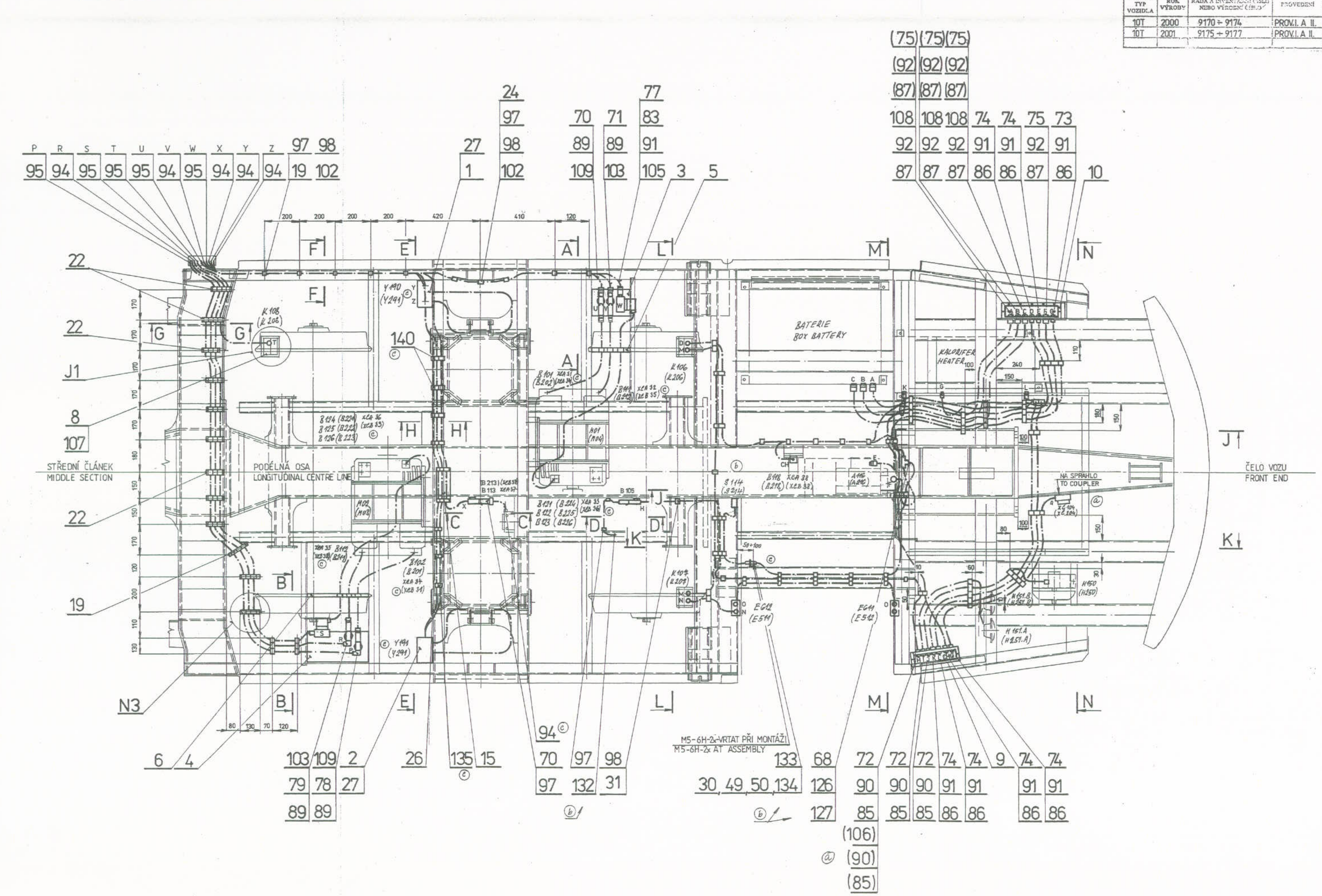
ŠKODA

Název: KABELÁŽ PRO PODVOZEK VN
CABLING FOR BOGIE HIGH VOLTAGE

Do 101702 f
List/list 2/1

VÝROBNÍ TYP VOZIDLA	ROK VÝROBY	ŘADA A INVENTÁRNÍ ČÍSLO NEBO VÝROBNÍ ČÍSLO	PROVEDENÍ	CELK. HMOTNOST PRO TRAMVAJ (kg)	POZNÁMKA
10T	2000	9170 ÷ 9174	PROV.I. A II.	31,1 kg A 30,3 kg	PŘ. DÍL - PROV.I., ZAD. DÍL - PROV.II
10T	2001	9175 ÷ 9177	PROV.I. A II.	40 kg A 39,5 kg	PŘ. DÍL - PROV.I., Z. DÍL - PROV.II

Index	Počet	Popis změny	Provedl	Datum	Podpis	Schválil	Datum	Podpis
a	5x	DOPLNĚNÍ TRANSPONDERU, ZRUŠ. RYCHLOMĚRU	RYBOVSKÝ	28.3.00	[illegible]	EDL	28.3.00	[illegible]
b	5x	DOPLNĚNÍ ČDIVAČE	BEKOVÁ	5.9.00	[illegible]	LANG	6.9.2000	[illegible]
c	–	KRYT KONEKTORU	BEKOVÁ	7.12.00	[illegible]	LANG	27.2.01	[illegible]
d	1	DOPLNĚNÍ POZ. 56	BEKOVÁ	14.6.01	[illegible]	LANG	14.6.01	[illegible]
e	–	ZVÝŠENÍ KS U POZ. 140	BEKOVÁ	10.7.02	[illegible]	LANG	10.7.02	[illegible]



POZNÁMKY: / NOTES:

1) ZAPOJENÍ VODIČŮ PODLE MONTÁŽNÍCH SCHEMAT.
- WIN CONNECTION ACCORDING TO ASSEMBLY DIAGRAMS.

2) ČÍSLA POZIC V ZÁVORKÁCH PLATÍ PRO ZADNÍ DÍL.
- NUMBERS IN BRACKET ARE VALID FOR END PART.

3) PŘI MONTÁŽI VODIČŮ MN MEZI SKŘÍNÍ A PODVOZKEM RESPEKTUJTE CELKOVÉ PROPÉROVÁNÍ 85 mm/50 mm - DORAZ; 35 mm ZMĚNA NIVELITY.
- RESPECT POSSIBLE MOVES BETWEEN TRUCK AND BODY.

4) HADICEMI O.K. 65 OZNAČENÍ Y,Z PRO KOLEJ. BRZDU POKRAČUJTE DO SLOUPKU JEŠTĚ 2000mm OSTATNÍMI HADICEMI O.K. 65 A O.K. 66 POKRAČUJTE DO SLOUPKU 200 mm.
- HOZES ITEM 65 (Y,Z) FOR TRACK BRAKE PROLONG 2000mm INTO COLUMN, OTHER HOZES (ITEM 65, 66) 200mm INTO COLUMN.

(c) 5) O.K. 59,60 POUŽIJTE KE SVAZKOVÁNÍ NEBO PŘIBANDÁŽOVÁNÍ HADIC A VODIČŮ.
- ITEM 59,60 USE FOR BUNDLING.

(a) 6) HADICE A,B,C VČETNĚ PŘÍSLUŠENSTVÍ JSOU JEN NA ZADNÍM DÍLU. HADICE H VČETNĚ PŘÍSLUŠENSTVÍ JSOU JEN NA PŘEDNÍM DÍLU.
- HOZES A,B,C INCLUDING ACCESSORIES ARE ONLY ON THE REAR LINE.
- HOZES H INCLUDING ACCESSORIES ARE ONLY ON THE FRONT LINE.

7) PROPOJKU VOZŮ OK. 131 UMÍSTĚTE DO VÝSTROJE.
- CABLE CONNECTION OK. 131 PLACE EQUIPMENT.

(b) 8) PRO PŘEDNÍ DÍL PLATÍ PROV. I., PRO ZADNÍ DÍL PLATÍ PROV. II.
- EXECUTION I. IS VALID FOR THE FRONT PART. EXECUTION II. IS VALID FOR THE REAR PART.

(b) 9) POZ. 133 USTAVIT PŘI MONTÁŽI PODLE DÉLKY DODANÉHO VODIČE. OTVORY M5-6H VRTAT PŘI MONTÁŽI.
- ARRANGE ITEM 133 - AT ASSEMBLY - TO THE WIRE LENGTH DRILL HOLES M5-6H AT ASSEMBLY.

OZN.	Φ HAD	POZ.
A	28,5	68
B	28,5	68
C	28,5	68
D	21,2	67
E	21,2	67
F	28,5	68
G	15,8	66
H	15,8	66
I	15,8	66
J	15,8	66
K	21,2	67
L	21,2	67
M	21,2	67

OZN.	Φ HAD.	POZ.
CH	21,2	67
N	21,2	67
O	15,8	66
P	15,8	66
R	13	65
S	15,8	66
T	15,8	66
U	15,8	66
V	13	65
W	15,8	66
X	13	65
Y	13	65
Z	13	65
Q	21,2	67

Typ 10T — Měřítko 1:10 — A1
Bekova — 1.3.2000
ŠKODA DOPRAVNÍ TECHNIKA s.r.o.
KABELÁŽ PRO PODVOZEK MN
CABLING FOR BOGIE LOW VOLTAGE
Do 101703 / e

4.0 VEHICLE WEIGHTS AND AXLE LOADING

The following table shows the main street car weights and specific loads considered; it also outlines the number of passengers (both seated and standing) that can be accommodated by the vehicle, as well as the total number of passengers for individual load cases. The driver's weight is accounted for on the overall vehicle weight and loads as well.

The estimated car weights are as follow:

LOAD TYPE	DESCRIPTION	SEATED + STANDING + DRIVER	TOTAL OCCUPANTS	WEIGHTS
	TRUCK ASSEMBLY	0	**0**	**4,340 kg**
	WEIGHT PER AXLE AT AW3	30 + 127 + 1	**30 + 127 + 1**	**9,765 kg**
AW0	EMPTY	0	**0**	**28,000 kg**
AW1	SEATED	30 + 0 + 1	**30 + 1**	**30,170 kg**
AW2	SEATED + 4 P / m^2	30 + 85 + 1	**115 + 1**	**36,120 kg**
AW3	SEATED + 6 P / m^2	30 + 127 + 1	**157 + 1**	**39,060 kg**
AW4	SEATED + 6.6P /m^2	30 + 140 + 1	**170 + 1**	**39,970 kg**

Calculations in table above are based on 70 kg per passenger and one operator/driver. The area of standing passengers is approximated at 21.25 m^2.

All installed vehicle equipment is arranged such that its weight is evenly distributed on all four axles in order to maximize adhesion and preclude a tendency to derail. The maximal difference in weight acting on trucks does not exceed 900 kg for all loading conditions, and the wheel lateral imbalance does not exceeding 290 kg for all loading conditions.

For a full description of the weights and passenger loading please see the Technical Specification attachment.

5.0 EVIDENCE OF SERVICE PROVEN DESIGN FOR SYSTEMS AND COMPONENTS

The proposed new prototype vehicle is based on the existing Portland street car design. Seven vehicles using this design have been in use since 2001 (first 5 vehicles) and 2002 (last 2 vehicles) in Portland. The total number of vehicles with this basic design is ten: seven in Portland and three in Tacoma. As described in the RFP reply the new (proposed) vehicle is basically similar / same as the existent one but with B-A compliance and a slightly different electrical system. This means that all common (same / similar) systems meet the RFP requirements (at least 2 years, 100,000 vehicle-km, with at least 20,000 km/vehicle and the fleet size of minimum five) – the Portland fleet has seven cars.

For the new components proposed on the electrical system (traction and communication): the electrical traction system and design is actually not a completely new system. The design is a slight modification of the current design as described previously and in section 11 herein. This design has been used on several products by Skoda and has accumulated the necessary time/km to prove out its design, performance and reliability. The system design is the same as for the Prague cars and the Vectra car. Two vehicles for Prague, have already accumulated over 80,000 km in operating service and one Vectra vehicle completed more than 6 months in service with at least 20,000 km in service, both with excellent results. The drive system used on the electrical propulsion of the Boston trolleybuses is the same as the one proposed for this RFP. The vehicles using this type of design, designed and produced by Skoda, already have over 100,000 miles; the trolleybus fleet consists of 60 vehicles with 50 - 60,000 miles each.

The approach we take on this prototype is one of minimum risk – the new design is actually proven on other products and it has been used in real service/duty cycle by existing vehicles.

6.0 CAR BODY AND INTERIOR AND EXTERIOR APPOINTMENTS

a. General

The OIW Type 10 T3 street car will maintain the overall car body design of the existing Portland street car vehicles. The roof structure mounting supports will be slightly modified to accommodate the new Skoda Electric components. Domestic materials will be utilized to the greatest extent possible. All materials utilized on the car body will equal or exceed the mechanical properties of the existing Portland street car vehicles. The material preparation, coatings, anti-corrosive coatings and paint systems will be the same or similar to the existing coating scheme. This strategy ensures not only compatibility between current and future vehicles, but will eliminate the need for additional testing on an already proven and/or compliant design.

The overall external vehicle appearance theme will remain consistent with the existing Portland street car vehicles.

***** Optional offer: If desired by the customer, OIW could provide an updated external appearance, featuring more modern features and more up-to-date styling. Several variations are available for proposal. The new vehicle look ("face-lift") could be accomplished with minimum impact on the existing vehicle and with maintaining the compatibility of the main systems (i.e. uses same windshield and same wiper/washer system). Please see the attached Technical Specification for details and available renderings.***

The vehicle car body is made of a lightweight steel structure and consists of welded steel sheet and profiles. The highly exposed steel portions of the vehicle, such as stairs, side wall sheeting and roof sheeting will be of stainless steel, an improvement over existing Portland street car vehicles. The car body is designed for a service life of 30 years, calculated on the material's resistance to corrosion and the influences of all operating conditions described in the RFP.

The front and rear vehicle underframes are provided with anticlimbers. The overall arrangement and height of the anticlimbers is fully compatible with the existing Portland vehicles. The front sill of each end underframe fitted with an anticlimber will serve as an energy absorbing structure upon possible impact of the vehicle into a solid object or another vehicle. The driver's cabins, from the front of the vehicle back to the first passenger door are designed for maximum operator safety.

The car is constructed of energy absorbing materials and components which may be easily repaired or replaced. The underframe and side walls have been designed to maximize passenger safety in the event of a side-impact collision. Emergency evacuation is possible in the event of damaged doors and side walls by removing the fixed parts of windows from within the vehicle's interior. Parts or components more exposed to potential damage, (such as bumpers), are easily removable and replaceable. The body structures of the individual sections are blasted and coated with a suitable weldable primer. The vehicle's side wall sheet metal panels are bonded to the car body with a high strength structural adhesive.

