WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY (WMATA)

Industry Survey for Locomotive Manufacture Capability

Expression of Interest – Locomotive Train

The Washington Metropolitan Area Transit Authority (WMATA) is in the planning stage for the procurement of a dedicated locomotive train. In advance of preparing a complete technical specification, WMATA is requesting comments from the locomotive manufacturing industry regarding top level designs and scheduling. The locomotive train shall be capable of pulling 500 tons of rolling stock with sufficient head room that a 20% traction power loss will not require rescue.

The attached document (General Design Criteria for Locomotive Train) identifies top level requirements for the locomotives along with WMATA system specifications. WMATA appreciates responses to the attached questions. In addition, WMATA appreciates any additional information to include viable design ideas, previous relevant experience, solutions to major hurdles, and facility description. Please provide responses along with your company's name, address, point of contact, telephone number, and email address no later than January 31, 2018 to the following:

Frederick R. Voellm, Contracts Manager
Washington Metropolitan Area Transit Authority
Office of Procurement and Materials
600 5th Street NW, Room 3B-01-A
Washington, DC 20001
or,
email fvoellm@wmata.com

For questions, please email or call 202-962-2485.

Responses submitted will be reviewed by WMATA engineering staff. WMATA may meet with individual respondents to discuss and review the information provided. Please do not provide proprietary solutions in your responses. Absence of a response will not be a factor in any future procurement.

If WMATA decides to proceed with procurement of the locomotive train, a formal solicitation will be issued. Complete technical specifications will be prepared based on WMATA's needs, taking into consideration industry comments to this Expression of Interest. Respondents are solely responsible for expenses associated with their responses. WMATA is not anticipating detailed technical analysis. Rather, WMATA is seeking informed input.

Thank you for any response that you may provide.

Washington Metropolitan Area Transit Authority (WMATA)
General Design Criteria for Locomotive Train

Top Level Locomotive Specifications:

1. The locomotives shall be capable of negotiating all WMATA track, tunnels, and structures; stay within the dynamic envelope; and conform to all WMATA restrictions regarding height, width, and weight, per the included track specifications and dynamic outline.

2. The locomotives and included equipment shall be capable of performing all functions while within the WMATA system, including tunnel areas, without degradation of performance, for an unrestricted period of time. This includes operating at 80% of its maximum output for extended periods of time within the tunnel system without overheating.

   Q2: What impact does WMATA's small tunnel clearance have on the locomotive design configuration?

3. Each locomotive shall be a minimum of 52 feet long and have a forward cab design. Coupling of the locomotives shall utilize