The vehicle roof is designed to accommodate the weight of maintenance personnel in addition to the installed, roof-mounted equipment. Provisions have been made for walkways and workspace on the top of the vehicle as an aid on the maintenance or replacement of the components. Water drainage from the roof of the vehicle is provided through the use of anti-corrosive down-pipes.

The vehicle doors are operated by a spindle mechanism with mechanical locks. These locks, together with the vehicle's electrical control system, prevent spontaneous, undesired opening of the doors in the event of a collision. To unlock the doors of a damaged vehicle mechanical handles are located near all doors. Once unlocked, the mechanical release allows doors to be opened by simply pushing on the door panels.

The vehicle body consists of three sections connected by upper and lower joint connections. The end sections are mounted on motorized trucks, while the middle section is suspended between the two end sections. The joint connection between sections provides for rotation around the vertical axis. Additionally, one connection also provides for lateral shifting in the upper connection. The vehicle sections are connected in a manner that absorbs all rail irregularities while passing over a section of curved track, regardless of wheel wear conditions; from maximum wheel size to maximum permissible wear.

Each vehicle joint connection is fitted with a bellows in order to provide a comfortable passage way, as well as a position for standees. These bellows also accommodate all relative movements between car body sections. The bellows ensure the safety of the passengers while the vehicle is underway, and provide for ease of movement between individual sections of the car. The bellow system consists of two parts - the external bellows and the internal lining in the passenger compartment. This combination provides sufficient sound and thermal insulation for passenger comfort and ensures that the segment areas between car sections maintain the same noise level and ambient temperature as the rest of the vehicle.

b. Structural Design

The structural design of the Type 10 T3 car body will be similar to the existing Portland street car vehicles and meets the requirements set forth in the RFP. The RFP requires the end sill compression to withstand 392 kN load when applied to anticlimbers. Based on the existing FEA/calculation results and the compression test performed on the current Portland street car it was determined that the street car structure design has adequate safety factor to withstand this load condition and meet the RFP requirements. Both FEA Analysis results as well as test report could be submitted if requested.

c. Stress Analysis

All car body structures have been analyzed using finite element method FEA analysis. The analytical results have been validated through testing performed by SKODA Transportation at an independent certified laboratory in Plzen, Czech Republic. Both the FEA and test results/reports could be submitted upon request.

d. Jack Pads and Hoist Inserts

The vehicle is equipped with suitable lifting points on each section. These hoist points or jack pads are provided for lifting during maintenance or in the event of re-railing. The first section features non-slip jacking pads at the centerline of the motorized trucks located on both sides of the vehicle, and an additional two hoisting inserts near the doors. A third set of lifting jacking pads are located on the centerline of under frame, beneath the vehicle. Lifting or re-railing of the vehicle can be accomplished through the use of an overhead or auto-based crane or through the use of hydraulic lifting devices.

e. Folding Couplers

The vehicle is equipped with manually controlled, mechanically folding couplers for emergency towing purposes. These couplers are located on both ends of the vehicle, hidden behind end lower shrouds. This system is fully compatible with the existing Portland street car vehicles and is equipped with the "Prague Head" design. The coupler is located at 525 mm above TOR. Maximum operational load in tension or stress is 76 kN and the coupler is capable of absorbing 4.7 kJ of energy. During manual manipulation, the force does not exceed 15 kg and the coupling of two vehicles requires less than 4 minutes when performed by skilled operators.

f. Interior and Exterior Appointments – General

The interior and exterior fit out of the Type 10 T3 vehicle will be similar, if not identical, to the existing Portland street car. Items or components that may differ from the existing Portland street car vehicles are noted below. In most cases, these differences are due to the requirements to comply with the B-A provision and supply/manufacture from U.S. based suppliers, or are intended to present an upgrade or improvement to the existing Portland street car design.

g. Interior Finishing and Accessories

The vehicle interior will be finished with high quality, low maintenance materials. Currently we are pursuing two directions for the flooring system (a base line solution and an improved design). The base line passenger compartment floor could be formed from domestic 5/8" exterior grade plywood, manufactured of seven layers of domestically-grown wood, and glued with melamine formaldehyde glue. This material is treated to provide water resistance to inclement weather, flowing water, or humidity. The flammability ratings are pursuant to standard UIC 564.2 – Category B.

This waterproof, fireproof plywood sub-flooring is glued down over the under frame metal structure; small profiles of rubber which have previously been fixed to the structure will be used to set-up and control the adequate bond gap (2 to 4 mm thickness of glue). This technology provides a seal against water penetration into the floor and restricts the noise and vibration transfer into the vehicle.

The improved/alternative flooring material is composed of a composite "sandwich" (core material encased with aluminum or fiberglass skins). This new material will significantly reduce the noise inside the vehicle and the overall weight of the body while increasing its structural effect on the overall body structure. The performances of the flooring system will improve by using the composite material. The flammability, water and environment resistance will be the same as plywood/base line material, or improved through the use of the composite material. This design and manufacturing solution is risk free and is being used currently on many light rail vehicles and transit vehicles in general.

At each articulation section and throughout the door sills, the edges of the floor are trimmed with a stainless steel molding. At the leading edge of each stair step, a textured yellow safety nosing covers the top one inch of each riser and extends fully across the width of the step, to a three inch depth.

The interior trim of the passenger compartment consists of the following components:

- Sideboards (below window surrounds) – Domestically manufactured KYDEX 62015 sheeting. This 4.0 mm thick thermoplastic material is available on the same color and texture as the current Portland street car vehicles. It is uniform in color throughout, easily cleanable, and highly graffiti-resistant. Flammability ratings pursuant to standard UL 94, classification HB.

- The materials used for wall facing are easy to maintain and resistant to vandalism. The KYDEX side panels are fastened to the car body structure with mechanical fasteners. The lower portion of each panel is capable of withstanding a 22 kg impact without cracking or any other ensuing damage.

- Window surrounds are screwed into the structure along the upper frame, while the sides and lower frame are fastened using a Velcro hook-and-loop system. This manner of fastening along with the internal insulation material, prevents the intrusion of unwanted noise, and ensures the strength requirements of the window structure. Additionally, it facilitates ease of window replacement and reduces overall replacement and maintenance times. The fastening points of individual panels are standardized, and compatible with the existing Portland street car vehicles.

- Sidewall columns and window surrounds of the passenger compartment – domestically manufactured fiberglass laminate. The material consists of a gelcoat (minimum cured thickness of 12 mils) and polyester resin (Norpol or equivalent product) with 30% to 40% glass mat content. The material thickness is 4 mm, with a smooth surface finish on the gelcoated face. Flammability ratings are pursuant to standard DIN 5510-2 class of flammability: S3, smoking capacity class: SR2, dripping class ST2, and test methods are pursuant to DIN 54 837.

- Passenger compartment headliner - 4 mm thick KYDEX sheeting, color-matched to the vehicle sidewalls. In the articulating sections between the cabs (above the stair level), the panels are gray, similar in color to the interior bellows. The headlining panels are bonded to the structure, and trimmed throughout the entire cab length.

- Ceiling transition zone – At areas where the ceiling transitions into the sidewall of the vehicle is a slanted region that features a series of locked plastic access panels. These panels can be opened using a square maintenance key. They are hinged upward to provide access to any hidden electrical or mechanical equipment.

- Pivoting articulation sections - The internal transition bellows portion consists of ceiling and side panels. These structures are intended to prevent access to pinch points where squeezing injuries could occur. The transition has a continuous shape, free from sharp edges and projections. The components have been surface treated and are easily maintainable. The full assembly and supporting elements of the bellows have a 30 year expected service life in operation.

h. Insulation

The vehicle is insulated (floors, sidewalls and roof) with domestically manufactured ANCO TEXTRAFINE (or equivalent product) to provide both thermal and acoustical insulation. ANCO TEXTRAFINE is an insulation manufactured from long, textile-type glass fibers and bonded together with a thermo-setting, phenolic resin. The product is resistant to dilute acids, alkalis, greases, gasoline, and aliphatic oils. It will not mold, rot, nor sustain vermin. It is not corrosive to metals, will not settle under car vibration, nor has an odor, or is capability of absorbing odors. It is unaffected by temperatures up to 230 degrees Celsius. This insulating material fills the entire space between the panels of the internal facing and the external sheet metal.

i. Floor Covering

The floor covering of the Type 10 T3 vehicle consists of domestically manufactured, RJF Corporation "Koroseal Granite" anti-skid floor covering. This product incorporates a textured feel and adds a stylish look of randomly spaced flecks of silver, red and blue on a gray background. This material is wear and burn resistant, (exceeding the requirements of FMVSS302), and meets accepted industry standards for slip resistance, including OSHA and ADA.

The floor covering is bonded to the vehicle sub-floor with domestically manufactured Betamate. This low energy substrate adhesive is specifically designed for adhering anti-skid, vinyl floor covering materials. For the composite "sandwich" solution the floor covering could be molded-in over the "sandwich" top skin. Where the flooring meets the sidewalls, the covering forms a cove, and continues up the wall to a height of at least 100 mm. This configuration allows the floor covering to form a complete tub, fitted with openings for water drainage. The joints of individual sub-flooring boards are welded and should prove impenetrable to water for at least 10 years. Connections are easy to repair, should the need occur. The cantilevered seat supports allow for easy access to the entire vehicle floor for cleaning.

At the leading edge of each stair step, a textured yellow safety nosing, constructed of 2.5 mm fiberglass, will cover the top inch of each riser and extend the full width of the step for a three inch depth. This cover replaces the yellow tape used on the steps in the existing Portland street cars. It will both improve the visual contrast when climbing a stair and lessen the possibility of slipping when descending to exit.

j. Glazing

The Type 10 T3 vehicle side windows and the glazing of all passenger compartment doors, are made of single pane, chemically tempered safety glass, tinted light green with a minimum of 75 % light permeability. The 6.5 mm glass thickness is a lamination of two glass layers sandwiching a PVB interlayer. The chemical tempering of the glass eliminates the distortion common with heat treatments, which could be especially noticeable when layers are stacked.

***** Optional offer – for improved performance: If desired by the customer, the interior face of all glazing could be coated with an optically clear, distortion free polyester film. This lowers the risk of injury from breaking glass and provides and extra measure of protection against graffiti measure; the multi-layered 6-mil (.006") sacrificial laminate provides a significant resistant to etching and scratching of the underlying glass surface.***

The basic dimensions of side windows in the passenger compartment are:

- 1083 mm vertically x 1308 mm; at twelve locations throughout the three cab sections
- 1083 mm vertically x 833 mm; at two locations in the end cabs, cross-cab from the single-wing doors

The side glass assemblies of each driver's cabin are divided into two parts. Part of each assembly is a fixed, single glaze, chemically tempered 6.5 mm safety glass, having the same appearance and specs as the passenger windows. The remainder of each assembly includes a two-piece sliding pane, which can be manually opened by the driver.

The windshields are made of single glaze, chemically tempered safety glass, tinted light green with a minimum of 75 % light permeability. The glass thickness is 6.5 mm; being a lamination of two glass layers sandwiching a PVB interlayer. The windshield passes the tests prescribed by standard ECE 43R.

All windows are bonded to the vehicle body using cement SIKA 252 with corresponding activators. From the inside, the glazing is sealed by cement SIKA 221.

The current Portland street car vehicles have heating elements embedded in the PVB interlayer of the windshield and driver's side windows. This feature was not requested in the RFP and so has not been included in this proposal. The Type 10 T3 vehicle's heating and cooling system will feature ducting to provide a defogging/demisting/defrosting feature. Eliminating the heating element handles all maintenance concerns of glass overheating. Additionally, non-heated glass provides you a significant cost benefit.

***** Optional offer - for improved performance: If desired by the customer we could offer a heated windshield glass (heating feature) and, we would recommend adding timer cutoffs to the on/off switches. The output at the side glass will be 250W at 24 V. The windshield output will require 500W at 24V.***

k. Passenger Seats

The passenger compartment of the Type 10 T3 vehicle is outfitted with thirty (30) padded and upholstered seats. These seats are fixed to powder coated, corrosion proof steel frames. All frames are cantilevered and anchored to the sidewall, except where covering a sanding box compartment. All seats are identical, vandal-resistant, and are easily removable or replaceable.

The design of the proposed seat includes a heavy duty grab rail extending the full width of the seat back (similar in location to the headrest of an automotive seat). This is a variance from the style of the current streetcar, wherein the hand grip is mounted on the aisle side upper corner of the seat back.

Where two seats are clustered on a single frame, there is an ergonomically satisfying "individualized" seat allocated to each passenger (as opposed to bench style seating). The distance between centerlines of clustered seats is at least 430 mm.

***** Optional offer – for improved performance: If desired by the customer, one seating position could be eliminated, providing additional floor space for the ticket dispenser equipment. This would be near the door in the low-floor middle cab section fully accessible by persons with disabilities (i.e. compliant with the Americans with Disabilities Act).***

l. Stanchions, Handrails, Windscreens

The Type 10 T3 vehicle interior will be fitted with vertical and overhead horizontal rails to provide comfort and safety. These rails will assist passengers in maintaining a secure balance while in motion and during entry or egress from the vehicle. These stainless steel accessories are sufficiently strong, rigid and robust, with surfaces resistant to wear and damage.

Sufficient quantities of handgrips will be placed at all required sections, particularly near the vehicle door areas. These grips will hang loosely along the horizontal rails dropping to a height such that a 1.7 meter tall person can easily grasp. The grips will have stainless or powder coated tamper resistant fasteners. It will not be necessary for maintenance to remove the rails in order to replace any worn grips. The grips are fire resistant and have an expected service life of 10 years.

Additionally, the seats adjacent to the doors are protected from drafts by windscreen partitions, as required in the RFP.

m. Keys and Locks

Three different types of keys are provided for access to various areas of the car:

- i. Master Controller Key – a standard cylindrical insert lock and key; provides access to the driver's cabins and operates the master controller key switch.
- ii. Crew Key – an 8 mm square key; provides access to the cab breaker panels, exterior forward door manual release, the sanding boxes, overhead and under-seat access panels containing items or equipment that may require operator access, and can be used to operate the door crew switch.
- iii. Maintenance Key – a triangular key; provides access for maintenance personnel to open all other access panels.

n. Passenger Intercom

A passenger intercom system will be installed in the vehicle. Please see Sub-Part B, section 12 for additional information on this system.

o. Exterior Finishing – Roof

Walk path patterns will be placed on the roof of the vehicle. The one inch-wide, anti-slip strips forming the walk path patterns on the roof of the current Portland street car vehicles will be replaced with high traction, walkway mats covering the full area of the patterns. These coarse textured yellow mats provide 2×10^{14} Ohms Surface Resistance and will greatly contribute to the safety of the maintenance personnel.

p. Exterior Mirror

An adjustable interior mirror and two heated and remotely adjustable exterior mounted rear-view mirrors allow the driver an unobstructed view of all doors and the full vicinity of the vehicle.

q. Skirts

The prototype Portland street car exterior side skirts will be similar with the current car lids. These lids will be hinged, and supported by struts during maintenance of the trucks. Access will be accomplished by unlocking the skirts with the triangular shaped maintenance key.

r. Wayside Noise Limits

OIW/Skoda Team is planning to exceed the current performance of the existent Portland street cars and to meet the RFP requirements for interior noise (70 dBA – vehicle stationary, empty and 75 dBA – vehicle empty, on tangent track accelerating to 48 km/h or in max dynamic braking or friction braking). The new vehicle already incorporates components and/or features which are designated to reduce the interior noise to the acceptable limits as follow: the side windows on the current cars are temperate glass – by using thicker laminated glass (6.5 mm thick with 2 layers of glass and the insulating "film" in between) the noise level will be reduced significantly. The proposed flooring with composite sandwich material made of composite "honey-comb" encased between sheets of aluminium and/or fibreglass will also significantly reduce the interior noise versus the current plywood flooring. In addition the OIW/Skoda Team is planning to employ a specialized company in development and implementation of noise and insulation "packages" if the improvements already accounted for will not be sufficient. The OIW/Skoda Team can provide test results showing compliance with the RFP requirements.

For a full description of the car body and interior/exterior appointments please see the specific sections of the Technical Specification attachment.

7.0 OPERATOR CAB

a. General

Identical driver's stations are located at each end of the vehicle. These driver's stations are separated from the passenger space, and locked in order to prevent the driver from being disturbed by passengers. An audio system provides two-way communication with the passengers, configured to provide the following communication options:

- From the operator to passengers, inside and outside the vehicle;
- Alternating communication between a passenger inside the vehicle and the operator;
- From a passenger information system to passengers inside and/or outside the vehicle via pre-recorded announcement sequences and destination sign displays.

Access to the driver compartment is through a sliding door between the cabin and the passenger compartment. Once in the passenger compartment, the driver exits the vehicle through the single-wing passenger door. The driver's cabin is fitted with right-hand and left-hand window assemblies, providing for side views from the cabin. A portion of the side window assembly may be manually opened by sliding it horizontally.

The windscreen of each driver's cabin is fitted with a washer and a single wiper blade. The wiper system provides a constant, intermittent or variable speed wipe of at least 80% of the glass height and 60% of the width. These elements are controlled at the driver's desk. The filler for topping off the fluid level of the washer is located at a right-hand corner area of the desk. Green tinted glass is used to reduce light and solar radiation into the cabin, Also, the cabs are equipped with driver controlled, adjustable sunscreens, to aid the driver in all external light conditions including simultaneous front and side sunlight.

***** Optional offer – for improved performance: If desired by the customer, the tracks along which the side window screens slide up and down could be redesigned parallel, for easier operation than currently experienced.***

A bin with a lid is built into the right hand side of the desk, providing a convenient storage area for the driver's personal items. As an additional convenience, each cab will have a dual-plug 110 Volt AC power outlet. A 4.5 kg capacity UL listed fire extinguisher (minimum rating of 4-A:30-B:C, marine type) is mounted in each operator's cab, using a marine type bracket.

All heating or air-conditioning is thermostatically controlled by the driver. Each driver's station also has a heater situated beneath the cab, available for heating the cab without having to heat the passenger compartments. This heater has two independent circuits (750 Vdc) as well as a cell fan fed by 3x 460 V, 60 Hz. On the auxiliary panel is a control for either fan alone or fan with heating.

The centerline of the spring loaded driver seat is located 150 mm to the left of the vehicle's longitudinal centerline. The seat is able to swivel 30 degrees, and automatically locks in the forward facing direction to prevent uncontrolled movement. The lock can be easily released by the operator while seated to permit swiveling.

***** Optional offer – for improved performance: If desired by the customer, a pneumatic or electric motor could be installed in place of the manual adjustment.***

The ergonomically shaped seat and back cushion are upholstered with low smoke foam and covered with transportation grade, fabric-backed vinyl. The cushion and covering has a 100 mm minimum thickness, and is equipped with adjustable lumbar support, a right side flip-up armrest, 100 mm of height adjustment, and fore/aft travel of 150 mm.

The easily accessible control elements, located on the right-hand side of the base, enable the driver to assume an optimum driving position. The seat is securely bolted to the floor.

b. Operator's Controls

All the command and control buttons are available to provide relevant functions. The main controller, switches, buttons and displays are a modern type, recommended for public transport vehicles. The buttons are equipped with glued-on logos for long service life. Wording on the panel (including buttons) will not be subject to wear.

Controlling and signaling elements are arranged on the driver's desk in an ergonomic manner that incorporates safe labor practices. The cabin and desk have been designed to ensure that the displays and controls are all visible within a wide range of possible conditions. An auxiliary panel houses bypass and heating controllers, emergency drive switches and consumed and regenerated power counters.

The vehicle is equipped with an electronic diagnostic system for the benefit of maintenance personnel and drivers. This system collects data in the driver's and passenger cabins, monitoring for any sub-system failures. In the case of malfunction, it displays a brief description to the driver. The information is displayed on the left side of the dashboard in front of driver and can easily be read under all lighting conditions. The system records any failure with a corresponding time and date.

There is a manual lever in the left-hand side of the driver desk, used to control driving and braking performance. In case the driver becomes incapacitated, a driver's safety device, activated by the release of the revolved head of the lever, activates the protective circuits of the vehicle to apply maximum service brake. An ergonomically shaped lever and a comfortable elbow rest ensure driver comfort during control of the vehicle. An electronic horn may be activated by a foot pedal.

A separate button is provided for an alarm bell in the right-hand side of the desk. Also located on the right-hand side of the desk is a red mushroom-shaped brake button for use in the event of emergency or following a failure of the control circuits.

Driver cabins are fitted with an internal lighting system of two overhead fluorescent lamps. At night only the individual instruments and signal lamps need be left on. The light intensity of the backlit buttons and display are controllable via a dimmer.

Access to the driver station is through the passenger cabin via a cross-cab sliding door. This door is able to open and close without intrusion into the passenger cabin floor space. The door is made of sheet steel and steel shapes. The door structure and suspension is designed to prevent undesirable noise and vibration, and is painted to protect against corrosion. It is lockable from both inside and outside using a cylindrical insert lock. A single key is needed, per vehicle, to open either driver cabin door (being at each end of the vehicle). Part of the door also functions as a curtain. In the door is a pane of green tinted glass, with light permeability at least 75 %. It is matt finished to decrease reflectivity.

Please see drawing number DO 000357, sheets 1 and 2, and drawing number DO 100905 for operator's cab area plan in Sub-Part B., Section 3.0.c.

Please see drawing number LO 51448P for elevation drawings in Sup-Part B, Section 3.0.d.

For a full description of the operator's cab, please see the Technical Specification attachment.

8.0 PASSENGER DOORS

The doors and bridgeplates proposed on the Type 10 T3 vehicle are similar to the current Portland street car vehicles. The doors will be produced by either Bode or Faiveley; the Faiveley doors will be fully B-A compliant. Additionally, the doors could feature several slight improvements over the current street car design without requiring significant changes to the current structure.

The bridgeplates will also be similar to the current street car. At the sole discretion of the customer, the bridgeplates could be the same as the existing design (if CTS is desired as the supplier) or could be a combination between the current CTS bridgeplate supplier (for size and mechanics) and the door supplier for the controls.

Regardless of the source, the supplied bridgeplates will meet the dimensional and operating requirements set forth for the bridgeplate system.
General

a. General

The Type 10 T3 vehicle is equipped on each side with two double-leaf doors located on the center section and one single-leaf door located on the front-end sections. The double-leaf, two-wing doors on each side are located opposite each other. All the doors are intended for boarding of passengers.

The doors are a sliding-plug type, controlled by signals from operators' cabs. The doors are electrically controlled, and each door has its own electrical control.

The single double-leaf door per sidewall (at least 11 m from the front end) is equipped with a bridgeplate to provide level boarding and full accessible to mobility impaired persons. The bridgeplate is also electrically operated and operates in conjunction with the door system.

Each doorway includes two door panels which slide in opposite directions, parallel to the sidewall of the streetcar.

The door system components are fully interchangeable from one location to another on the street car. The bridgeplate system and controls are also fully interchangeable.

b. Door Panels

Door panels are made of a 28 mm aluminum sectional frame. The guide tracks for the guide rollers of the locking columns are integrated into the top and bottom sections. Each door panel is equipped with single-pane security glass panel which is bonded with the door section and sealed.

For each door panel, a locking column is installed in the portal. These locking columns are equipped with guide rollers, which run in guide tracks at the top and bottom of the door panels. A synchronous rotational movement outwards is achieved by means of coupling tubes between the driving unit and the locking columns. This also allows the locking power to be safely transmitted to the door panels.

The door panels have a sealing lip trim which seals against the sealing frame on the portal. The door panels themselves are sealed against each other in the center by means of the rubber trailing edge. This edge also provides a means of finger protection.

c. Door Operator

The door operator is powered by the 24 V vehicle power system. The door operator is located just above each door, and the left and right door leafs operate simultaneously. The twin panel, sliding plug door is centrally driven by means of an electric DC motor. The motor drives a planetary gear, which moves the door guiding elements and a synchronous belt drive.

The guiding elements of the right and left door panels are arranged in a laterally reversed position to one another and move in opposite directions. The path described by the door is divided into both plugging motions by a parallel steering system, as well as displacement of the roller carriages on guiding tubes.

In the case of the twin panel SST-E-Z, this ensures entry clearance of 1300 mm at a portal width of 1550 mm. For the single panel SST-E, entry clearance is 700 mm with a portal width of 850 mm. The SST-E-Z drive essentially consists of two roller carriages running on one guiding tube each and is connected with the respective door panel by means of one parallel steering system each. The parallel steering system generates the outward rotation of the door panel by means of a guide track. The roller carriages are coupled with the motor-gear-unit.

When the unlocked door panels open, both the rotating arms and the guide arms rotate outwards. This movement is controlled by roller carriages which are firmly connected to the rotating arms and run along the curved part of guide. When the roller carriages reach the straight part of the guide tracks, the rotation process ends and the door panels move parallel to the side wall of the vehicle. Both roller carriages are displaced along the guiding tubes.

d. Bridgeplates

The retractable bridgeplate is provided to bridge the gap between the doorway threshold and the wayside low platform at one side doorway on each side of the vehicle. If control power is lost, the bridgeplate remains in the last commanded position during the absence of control power.

Bridgeplate motion is possible only if the vehicle has zero (0) forward or reverse speed and only if all doors are closed. Doors related to bridgeplates are interlocked.

For the bridgeplate operation, there are two independent command signals:

a. Bridgeplates (+ doors) release
b. Bridgeplate retract

After the bridgeplate is released (buttons supplied just at no-motion) by the operator's pushbutton, the bridgeplate can be retracted by passengers' buttons or passengers' tape switches.

All bridgeplate movement is accompanied by a visual and audible signal in the related door/bridgeplate area.

The bridgeplate is situated underneath the side door threshold. The bridgeplate motion is outward, and then downward tilting.

e. Door Operator and Bridgeplate Control Panel

In each door/bridgeplate header area a panel is installed to control the line door and bridgeplate control commands. These panels are behind the door mechanism cover and can be opened by operator's square key only.

f. Door Functional Requirement

In the event of a loss of door control power, the doors will remain in the last commanded position during the absence of control power. The door drive closing/opening peak force is set to 115 kN. The maximum force on one leaf at closing is set to 65 kN. The door drive has locks retaining the door in a closed position. The locks are applied automatically after the door reaches the closed position. Each door is also fitted with a manually operable door release handle to allow all door panels (individually) to be manually opened in the case of emergency. The door system also includes also position-sensing switch to detect the door leaf position.

In order to operate the doors, there are two independent command signals which must be sent - door release and door open. The door release signal is necessary in order to allow for individual control of doors by local buttons located in the passenger compartments. The doors can only be released and opened when there is no forward or reverse motion of the vehicle.

The doors are closed automatically by a signal sent to close the door. This signal operates both the door and the bridgeplates.

g. Door Obstruction Detection

Each door seal is equipped with a sensitive edge and a pressure wave switch in order to detect obstacles in the doorway. If the pressure switch should detect an obstacle, the door leafs will immediately open and remain open for a preset period (this period is adjustable between 0 and 10).

Door control logic will then again attempt to close the doors again. If the obstruction has cleared, the doors will close and lock. If the obstruction is still detected, the cycle will repeat until the object has been removed. If the obstruction detection switch is closed while the doors are in the process of opening by the open signal command, then the open signal is not canceled.

h. Door Control Switches and Pushbuttons

Door control pushbuttons for door control are heavy-duty rail vehicle types, suitable for frequent use on street cars. The single-leaf doors, which are situated nearby the front end operators' cabs, are also equipped with a cab door-control pushbutton, which function even with the battery main switched off. A rotary switch can be provided, if desired. However, for unification with the original Portland street cars, it is recommended to use just one button for both opening and closing.

These buttons are placed underneath the covers, alongside the doors. The covers are lockable by square-keys. The under-cover place also includes a mechanical release lever for the first door if the battery power is not available.

The cab door-control pushbuttons are functional only when the reverse switch is in a forward, neutral or reverse position (any position other than "OFF"), and the no-motion signal is set to "ON".

On the cab dashboard, there are two groups of buttons. The first group is designated for the right sidewall side of the vehicle, and the second group serves the left sidewall side. On the right-hand side, there is also one extra pushbutton for crew opening of the first single-leaf door.

LED illuminated passenger pushbuttons are located on the double leaf doors. The single-leaf doors are equipped with non-illuminated buttons. The pressing of a passenger push button on a door-leaf gives the same "stop request" signal as a pressing of the tape switches, placed inside the passenger interior.

The bridgeplate passenger buttons also function as bridgeplate request buttons. By depressing the button, it will activate the bridgeplate deploy request, as well as sound an audible indicator in the cab. This action will also activate a red LED at the passenger door button to confirm that the request has been sent.

After pressing the interior bridgeplate pushbutton, opposite bridgeplate doors will also receive the request. When the operator opens the door on the service side, only that bridgeplate will deploy. If the bridgeplate button is depressed at a doorway after that door has been opened, the door will immediately close, the bridgeplate will deploy and the doors will re-open. The cab bridgeplate deploy request indicator will function to notify the operator.

i. Manual Door Release Mechanism

The doors are equipped with a manual mechanism to release them without the use of electrical power. If a passenger or operator operates a door using the manual release mechanism, the irretrievable maximum service brake (MSB) will automatically be applied. This mechanism can only be reset by a crew or operator's square key. The mechanism is operated from the vehicle passenger interior by a red colored lever placed near the door. The lever is intended to be used under emergency situations only. The lever is clearly labeled to notify passengers that operating the door with the manual mechanism will both open the door and stop the vehicle. Activation of lever will allow the door panel(s) to be unlocked and manually pushed open. The releasing mechanism will not electrically bypass the no-motion interlock.

An exterior manual door release is also provided, and consists of a lever located near the single-leaf doors.

j. Interlock Requirements

Doors and bridgeplates are electrically interlocked with no-motion circuits. Doors and bridgeplates can normally be operated only if the vehicle is in no-motion state. Power for opening or deploying circuits will be switched by non-welding critical circuit relays. The doors will also be equipped with a "green line", independent for each side of vehicle. This "green line" is switched on only when the doors are safely closed and locked. If the door loop circuit is not supplied, the door open bulb illuminates on the dashboard. This will remove propulsion power or maximum service brake will be applied.

k. Bypass Devices

A sealed door bypass is installed on the bypasses board in each cab. The bypass is active only in the occupied cab. The operator cannot operate the vehicle with passengers on board with any bypass activated, except in the case that vehicle must be moved into the closest stop to ensure passenger safety.

Each door and bridgeplate has its own bridgeplate cutout, situated behind the locked cover (lockable by square key). This cutout disconnects the motor and bridgeplate controller, bypasses the retracted and locked interlocks for that bridgeplate, and assures that the bridge remains retracted by mechanical restraints. Additionally, it deactivates the local passenger bridgeplate pushbutton lights and signals a cutout on the dashboard.

l. Annunciators

Door open status indicators are provided on the dashboard in each cab independently for each side of the vehicle. The status indicators are integral with the door operation buttons. There will be two (2) second warning signal (both visual, by yellow overhead lamp visible both from inside and outside and audible) before each closing door.

On the dashboard, there is also an audible bridgeplate deploy request indicator, momentarily activated each time the passenger bridgeplate pushbutton is depressed.

The passenger bridgeplate buttons also have a green LED, signaling that the bridgeplate function has been enabled.

The bridgeplate control also operates audible warning beepers, mounted near the bridgeplate mechanism. These beepers function for 2 seconds prior to bridgeplate movement and continue until extension or retraction is complete.

For a full description of the doors and bridge plate system, please see the Technical Specification attachment.

9.0 HEATING, VENTILATING, AND AIR CONDITIONING

a. General

The Type 10 T3 vehicle heating, ventilation and air conditioning (HVAC) system is provided to obtain passenger comfort criteria in the vehicle, both in the driver's cabs and the passenger compartment. Each HVAC unit has its own control, including its own sensors inside the HVAC unit. The HVAC unit is used both for cooling and heating. All energy, including heating energy, is drawn from galvanically-insulated three-phase auxiliary net 3x 460 V, 60 Hz fed by IGBT converters.

Control of heating and air conditioning is done automatically inside the HVAC unit. In the case of a failure of one of auxiliary converters, one half of the HVAC units remains out of service. Cab HVACs are operated locally by means of a special operating panel on the ceiling of the cab. All channels are equipped with filters to reduce the entry of dust. The filters are easily accessible for maintenance purposes. The cooling circuits include the rectifying and conducting channels to distribute the conditioned air to proper places of the street car and to prevent the short-circuiting of the air flows. Air is equally distributed to all sections of vehicle.

Control circuits related to the system are supplied from the 24 V systems.

An anti-condensation system is provided in the driver's cabs, and the condensed water is carried to a special drainage site behind the cab.

The Type 10 T3 vehicle is equipped with 2 cab roof units for each operator cab (one HVAC unit for cab), and 4 passenger compartment HVAC units, which provide the heating, ventilation and air conditioning for passengers. The cab HVAC units work with independent ducts, making the passenger interior HVAC unit circuits completely independent from the cab circuits.

All parts of the air conditioning system are high-quality of a special design for mass transit (rail vehicle).

b. Ventilation

The ventilation of both cab and passenger interiors is accomplished by blower fans on the evaporator units of the HVAC units. The fresh air intakes are at the floor level. The cab ventilation is made possible through the use of cab heaters, which offers ventilation mode.

The conditioned air is distributed by a ceiling mounted diffuser and two rows of ducts.

c. Heating Requirements

The vehicle passenger compartment heating is consists of both HVAC unit heaters (fed by three-phase auxiliary net 3 x 460 V, 60 Hz) and additional passenger compartment sidewall heaters (fed by 750 Vdc). The heating is thermostatically controlled. The heating is designed to maintain the interior temperatures between 18 and 22 °C at an ambient temperature of –8 °C. The sidewall (floor) passenger compartment heaters are located behind protective covers.

For the windshield defrosting and defogging, the 24 V battery net is used. The system has sufficient capacity to defog the windshields and side cab windows at temperatures below 0 degrees C.

d. Air Conditioning Function

The air conditioning system utilizes unified HVAC units for passenger compartments and 2 HVAC cab units, each for one cab. The units are compact containers, and it is not necessary to disconnect any coolant piping during installation or removal from the car. The units utilize R-407C coolant.

The air conditioning system is designed to maintain the passenger compartment temperatures between 22 to 26 °C with a relative humidity of 60% or less at ambient temperatures up to 32 °C.

e. Controls

The HVAC units are distributed on the roof of the vehicle such that the car interior temperatures are uniform throughout. The air comfort control is activated automatically after the operator's console is activated, and 750 Vdc supplies the pantograph.

f. Hardware Requirements

Self-contained compact HVAC equipment is used. The HVAC units' containers are made of high-quality materials like stainless-steel sheets, and copper tubes. The refrigerant compressors are fed by 3x 460 V, 60 Hz. Each HVAC unit has its own box of circuit breakers, contactors and electronic control. The refrigerant liquid is in a closed circuit.

For a full description of the HVAC system, please see the Technical Specification attachment.

10. AUXILIARY ELECTRICAL EQUIPMENT

a. General

The electrical equipment is fully operable at 750 Vdc rated catenary voltage. All equipment is safely operating in the range of continuous voltages of 525 to 925 Vdc. Power parameters and acceleration rate during operation is guaranteed by nominal or higher voltage.

Nominal catenary voltage .... 750 Vdc
Minimum catenary voltage .... 525 Vdc
Maximum catenary voltage .... 925 Vdc
Maximum catenary voltage at regeneration .... 900 Vdc
Maximum DC link voltage at hazard brake (converters disconnected from catenary) ...... 975 Vdc

b. Primary Power System

The pantograph is a light, single-arm, service-proven design. The pantograph head is supplied current from catenary through two carbon strips. The pantograph operating height is between 4000 and 7000 mm from top of rail. The pantograph meets IEC 494. The main parameters are:

Rated voltage .... 750 Vdc (525-975 V)
Nominal pressure on the contact wire .... 80 kN (adjustable)
Carbon strip width .... 60 mm

The pantograph is mounted on the A section of the three-section vehicle. The pantograph design and its holders assure the safe and reliable service up to maximum speed. The pantograph is operated by a spindle drive supplied by 24 V battery voltage. The pantograph has both electrical and mechanical locking relative to the vehicle. In the event of an emergency, the pantograph can be manually retracted by means of the level situated in the cab.

- A Voltage Surge Arrester is provided to overtake the atmospheric voltage peaks and protect the vehicle's power electrical equipment. The arrester is situated on the roof near the pantograph.

- The traction circuits are protected against over currents and short-circuit by a high-speed circuit breaker, of approximately 1100 A. A 1260 A fuse is situated in front of the high-speed circuit breaker in the knife-switch box. Each auxiliary circuit has its own fuse for protection.

- A knife-switch box is located in the roof of the A-section of the street car. The switch has four positions: NORMAL, AUXILIARY, OFF and SHOP. The knife-switch box has a plastic cover. The knife-switch box also includes a shop-plug.

- Each axle has its own ground-brush for primary current return to rails.

- Line filters for traction converters (input L-C filters) are included in the traction converter covers. Line filters are also included in the auxiliary power converters for auxiliaries. Each converter with a DC link capacitor has a bleeder resistor permanently connected across the terminals.

c. AC Power Supply

The vehicle includes two identical DC-AC auxiliary converters, supplied from 750 Vdc catenary through protective fuses. Each auxiliary converter supplies one half of vehicle's auxiliary net, i.e. HVAC units as well as converter and cab heater fans. The converter is of the same design as previously supplied on the Type 10 T vehicles in 2001-2002 to the city of Portland, so their construction is service proven. Also included are air-cooled IGBT's as well as a high-frequency (12 kHz) transformer for galvanic insulation. Dual converters provide redundancy for auxiliary power circuits. The converters starts immediately after the pantograph is on catenary with voltage. The auxiliary converters nominal output is 3x 460 V, 60 Hz.

d. Low Voltage System

The vehicle battery net is 24 Vdc with an operational range from 16.8 to 30 V continuously. It can accept short spikes up to 33.6 V for a period of 1 second.

- The vehicle has one main NiCd battery and one small auxiliary battery. While the vehicle is moving, the voltage drops on the main battery (while in battery-run mode) is high (voltage is under 16.8 V). On this instance, the auxiliary battery supplies power to electronic devices. The main battery is placed underneath the vehicle floor in a special, accessible container. The battery is properly dimensioned to provide sufficient power for emergency lighting and other functions as defined in chapter 8.4.4 of the RFP. The battery box is designed to allow for proper maintenance and checking of the electrolyte level, and to allow easy electrolyte level control. Electrolyte is filled from one point. Lower than the minimum required battery voltage is signaled in the driver's cab.

- The vehicle battery is charged from two battery-chargers connected in parallel. Each battery charger is galvanically isolated and the output is protected with the fuse. The chargers work immediately after catenary voltage is available. The battery charger container is placed on the roof of the B section of the vehicle alongside the auxiliary converters. There is also another converter (dc-dc chopper) for stabilization of voltage to exactly 24 V. This is provided for protection of light bulbs, and should protect the bulbs from defects when the charger voltage 28 V is continuously applied to them.

e. Auxiliary Electrical Distribution

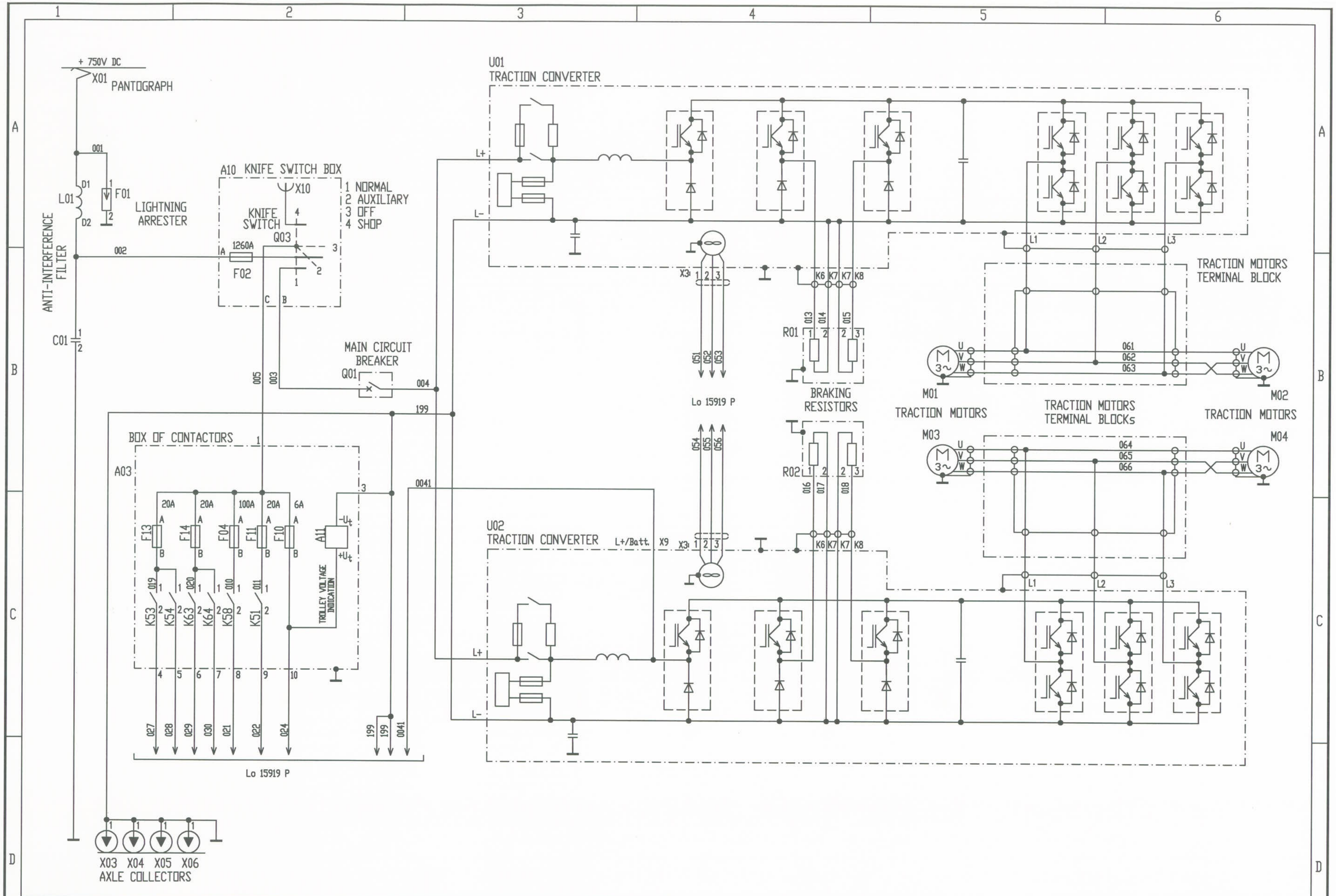
The auxiliary 3 X 460 VAC, 60 Hz circuits are protected by three-phase circuit breakers. They are located in the auxiliary converters' containers. The individual 750 Vdc contactors are protected though fuses. Both fuses and contactors are placed in the contactor container on the roof of the C section of the vehicle.

f. Portable Test Connectors

The roof mounted electrical equipments are provided with the RS 232 connectors and they are located inside the vehicle. Service panels for diagnostic equipment with service connectors are located in the cab-wall and behind the passenger compartment equipment covers. It is not necessary to go on the roof of the vehicle and open the electrical equipment containers for a service data collection.

See the referenced auxiliary and power circuits drawings following this page (pages 102 & 103).

For the complete description of the Auxiliary System please see the Technical Specification attachment.



Kreslil / Drawed by	Křibek	12.06.2006			12.10.2006
Přezkoušel / Verificated by	Voch	12.06.2006	Schválil / Approved by	Šrámek	12.06.2006

ŠKODA TRANSPORTATION s.r.o.

Změna/Revision | Datum/Date | Podpis/Signature | Indice

Název / Name
HLAVNÍ OBVODY
POWER CIRCUITS
Typ / Type 10 T3 (OIW)

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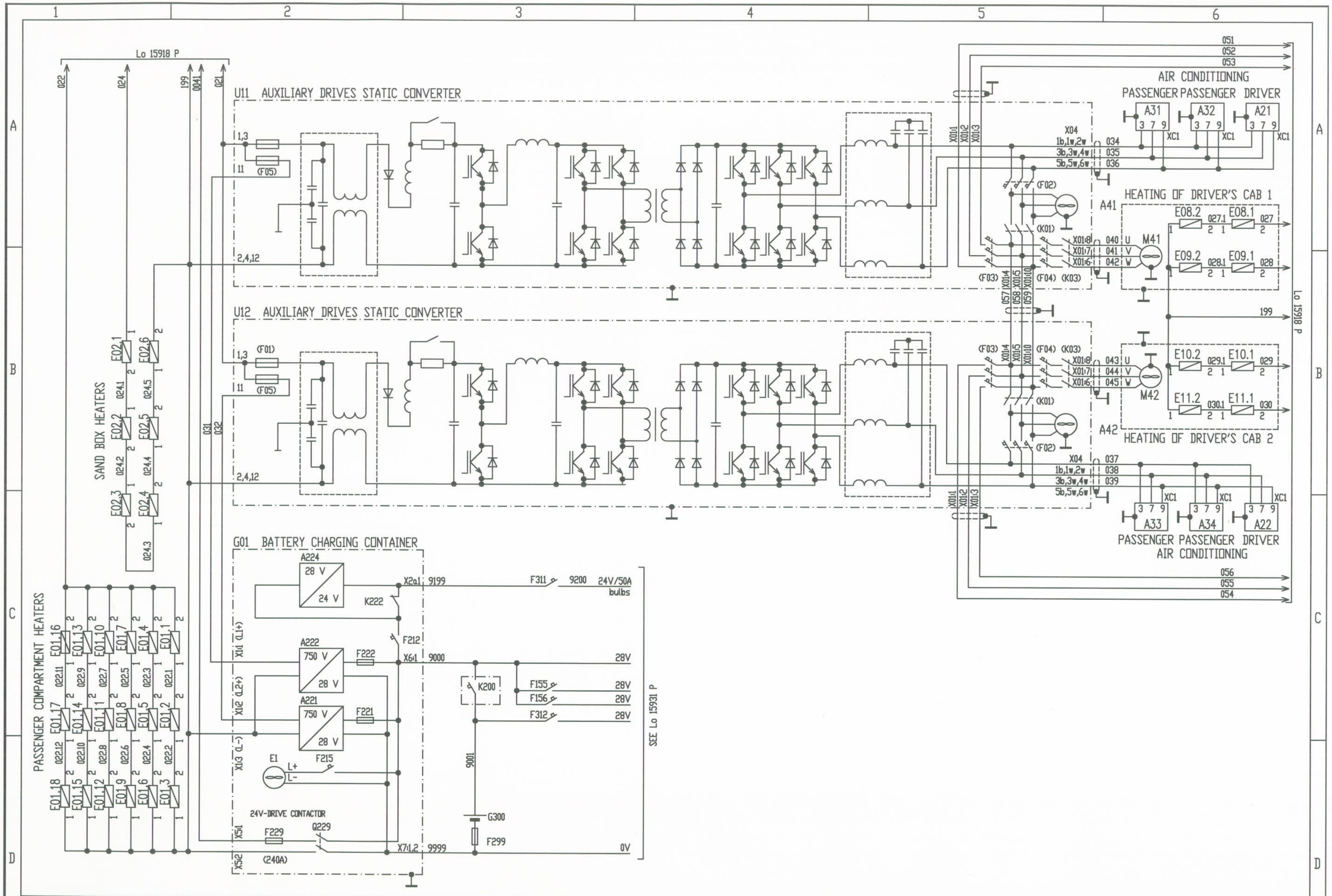

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ŠKODA TRANSPORTATION s.r.o.

Změna/Revision | Datum/Date | Podpis/Signature | Indice

Název / Name
POMOCNE OBVODY
AUXILIARY CIRCUITS
Typ / Type 10 T3 (OIW)

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Ind.
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11. PROPULSION SYSTEM AND CONTROLS

a. General

The vehicle propulsion system is divided into two independent halves; their controls cooperate through a CAN bus line. There are two IGBT traction converters located on the roof of the C section, each feeding two three-phase asynchronous traction motors, connected electrically in parallel. For the electro-dynamic braking, the converters are able to brake both with regenerative (primary) or resistor braking (the amount of energy only that can not be recovered). Each traction converter has its own braking resistor block. The propulsion system is secured against the catenary line over-current by one high speed circuit breaker. In the case one of the converter fails, the vehicle can move with just one converter functioning. The propulsion system also includes spin/slide protection.

b. System Requirements

The traction converters are based on the air-cooled IGBT, microprocessor-controlled converters. The IGBT's themselves are made using the SKiiP Pack (Semikron integrated intelligent Power Pack) technology which saves the number of thermal transitions between the semiconductor and its air-cooler. The one SKiiP module also includes the current sensor, over-current protection, temperature sensor and driver in one compact module. Therefore the propulsion converter is very compact with minimum parts. The main advantage of using the SKiiP Pack modules is the reduced thermal stresses on the semiconductor chips, reduced thermal loses due to the removal of one thermal transition and higher compactness of converter block.

Each traction motor runs one axle with two wheels through the classic double-stage gears.

c. Equipment Thermal Capacities

The main components of the propulsion system are either based on the original Portland (10 T) design (traction motors, braking resistors) and/or newly-developed, based on the experience with similar vehicles (traction converter and corresponding control units). On either case, the propulsion system components are over sized for sufficient thermal capacity. Both traction converters and traction motors are equipped with temperature sensors to constantly monitor their temperatures.

d. Switching Line Transients

Each traction converter container includes a line filter to limit the switching line transients form overhead line. The vehicle equipment is designed to withstand all allowed vehicle and catenary transients without damage or life reduction.

e. Electromagnetic Interference

The vehicle propulsion system will be designed to fulfill the EMI limits according the EN 50121-3-1 norm. The concrete provisions include the shielding and grounding concept (shielded cables, the steel traction converter cover with line filter and a filtering capacitor inside the converter). The EMI compatibility will be demonstrated by measurement on the finished vehicle.

f. Performance Characteristics

The vehicle performance characteristics for both driving (running) and braking will be completely identical to the vehicle performances of original Portland Type 10 T vehicles delivered to the City of Portland on 2001-2002.

Since the friction brake control for the mechanical brakes is identical to the original type used on the 10 T vehicles, the system behavior and its characteristics are identical as well. Dynamic braking capacity combines both the regenerative and rheostatic braking found on the original Type 10 T vehicles. The braking is blended and overtaken by mechanical brakes between speeds of 7 and 2 km/h.

The braking force is independent from the catenary line voltage. Generally the propulsion system is ready to use the electric brakes whenever the vehicle is moving and traction inverters are being controlled to energize traction motors. If the vehicle accelerates or runs by using the energy of the catenary line and a lack of voltage occurs, the propulsion system disconnects itself from the catenary line very fast and sets very low electrical brake necessary to excite traction motors. If this happens, the propulsion system is ready to brake in case of short circuit of the catenary line, loss of voltage, disconnecting from catenary line or under-voltage of catenary line.

The regenerative brake has priority over the resistor brake. If the catenary line voltage reaches its maximal value (925 V) during regenerative braking, maximum possible energy is regenerated and the excess of energy is dissipated in the braking resistor. If the desired braking performance can not be reached due to low voltage in catenary line and with respect to the maximum available HSCB current, the propulsion system is disconnected from catenary line and all braking energy is dissipated in braking resistors independently of catenary line.

The change of vehicle direction is made only at zero speed. The change is made by the traction converter control (two phases changed) based on the signal from the cab reverse switch.

On each cab there are over-switches to disconnect the failed traction propulsion converter, as well as a disbreaking device. The disconnection of one truck is independent from the second truck. In the case that one truck is disconnected, the speed limit is applied.

Both propulsion drive control and brake control are equipped by a wheel spin-slide correction. The information about the wheel rotation speed is taken from a speed sensors placed on the traction motors. For safety reasons, this correction does not work during emergency braking.

The vehicle control limits the maximum reachable speed to 30 mph (= 48 km/h). The over-speed protection is ensured this way. The software-enabled speed limit, however, can be bypassed by the over-speed bypass if required.

The vehicle circuits are protected from atmospheric transient voltages by the lightning arrester. This component is installed on the roof near the pantograph. The traction system is protected by one high speed circuit breaker. This component is installed on the roof. The auxiliaries fed from the overhead line are protected by fuses. The control circuits are protected by low voltage circuit breakers.

The control circuits verify that the requested braking effort is produced by the propulsion system. If a lack of braking effort occurs, the feedback is transferred to the friction brake control unit and the dynamic brake fault is indicated.

Visual annunciation of all propulsion system faults will be provided by means of display and/or warning lamps and these events will be recorded.

g. System Components

The traction motor (Type MLU 3436 K/4) is the same design as used on the Type 10 T vehicles, and as such, is a service proven component. It is a three-phase, squirrel cage, four-pole, air-cooled machine with a thermal insulation of Class 200. They are designed and tested in accordance with the IEC 349 standards (EN 60349-2). The traction motor is fastened to the truck frame and is connected to the gearbox through a resilient coupling.

The connection of the traction motor phases to vehicle cabling will be done through a three-phase shielded connector. The main advantage of using the original traction motor type is its compliance and compatibility with those delivered originally and high reliability.

h. Gear drives

The dynamic brake resistors are placed on the roof of C-section of the vehicle. Their design is state of the art and is similar to the existing 10 T resistors. The resistor consists of two self-ventilated blocks. Each block is insulated from its frame and the frame is insulated from vehicle resistor's box. This box is covered by grid to prevent infiltration of dangerous parts from above. The contactors – both link and charging – are placed on the traction converter container. One high speed circuit breaker protects two parallel connected propulsion converters. Also, a four positions knife switch is installed. No other contact apparatus is installed on the traction system. A line filter is placed on each traction converter. The filter consists of the input choke and DC – link capacitors. The control system will check the DC-link capacity to prevent the changes of the values that may cause the excessive EMI.

The traction converter is situated in the roof-containers; both containers are placed on the roof of the vehicle C section. The converter has air-forced cooling by a three-phase motor fan. Converter filter choke, charging circuits, as well as power semiconductors are cooled in a common air duct.

The converter container has propulsion control segregated from the area of power converters. The control part and power part are connected together by means of galvanic separated circuits. For the converters, the controls that are used are 32-bit microprocessors with I/O peripherals. The converters are taking data both from the CAN buses and from direct wire inputs. Each converter has its own control. Also included are diagnostic monitoring functions with their software. All the controls are equipped with diagnostic connectors and data memories to simplify the maintenance. The customer will also obtain diagnostic software to collect and analyze the data from converter control.

For the complete description of the Propulsion System, please see the Technical Specification attachment.

12. TRUCKS

a. General Arrangement

The prototype truck assembly will be of the same design as the current truck assembly currently in service on the existing Portland streetcar. The manufacturing of the truck assembly will be a combination of U.S. and foreign suppliers in order to comply with Buy America requirements without compromising the quality and integrity of the existing system. However, a large majority of the subcomponent production and the final integration of the truck assembly will occur in the United States in order to comply with the Buy-America requirements and to simplify and accelerate parts replacement with local suppliers.

OIW will utilize its core competency and manufacture the welded steel frame identical to the current design.

The brakes will be manufactured by one of the world's most recognized and proven brake manufacturers, Knorr-Bremse, and the wheel sets will be manufactured in the U.S. by Penn Machine. Penn Machine is currently supplying approx. 95% of the wheel sets on the U.S. (light) rail market. The remaining, non-critical components will be supplied by a combination of U.S. and foreign suppliers. Final assembly and integration of the subcomponents will occur at Penn Machine, who is recognized as one of the most experienced systems integrator and producer of major bogie components.

The proposed vehicle has two motorized, two-axle trucks of the same design as the existing service proven Portland Streetcars. Each truck is mounted under the end sections of the street car and is equipped with two laterally mounted asynchronous traction motors as individual drive for each axle. The trucks are suitable for safe operation at speeds up to 70 km/h and provide adequate ride quality at speeds up to 48 km/h.

***** Optional offer – for improved performance: If desired by the customer, OIW is offering an option for an improved hydro-pneumatic suspension (HPS, active suspension) that allows full control of the floor level regardless of the vehicle load. The optional suspension system is offered by Knorr-Bremse as an optional package with the proposed brake system. The HPS is a proven design and currently used on many high-end vehicles. In addition to the advantages of the active suspension, the HPS improves the ride and passenger comfort. OIW is also offering an option, at the discretion of the customer, for an improved/redesigned bogie (with or without HPS). The combination of the HPS and the redesigned bogie could allow the elimination of several components/controls that will improve vehicle operation, reliability, and maintenance. Please reference the optional bogie redesign in the technical specification to evaluate the advantages of this system and whether or not the City desires its consideration for incorporation.***

b. Design Considerations

The proposed truck design is proven to have a 30-year service life without structural repairs, it has a wheel base of 1,880 mm, it is proven in service, and it is identical and interchangeable with the current Portland street car truck assembly.

The traction motor and gearbox are connected together with a gear tooth coupling, which allows mutual relative movements in service. Traction motors are bolted to the middle crossbeam of truck frame and are fully suspended by primary suspension.

Each axle of the traction truck is fitted with a passive electro-hydraulic brake unit. The unit is mounted on the flange of gearbox and acts on the brake disc pressed on the axle. The principle of the brake unit is based on the stack of steel springs, which act as a passive accumulator of energy. When the unit is without power (de-energized), it automatically applies pressure on brake disc. After pressure is applied on one of the two brake circuits (main and emergency) from the diaphragm accumulator, the disc is gradually released. If the pressure is released, the braking force and disc pressure is renewed.

The axle collectors and other wearable parts are removable on an assembly pit without the need of truck disassembly. No cables or pipes are located below the truck or near the TOR. Cabling on the truck frame is not fastened to the pipe adapting pieces.

Before assembling the traction trucks below the vehicle body, a running test is performed on a test stand by the manufacturer. The paint system of the truck is epoxy primer and polyurethane top coat. As protection of the vehicle body against pollutants and water, mudguards are fastened to the bogie frame at the wheel points. The truck system is designed such that it fully complies with the RFP clearance requirements and even for the extreme conditions (max wear, full deflected suspension or failure, static and dynamic suspension stop, etc) the min clearances are met (12 mm to car body mounted equipment and all truck parts will clear the TOR by 50 mm or more).

c. Suspension System

The vehicle trucks are equipped with primary and secondary suspension systems. The primary suspension consists of elastomeric elements located on the truck frame, on the lateral centerline of the longitudinal beams. The secondary suspension consists of two sets of coil steel springs, each with different helix dimensions, in conjunction with elastomer elements located on each truck. The suspension system is also complemented with vertical hydraulic dampers. The coil springs are mounted on the lower rubber bases that provide the necessary suspension stops to limit motion to within clearance requirements. Upper rubber bases are also incorporated that include fixed steel bump stops. The exact location of the springs on the truck frame is maintained by the fixed position of a welded round base. A guide board that is inserted on the upper rubber base secures the exact location of the spring on the bottom of the body.

In the case of worn wheels, it is possible to adjust the vehicle height with complementary steel plates inserted between these guide boards. However, the suspension system is not equipped with an adjusting device for compensation of wheel wear and does require a jacking of the vehicle.

Currently the OIW/Skoda team is working on defining the design solution for compliance with section 10.3.6 of the RFP – wear adjustment. This requirement (# 10.3.6 – "provisions shall be made in the truck design for up to 40 mm of vertical adjustment of the suspension to compensate for maximum wheel wear or settlement of other truck parts") has not been included on the original Portland street car design; our team is confident that a feasible and reliable solution will be implemented to meet this requirement.

d. Truck Frame and Bolster

The truck frame is made of fabricated I-beam structure, welded from steel plate. There are no sliding surfaces involved in retaining the journal bearings in their proper position. The transmission of traction and brake forces between the vehicle body and the truck frame is provided by traction supports with rubber blocks on both sides of the truck frame.

e. Journal Bearings

The journal bearings are sealed units that incorporate permanent lubrication, and do not require additional lubrication during their service life. The suggested interval of maintenance of these bearings is 1,200,000 km or 10 years of operation, over the expected service life of 2,800,000 km. This interval is service-proven based on the existing Portland Streetcar operation.

f. Wheels

The wheel design is based on existing Portland Streetcars, and the wheels are equipped with rubber-sprung tires. The wheels will also serve as an electrical interface for grounding purposes and they are equipped with earth coupling, which over-bridges the rubber suspension. The wheels are designed for disassembly from the axle using pressure oil.

g. Axles

The axles are made of machined hot-rolled steel bars as are the axels on the existing Portland Streetcars.

h. Wheel-Axle Assembly

The wheels, axle bearings and ground brush rings are fitted to the axle by pressing. The axle boxes are made of cast-iron. Their shape is designed with careful regard for the safe transfer of all forces between the truck frame and the axle.

i. Track Brake Supports

Electromagnetic track brakes are suspended directly on the bearing box. After they are connected to the batteries, the solenoid of the track brake creates a vertical attractive force that causes friction between the brake shoe and rails. This creates the longitudinal braking force that acts against the direction of the vehicle movement. The track brake support arrangement always maintains positive lateral alignment with the running rail.

j. Safety Bars

Safety bars are provided at the outboard ends of the trucks and can be easily mounted and dismounted. The safety bars are all identical, so that they can be easily interchanged. The support of safety bars also serves as a sanding hose holder.

k. Grounding Device

There is a ground device on each axle that allows for safe current passage into the rail and this device bridges the axle bearings. There is a seal preventing penetration of pollutants from the grounding brush to the bearing located between the ground contact and the axle bearing.

l. Wheel Flange Lubrication System

The leading axle of the respective running direction of the vehicle is equipped with a wheel flange lubrication system consisting of spring pressed carbon sticks. These devices are all identical, so that they can be easily interchanged.

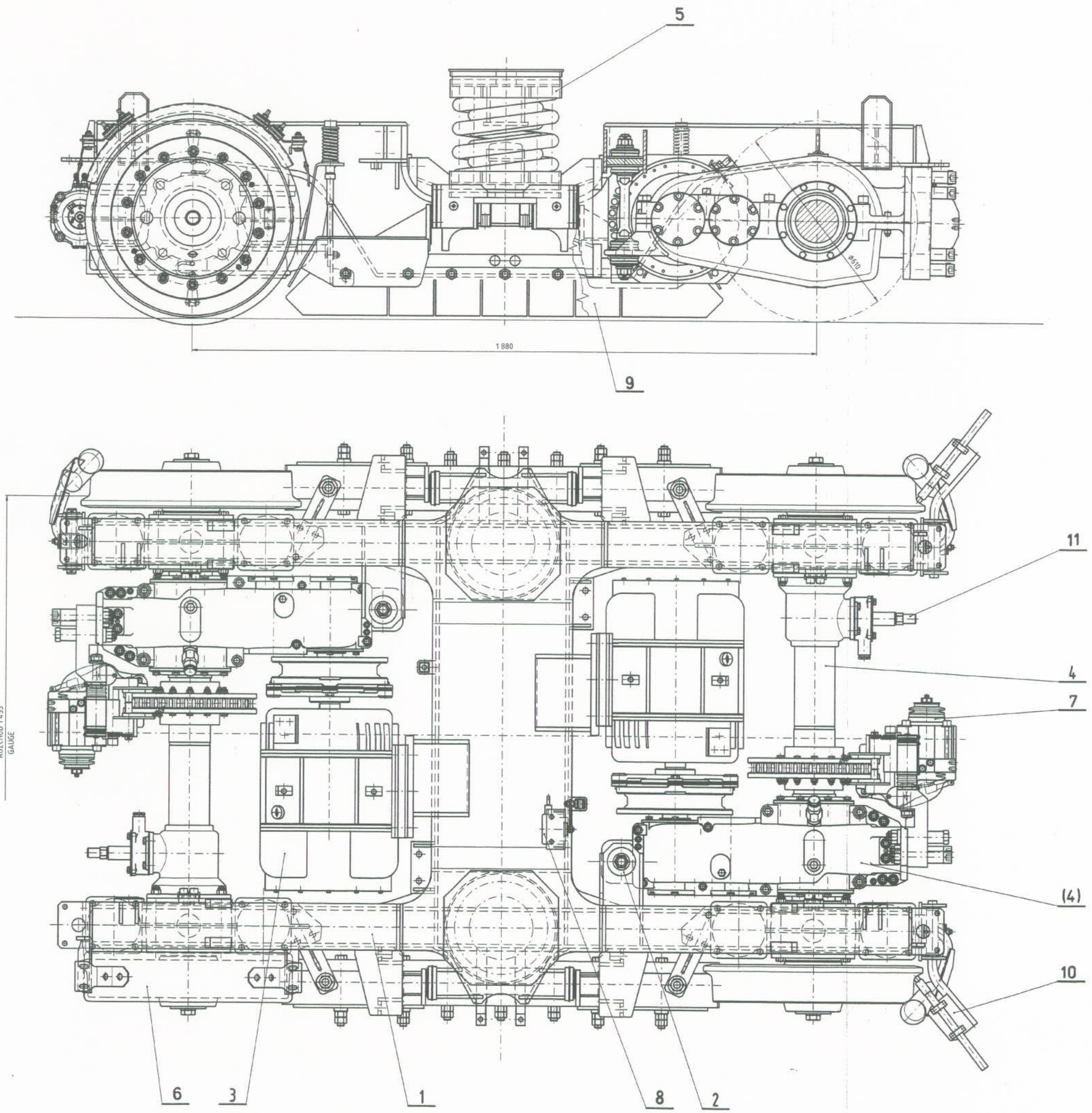
m. Truck Serial Number

Each truck is provided with a serial number identification plate located on the right side of the truck body. The figures are 20 mm in height to ensure easy identification of the pertinent information.

See the attached drawings, following this page (pages 112 & 113).

For the complete description of the Truck Assembly System please see the Technical Specification attachment.

VÝROBNÍ TYP VOZIDLA	ROK VÝROBY	ŘADA A INVENTÁRNÍ ČÍSLO NEBO VÝROBNÍ ČÍSLO	PROVEDENÍ	CELK. HMOTNOST PRO 1...PROV....(kg)	POZNÁMKA
10 TO	2000	9 170 ~ 9 174	PROV. I	4 132,2	
10 TO	2001	9 175 ~ 9177	PROV. III	8264,4	



STRANA PODVOZKU SMĚŘUJÍCÍ K ČELU VOZIDLA →
TRUCK SIDE FACING THE CAR FRONT END

POZNÁMKY:

1. PŘEVODOVKY SE PLNÍ OLEJEM MOGUL TRANS 80W/90 POZ. 12 DO VÝŠE KONTROLNÍHO OTVORU.
2. NÁTĚR: Lo 14 635/7 – RAL 9005 - 4 m²
3. ©→ ŠROUBOVÁ SPOJENÍ S PŘEDEPSANÝM UTAHOVACÍM MOMENTEM OZNAČIT KONTROLNÍM BAREVNÝM PRUHEM. (PŘEVODOVKA, SPOJKA, UPEVŇOVACÍ ŠROUBY MOTORU, BRZDOVÉ JEDNOTKY, PRIMÁRNÍ VYPRUŽENÍ)

NOTES:

1. FILL GEARBOXES WITH OIL TYPE MOGUL TRANS 80 W/90, ITEM 12 UP TO A LEVEL OF THE INSPECTION HOLE.
2. PAINT: Lo 14 635/7 – RAL 9005 - 4 m²
3. ©→ MARK SCREWED CONNECTIONS WITH PRESRIBED TIGHTING MOMENT BY COLOR STRIP. (GEARBOX, COUPLING, MOTOR FIXING BOLTS, CALIPER UNITS, PRIMARY SUSPENSIONS)

KUSOVNÍK SESTAVY NEPLATÍ
PLATÍ ODDĚLENÝ KUSOVNÍK V BAANU
ASSEMBLY LIST OF ITEMS IS NOT VALID
VALID IS THE SEPARATE LIST IN THE BAAN SYSTEM

Změna	Počet kusů =3	Počet kusů =1	Název - rozměr - polotovar	Číslo výkresu - Nákup / Norma, katalog, model, atd.	Čistá hm.	Poz.
						20
						19
						18
						17
						16
						15
						14
						13
	4	2	MOGUL TRANS 80W/90 OIL		3,6	12
	4	2	NÁPRAVOVÝ SBĚRAČ EARTH CONTACT	Do 201 852=2	4,73	11
(b)	2	1	PÍSKOVÁNÍ A MAZÁNÍ OKOLKŮ SANDING AND GREASING	~~Dk P98220~~ Do 000 297=#2	22,1	10
	2	1	MONTÁŽ KOLEJNICOVÉ BRZDY TRACK BRAKE	Do 101 648=1	379,-	9
	2	1	SNÍMÁNÍ ZATÍŽENÍ LEVEL TAKING	~~Dk P98103~~ Do 101 445=1	3,2	8
	4	2	KOTOUČOVÁ BRZDA DISC BRAKE	~~Dk P90101~~ Do 000 227=1	79,5	7
	8	4	PLATNÍKY FENDER	~~Dk P98215~~ Do 101 439	4,2	6
	2	1	SEKUNDÁRNÍ VYPRUŽENÍ SECONDARY SUSPENSION	~~Dk A106 210~~ Do 100 920=1	182,4	5
	4	2	PŘEVODOVKA GEAR-BOX	Do 000 289=1	373,-	(4)
(d)	4	2	DVOJKOLÍ 1435 WHEELSET	~~Dk P97101~~ Do000403=1 ~~Do 000228=1~~	657,7	4
	4	2	MONTÁŽ MOTORU MOTOR ASSEMBLY	~~Dk P98210~~ Do 101591	340,-	3
	4	2	ZÁVĚS PŘEVODOVKY REACTION ROD	Do 101557	5,83	2
	2	1	RÁM PODVOZKU TRUCK FRAME	~~Dk P95101~~ Do 000292	600,-	1

Ind.	Počet	Popis změny	Provedl	Podpis	Datum	Schválil	Podpis	Datum	Čís. zm.
d	1	Změna poz. 4	Broch		9.9.03				
c	2	Doplněno značení šroubů.	Zendek		4.4.2001	Šafránek	4.4.01		
b	1	Změna 10 u poz. 10	Kadlec		7.3.01	Šafránek	7.3.01		
a	–	DOPLNĚNO PROV. III	ZĚDOVÁ		10.10.00	Šafránek			

Provedení: =1 … =6

Hmotnost: 4 132,2 kg (=1); 82644 (=3)

Poznámka: PORTLAND; TACOMA

TOLEROVÁNÍ ISO 8015, ISO 2768-mK, EN ISO 13920-BF

Celková hmotnost (kg)

Formát: A0

Vypracoval	BIRKHAHN	09.11.99	
Kontroloval	SKALICKÝ	17.12.99	
Výr.proj.	ŠAFRÁNEK	21.12.99	
Normalizace	Dudová	17.12.99	
Spec.technol.			
Kvalita			
Schválil	Müller	12/99	

Sestava (Pozn.)

CAD: AutoCAD r.14 Profi 6.3

Typ: 10T | Skupina: 18 | Měřítko: 1:5

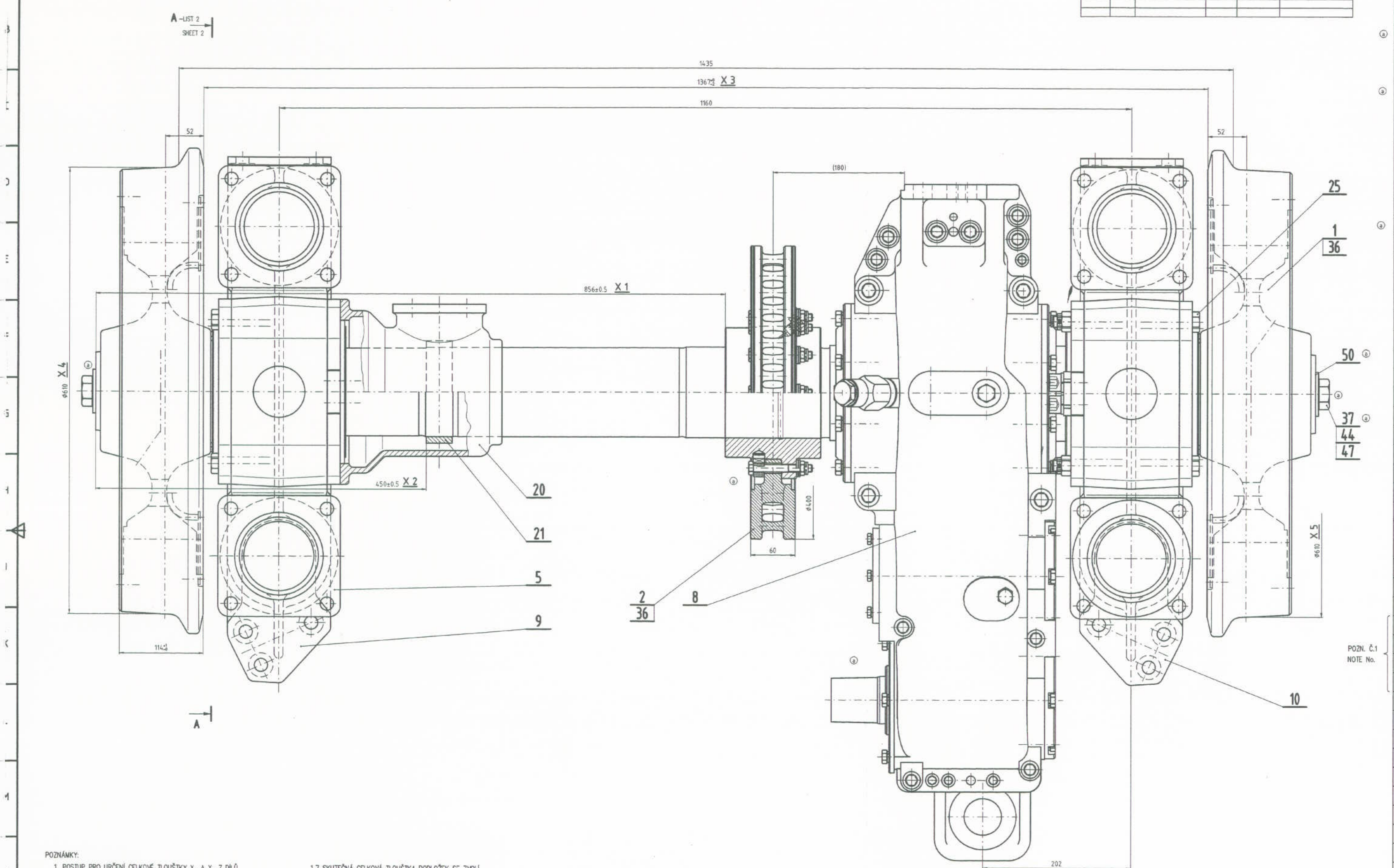
KOLEJOVÁ DOPRAVA s.r.o., Vectářova 3, PRAHA 8

Název: PODVOZEK 1435 TRUCK

Číslo výkresu: ~~Dk P98101~~ Do 000291/ d

ŠKODA a.s. Plzeň 1 -12- 2000

VÝROBNÍ TYP VOZIDLA	ROK VÝROBY	ŘADA A INVENTÁRNÍ ČÍSLO NEBO VÝROBNÍ ČÍSLO	PROVEDENÍ	CELK. HMOTNOST PRO 1.PROV.(kg)	POZNÁMKA
10T	2000	9170 AŽ 9174	PROV. I	557,7	



Počet kusů	Název – rozměr – polotovar	Číslo výkresu – Nákup / Norma, katalog, model, atd.	Čistá hm.	Poz.
1	LOCTITE 574		0.020	50
20	PODLOŽKA 16 / WASHER	ČSN 02 1741.15	0.009	49
8	PODLOŽKA 12 / WASHER	ČSN 02 1741.15	0.002	48
2	PODLOŽKA M24 / WASHER	BOSSARD / BN 737	0.073	47
16	MATICE ISO 4034-M16-8.8-A3L / NUT		0.030	46
4	ŠROUB ISO 4762-M16x35-8.8-A3L / BOLT		0.084	45
2	ŠROUB M24x40 PODLE ISO 4017 / BOLT	BOSSARD / BN 56	0.274	44
8	ŠROUB ISO 4017-M12x25-5.6-A3L / BOLT		0.036	43
16	ŠROUB ISO 4014-M16x60-8.8-A3L / BOLT		0.116	42
				41
2	ZÁCHYTKA / FASTENER	Dk A498463 / Do 404652	0.690	40
2	NÁRAZNÍK / STOP	Dk A498460 / Do 404651	0.020	39
2	VÍKO / COVER	Dk A498459 / Do 404650	0.680	38
1	LOCTITE 242		0.020	37
1	LOCTITE 232 WHEEL MOUNT		0.100	36
1	TUK PM-LV2EP / GREASE		0.050	35
2	TĚSNICÍ KROUŽEK 10x14 / SEALED RING	ČSN 02 9310.2	0.001	34
2	ZÁTKA M10x1 / STOPPER	ČSN 02 1915.15	0.013	33
				32
4	O-KROUŽEK 200x3 / RING	RUBENA / PN 02 9281.2	0.005	31
8	ZÁVLAČKA ISO 1234-4x32-St / COTTER	ČSN EN ISO 1234	0.003	30
8	MATICE M16 / NUT	ČSN 02 1411.55	0.044	29
				28
				27
4	ŠROUB M16x200 / BOLT	Dk A397424:2 / Do 302863:2	0.344	26
4	ŠROUB M16x190 / BOLT	Dk A397424:1 / Do 302863:1	0.328	25
4	ŠROUB / BOLT	Dk A497423 / Do 404491	1.160	24
4	PŘÍLOŽKA / LINER	Dk A497422 / Do 404490	0.028	23
4	PODLOŽKA / WASHER	Dk A497420 / Do 404489	0.655	22
1	KROUŽEK SBĚRACÍ / COLLECTING RING	Dk P97400 / Do 406614	1.140	21
1	SKŘÍŇ / CASE	Dk A197410 / Do 100981	14.000	20
				19
				18
2	VNĚJŠÍ VÍKO / OUTER COVER	Dk A297407 / Do 201144	5.300	17
2	PODLOŽKA / WASHER	Dk A497406:4 / Do 404487:4	0.121	16
2	PODLOŽKA / WASHER	Dk A497406:3 / Do 404487:3	0.097	15
2	PODLOŽKA / WASHER	Dk A497406:2 / Do 404487:2	0.072	14
2	PODLOŽKA / WASHER	Dk A497406:1 / Do 404487:1	0.048	13
2	VNITŘNÍ VÍKO / INNER COVER	Dk A297404 / Do 201143	5.100	12
4	KROUŽEK / RING	Dk A497403 / Do 404486	2.220	11
1	LOŽISKOVÁ KOMORA PRAVÁ / RIGHT AXLE BOX	Dk A197401:2 / Do 100980:2	47.000	10
1	LOŽISKOVÁ KOMORA LEVÁ / LEFT AXLE BOX	Dk A197401:1 / Do 100980:1	47.000	9
–	PŘEVODOVKA 1435 / GEAR BOX	Dk P96101 / Do 000289	373.000	8
				7
				6
4	PRUŽINA / SPRING	GUMOKOV H.K. / Č.V. 150.15/9	8.000	5
4	LAMELOVÝ KROUŽEK / LAMELLAE RING	FEY-LAMELLENRINGE / FK 6 ASD 152x6x2		4
2	LOŽISKO / BEARING	SKF / BT2 - 7020	17.000	3
1	BRZDOVÝ KOTOUČ W400B060PGUH / BRAKE DISK	KNORR-BREMSE / Č.POL. II42749/1240	39.000	2
2	KOLO V60 610x114 PORTLAND / WHEEL	SAB WABCO / Č.V. 180094	198.000	1

POZN. Č.1 / NOTE No. (items 13–16)

ASSEMBLY LIST OF ITEMS IS NOT VALID
VALID IS THE SEPARATE LIST IN THE BAAN SYSTEM

POZNÁMKY:

1. POSTUP PRO URČENÍ CELKOVÉ TLOUŠTKY X_1 A X_2 Z DÍLŮ POS. 13 AŽ 16 (NA LISTU 2):
   1.1 ZMĚŘIT MÍRU A
   1.2 ZMĚŘIT MÍRY B_1 A B_2 A URČIT ABSOLUTNÍ HODNOTU ROZDÍLU $\Delta B = |B_1 - B_2|$
   1.3 URČIT $A' = A + \Delta B$
   1.4 ZMĚŘIT C_1 A C_2 (C_1 A C_2 JSOU ARITMETICKÉ PRŮMĚRY ZE 2 HODNOT MĚŘENÝCH VE 2 MÍSTECH VZÁJEMNĚ POOTOČENÝCH O 180°
   1.5 VYPOČÍTAT $X'_1 = \frac{1367 - A'}{2} - C_1$
   $X'_2 = \frac{1367 - A'}{2} - C_2$
   1.6 JMENOVITÉ TLOUŠTKY PODLOŽEK JSOU
   $X_1 = X'_1 + (\Delta B)^*$
   $X_2 = X'_2 + (\Delta B)^*$
   $^*\Delta B$ SE PŘIČÍTÁ JEN NA STRANĚ MENŠÍ MÍRY B.
   1.7 SKUTEČNÁ CELKOVÁ TLOUŠTKA PODLOŽEK SE ZVOLÍ V ROZMEZÍ $X_1{}^{0}_{-0.5}$ A $X_2{}^{0}_{-0.5}$
   1.8 HODNOTA ROZKOLÍ PAK MUSÍ BÝT 1367^{0}_{-2}
2. PŘI LISOVÁNÍ PRUŽIN POS. 5 JE NUTNO ZAJISTIT, ABY SPOJNICE OS DĚR ø18 PRUŽIN BYLY ROVNOBĚŽNÉ Z PODÉLNOU OSOU LOŽISKOVÉ KOMORY TAK, ABY BYLA ZAJIŠTĚNA MONTÁŽ PRUŽIN DO RÁMU PODVOZKU.
3. KOLA SE LISUJÍ SILOU 392 – 735 kN NA DORAZ PŘI MAZÁNÍ NÁPRAVY A NÁBOJE PROSTŘEDKEM LOCTITE 232 WHEEL MOUNT
4. LAMELOVÝ KROUŽEK POS.4 A DRÁŽKU DO KTERÉ BUDE ULOŽEN NATŘÍT PŘED MONTÁŽÍ TUKEM PM-LV2EP
5. BRZDOVÝ KOTOUČ SE LISUJE SILOU 300 – 700 kN PŘI MAZÁNÍ NÁBOJE A NÁPRAVY PROSTŘEDKEM LOCTITE 232 WHEEL MOUNT.
6. POVRCH PRYŽE U DÍLŮ POS. 5 NESMÍ BÝT NATŘEN BARVOU.
7. DOTAHOVACÍ MOMENTY PRO
   MATICE M16 POZ. 29 170 Nm ○24
   ŠROUBY M36x3 POZ. 24 1500 Nm ○55
8. (a) KOLA VYBRAT TAK, ABY ROZDÍL PRŮMĚRŮ KOL NA JEDNÉ NÁPRAVĚ BYL MAXIMÁLNĚ 0,5 mm.
9. KÓTY OZNAČENÉ INDEXEM X MAJÍ NAMĚŘENÉ HOTNOTY EVIDOVANÉ V MĚROVÉM PROTOKOLU.

Notes:

1. Procedure for determination of the overall thickness of X_1 and X_2 with parts items 13 to 16 (on sheet 2):
   1.1 Measure the value A
   1.2 Measure the values B_1 and B_2 and determine the absolute value of the difference $\Delta B = |B_1 - B_2|$
   1.3 Determine $A' = A + \Delta B$
   1.4 Measure C_1 and C_2 (both C_1 and C_2 are the arithmetic average of the two values measured in the two positions turned mutually by 180°)
   1.5 Calculate $X'_1 = \frac{1367 - A'}{2} - C_1$
   $X'_2 = \frac{1367 - A'}{2} - C_2$
   1.6 Rated thicknesses of washers are, as follows:
   $X_1 = X'_1 + (\Delta B)^*$
   $X_2 = X'_2 + (\Delta B)^*$
   $^*\Delta B$ is added on the part of the smaller value B, only.
   1.7 The actual overall thickniss of washers shall be selected within a range of $X_1{}^{0}_{-0.5}$ and $X_2{}^{0}_{-0.5}$
   1.8 The value of wheelset must be then 1367^{0}_{-2}
2. When pressing springs item 5 take care of that the connecting line of axes of holes dia. 18 of the springs are in parallel with longitudinal axis of the bearing housing so that the springs can be assembled in the truck frame.
3. Wheels are pressed at a force of 392 to 735 kN up to stop when lubricating the axle and hub using LOCTITE 232 Wheel Mount.
4. Lamella ring item 4 and groove which it is to be mounted in by means of PM-LV2EP grease prior to assembling.
5. Press the brake disc at a force of 300 to 700 kN when lubricating the hub and axle by means of LOCTITE 232 Wheel Mount.
6. Surface of rubber by parts pos. 5 shall not be painted.
7. Tightening moments for
   Nuts M16 item 29 170 Nm ○24
   Bolts M36x3 item 24 1500 Nm ○55
8. Select wheels so that the diference of wheels dia. on one axle aquals maximum 0,5 mm.
9. With index X marked dimensions have written measured values in dimensional protocol.

SVAŘOVÁNÍ DLE DIN 6700 - SGK 3
SVAŘENO 135 EN 440 - G 42 A M G3Si1
KVALIFIKACE SVAŘEČE EN 287-1 135 P FW W01 t05 PB

WELDING ACCORDING TO DIN 6700 - SGK 3
WELDED 135 EN 440 - G 42 A M G3Si1
WELDER SKILLS EN 287-1 135 P FW W01 t05 PB

Ind.	Počet	Popis změny	Provedl	Podpis	Datum	Schválil	Podpis	Datum	Čís. zm.
a	11x	Změna šroubů a podložek (Poz. 44, 47)	BIRKHAHN		22.12.99			17.7.00	P 002

1030.7

TOLEROVÁNÍ ISO 8015, ISO 2768-mK, EN ISO 13920-BF

Celková hmotnost [kg]

Formát: A0

Vypracoval	BIRKHAHN	25.10.99
Kontroloval	SKALICKY	29.10.99
Výr.proj.		17.7.00
Normalizace	Dudová	08.11.99
Spec.technol.	KOTĚŠOVEC	08.11.99
Schválil	Müller	11/99

Kvalita

CAD: AutoCAD r.14 Profi 6.3

PORTLAND

Typ: 10T | Skupina: 21 | Měřítko: 1:2

KOLEJOVÁ DOPRAVA s.r.o., Voctářova 3, PRAHA 8

Název: DVOJKOLÍ 1435 WHEELSET

Číslo výkresu: ~~Dk P97101~~ a
Do 000228 a
Listů: 2 List: 1

13. FRICTION BRAKE SYSTEM

a. General

The braking system of the vehicle, supplied from Knorr-Bremse Corporation, consists of one friction brake system. This system may be used independently or together with the dynamic brake system and magnetic track brake system in combination. The friction brake system is service proven and fully compatible with the existing Portland Streetcar vehicles.

The friction brake system provides electro-hydraulic controlled spring applied (passive) service for parking and emergency braking on both motorized trucks of the vehicle. The brake calipers incorporate the spring actuation mechanisms together with a hydraulic auxiliary release capability. The friction braking is provided on each axle of the vehicle.

b. System Description

The brake system of the vehicle provides the following functions:

1) **Service Braking** - the dynamic brake system acts within a range of 48 to 5 km/h, friction brake system acts below 5 km/h; brake force is continuous from 0 to 100%; AW0/AW3; deceleration 1.34 m/s^2.

2) **Maximum Service Brake** – the dynamic brake system acts within a range of 48 to 5 km/h, friction brake system acts below 5 km/h; brake force is maximal; AW0/AW3; deceleration 1.34 m/s^2.

3) **Dynamic Brake Failure 50 %** - the dynamic brake system acts within a range of 48 to 5 km/h, friction brake system acts in range 48 km/h to stopped; brake force is continuous from 0 to 100%; AW0/AW3; deceleration 1.34 m/s^2.

4) **Dynamic Brake Failure 100 %** - friction brake system acts in a range from 48 km/h to stopped, brake force is continues from 0 to 100%; AW0/AW3; deceleration 0.94 m/s^2.

5) **Emergency Brake with Dynamic Brake** – dynamic brake system acts in a range from 48 to 5 km/h, friction brake system acts in a range from 48 km/h to stopped, at constant level at AW0; track brake acts until full stopped; brake force is maximal; AW0/AW3; deceleration 2.23 to 2.90 m/s^2 in range from 48 to 25 km/h, in range from 25 km/h to stopped is not defined.

6) **Emergency Brake without Dynamic Brake** – friction brake system acts in range 48 km/h to stopped; track brake acts until stopped; brake force is maximal; AW0/AW3; deceleration 2.23 - 2.90 m/s^2 in range 48 – 25 km/h, in range 25 km/h to stopped has not been defined.

7) In case of dynamic braking failure, the disc brakes assume the full braking power of the vehicle at any speed. Then the vehicle can continue, but at a restricted speed.

c. Power Source

The friction brake control equipment is powered by the 24 V DC low voltage power supply

d. Dynamic Brake interface

An independent friction brake ECU is provided in the brake system. The dynamic brake signal is utilized by the disc brake control logic system for each truck, reducing the disc brake effort in response to the presence of dynamic braking.

e. Parking Brake

A passive, spring-applied, parking brake is provided for each axle of the vehicle. The parking brake is configured to release when the parking brake valve is de-energized.

f. Disc Brake cut-out

In the event of a failure or a loss of electric power in the car control system, the spring applied brakes will engage. If the vehicle needs to be moved or towed, these brakes can be released using a manual hydraulic release system consisting of two auxiliary release units. Each truck system incorporates its own auxiliary release unit mounted separately in both driver cabs.

g. Disc Brake – propulsion system interlocks

The disc brake system is interlocked with the propulsion system such that propulsion is removed if any disc brake remains applied (on any truck of the vehicle) for more than 7 seconds after application of propulsion. Complete disc brake release is possible at all vehicle speeds down to 0 km/h. The ECU detects low supply pressure and low fluid levels and applies the disc brake. Simultaneously, the information is sent to the vehicle control logic, which removes propulsion.

h. Thermal Capacity (duty cycle)

The friction brake system provides the thermal capacity to handle braking below 5 km/h during normal operation at AW3 loading in addition to a full stop with maximum service brake. Furthermore the friction brake system has the capability for at least one 48 km/h stop, in the event of complete dynamic brake failure. The thermal capacity of the friction brake system has been service proven by existing Portland Streetcar vehicles.

i. Track Brake

The vehicle is equipped with four non-adhesive electro-magnetic track brakes. Each bogie is equipped with two track brakes, one for each side, electrically connected in parallel and supplied through contactors from the 24 V vehicle battery.

Track brake application during emergency stopping is interlocked with the no-motion detection circuitry. Track brake system is effective at all speeds from maximum down to full stop over all conditions of curves and grades. The track brake force is not modulated by blending, load compensation or any other means.

Track brake control and logic is provided by relays and contactors separate from the disc brake propulsion control logic. Each truck's track brakes are controlled by a separate relay and contactor circuit, fed from a dedicated cicuit breaker.

j. Sanding System

The vehicle is equipped with an automatic sanding system, which may also be controlled manually. The system automatically delivers sand between the wheel and rail, correcting for major sliding and emergency braking. If the emergency brake is applied, sanding is activated automatically to increase the braking effectiveness. The sanding system distributes the sand effectively and uniformly in front of each wheel. A low sand level in the storage boxes is signalled at the driver's desk. The automatic sanding application is interlocked with the motion detection circuitry. The manual sanding, (initiated by a driver's footswitch), operates independent of the motion detection circuitry. Sander control and logic is provided by relays separate from the friction brake control logic. The sand is electrically heated to ensure it stay permanently dry. The sand storage boxes are filled from inside the vehicle.

*****As part of the "** Optional offer" from Section 12 above (The Truck system) – for improved performance and at the discretion of the customer, OIW could offer an option for an improved hydro-pneumatic suspension (HPS, active suspension) as parts of the Knorr-Bremse package with the proposed brake system. For more info on the HPS package please see Section 12 above and the Technical Specification attachment.***

For the complete description of the Brake System please see the Technical Specification attachment.

14. VEHICLE COMMUNICATIONS SYSTEM

The Type 10 T3 vehicle communications systems shall be compatible with all major systems found on the existing Portland street car. The primary system components will be supplied by Meister Electronics, Inc., which is the same supplier used to manufacture the existing Portland street car vehicles. Meister Electronics, Inc. has extensive experience in providing communication systems for public transportation.

The Type 10 T3 vehicle communication system includes, but is not limited to, the public address (PA), passenger emergency intercom, cab-to cab intercom, passenger information and train-to-wayside communication (TWC) systems.

Each operators cab is also equipped with a dual mode mobile radio. It is placed in the overhead cabinet on the left side of the cab. The mobile analog radio has narrow and broad band operation features and economical software update capability. It can send and receive either voice or data information. Mobile radio is Motorola MCS 2000, 800 MHz, 10-15W type. It is equipped with an antenna and microphone.

The Type 10 T3 vehicle audio communication system allows for announcement to passengers both automatically and manually, inside and outside the vehicle. The system includes a microphone, an interior/exterior speaker, an amplifier, an ambient noise sensing control, and a vehicle acoustics control.

a. Audio Communications

The communication system allows for communication in the following situations:

- The operator can communicate with passengers inside and outside the train using the onboard public address system.
- Communication between cabs is made possible via the use of a cab-to-cab intercom.
- Passengers inside the vehicle can communicate with the operator using two passenger intercom stations located in the passenger area.
- Audio communication occurs to passengers inside and/or outside the train via pre-recorded announcement sequences and destination sign displays. Each car has an automatic station and display system and travel direction is announced before the vehicle starts and before a pre-determined distance to the next station.
- Audible tone and announcement to the passenger inside and/or outside the vehicle use a signal from the door system.

b. Public Address System

The Type 10 T3 vehicle will be equipped with a public address system that allows the operator to communicate with passengers in the vehicle via speakers located inside the vehicle, on the left and right sides of the exterior, and on the driver's cab. The operator is able to control the inside set of speakers, the outside set of speakers, or both via a control switch. This is consistent with the current Portland streetcar. Sound level in the vehicle will be adjustable. The control range is not higher than +8 dB above the average input level. The tone volume is distributed to the passenger section homogenously and will not change more than ± 3 dB.

Eight interior speakers are located in one vehicle. The distance between two speakers is no more than 2350 mm in the passenger areas. This way we provide even coverage on each section of the vehicle.

c. Interior Speakers

The interior speakers will be fully compatible with the current Portland speakers and will have the following performance/specification:

- Maximum power: 8W
- Speaker loud: 92 dB

The perforated grilles for speakers in the inside passenger area will be mounted flush in ceiling panels. Theses grilles are removable for access to the speaker and will be held in place with tamper-proof screws.

d. Exterior Speakers

The Type 10 T3 vehicle will be equipped with four exterior speakers. Two exterior speakers are located on each side of the car. They are mounted on the roof close to the doorway so the passengers can hear the announcement easily. They are waterproof and resistant to detergents used during car washing. The installation of the exterior speakers protects them from the mechanical damage of car wash brushes. Wires of the exterior speakers are in waterproof conduit and the wire routing protects it from mechanical damage. Speakers and their wires are inside the outline of the car.

The exterior speakers will be fully compatible with the specifications as follows:

- Maximum power: 6W
- Speaker loud: 99 dB
- Humidity class: IP55

e. Amplifiers

The Type 10 T3 vehicle will include an Amplifier Unit. The Amplifier Unit is connected through the vehicle-data and low frequency audio lines to the Vehicle Acoustic Controller and Main Controller Unit modules. Each Amplifier Unit contains three 5-watt amplifiers. The amplifier is used to drive interior speakers and exterior speakers. This arrangement allows for the elimination of the 70.7 Volt line. This proposed system meets the existing Portland car design.

f. Cab Microphone

Both operator cabs in the Type 10 T3 vehicle have type ME-251/320 heavy duty, high noise suppression, goose neck, cardioids type microphones.

g. Intercom System

The Intercom system enables calls to be initiated from any cab to another cab and also to the cabs from the passenger areas.

The cab-to-cab intercom system in the Type 10 T3 vehicle allows for communication between cabs and from another vehicle during towing operations. An intercom call will be annunciated in every cab, by means of a one-time call chime and an indicating light which stays on throughout the call until it is completed. A waterproof connector is installed to the towing bar (each end of the car) for the cab-to-cab intercom connection between two vehicles.

There are two passenger intercom stations located in the passenger area close to the wheelchair doorways. Position of the intercom station allows for easy access for the mobility impaired individual. The intercom stations will be mounted at a height of 1200 mm above the floor.

The passenger intercom unit includes a communication request push button, status indication LEDs (*busy*-red, *wait*-yellow, *talk*-green), a loudspeaker and a microphone. The system includes a "press-to-latch" feature which allows for immediate communication with the train operator via the paging speaker without having to continue pressing the push button. When the passenger "press-to latch" switch is pressed, the passenger intercom function will be annunciated in the controlling cab by a call chime and an intercom indicating light. To enable communication, the train operator shall select the intercom and communicate with all latched passenger intercom stations. The train operator can command all latched passenger intercom stations to be reset and the intercom indicating lights shall turn off.

The system will not allow communication between one passenger intercom station and another. The system is marked with easy to read graphics which identifies each unit as an "Emergency Intercom". The instructions are marked in raised lettering which reads, "Push Button Once To Contact Driver".

h. Passenger Information System

The vehicle is equipped with an information system, including the destination signs located at both ends of the vehicle, behind the windshield. Control of the destination is selected by a route selection process from the automatic announcement system in the driver's cabin and command automatically to the inactive cab.

A control panel in the cab indicates to the driver the current displayed message. Each destination sign has a high resolution transflective full matrix (26 v x 180) LCD screen with high-contrast yellow text on a black background. The transflective liquid crystal display works delay-free under any temperature and lighting conditions, from complete darkness to bright sunlight.

The system is resistant to electrical noise that is common on electrified rail vehicles. Each sign will remain in the last selected position when power to the sign is cycled on and off. When all signs in the vehicle have the proper display, the system shall give a positive indication to the operator.

Programming of the system is accomplished with universal interfaces based on Windows PC software for RS232/RS422.

i. Automatic Station Announcement

Each Streetcar has an automatic station and display system. There are four (4) interior displays to show the visual information and use the Public Announcement system to audibly inform the passengers. When the driver selects the route at the initial station destination boards are adjusted and also automatic announcement system is set according to the travel direction. Travel direction is announced before the vehicle starts and an announcement related to the upcoming stop is made before a certain distance to the next station. In the meantime, information related to those announcements can be seen on the displays by all the passengers in the vehicle. To calculate the distance between two stop stations the system uses "odometer/door open" algorithm. The alpha-numeric display of the control panel duplicates the message as seen on the interior display sign. Each operator cab has a control panel on the dashboard and the position of the control panel can be easily reached by the seated operator.

The structure of the Automatic Station Announcement and Display System is as follows:

Message	Position of train	Type of the message
"Next stop ..."	Train approaches a station	Internal audio and visual
"This station is ..."	Train stops and doors are opening	Internal audio and visual
"Next station is ..."	Doors close and train is departing	Internal audio and visual
"Next station is ..."	Between stations	Internal visual

The operator can select a special or emergency message directly from the control panel. These messages are visual and/or audio and internal and/or external like "Out of service" or "Emergency" etc.

The proposed memory card has 40 MB rewritable storage capacity. This capacity is enough for 160 minutes of speech or approximately 8,000 next stop announcements.

The alpha-numeric LED interior display shows 24 characters and is suitable for long text strings. Its size is 8"x150" and it includes an integrated additional "STOP" display.

j. Train-to-Wayside Communication System

The Type 10 T3 vehicle is equipped with a train-to-wayside communication system. This system is compatible with the existing TriMet LRT system.

k. System Description

The vehicle is equipped with a HP2 transponder on each end, which transmits digital information to the wayside loop antennas in the track way.

l. Functional Requirement

The Type 10 T3 vehicle is also equipped with a Vetag transponder which transmits a 19-bit data message to the wayside antenna.

This message includes:

- Train Number
- Route Number
- Car Number
- Stationary Preempt/Activation
- Switch Call (Left or Right)
- Active Cab (on for active cab)
- End of Train

m. Carborne Equipment

In addition, each car of the Type 10 T3 vehicle is equipped with a set of TWC equipment that consists of:

- Two transponder (HP2) assemblies (one per end)
- Two cab control panel (Vetag Code Control Box), (one per cab)
- HP2 Transponder Extension Cable
- CCB Cable with connector
- CCB Power Cable

All carborne TWC equipment is identical in all cabs and it is energized from the low voltage power system through a dedicated circuit breaker.

n. Cab Control Panel

The Type 10 T3 vehicle has a Vetag Code Control Panel which includes four push buttons and four ten-position (0-9) thumbwheel switches. The push buttons are back lighted when the transponder for the active cab is over a wayside loop and is being "interrogated".

The Cab control panel has the following inputs and signals:

- Battery positive (+24V) from a dedicated circuit breaker
- Battery negative
- Cab active signal
- End-of-train signal

All inputs connect to the cab control panel through a conducted cable, equipped with a quick disconnect connector.

o. Transponder Assembly

Each transponder for the Type 10 T3 vehicle is installed on the longitudinal centerline of the vehicle 2350 mm from the front of the car. The mounting bracket of the transponder dampens the transponder from the vibration when the streetcar is moving. The transponder cable is equipped with a waterproof AMP bayonet connector.

The transponder receives a 100 KHz interrogation signal via the ferrite antenna to activate the transponder and cause it to transmit a data message via the same antenna. The transponder activates the backlight in the console panel switches when an interrogation signal is received to indicate that the transponder is located over a wayside loop. The transponder transmits the 19-bit data message that is indicated by the cab control panel to the wayside "interrogator".

For the complete description of the Vehicle Communication System and additional info on this major system please see the Technical Specification attachment (Section 12).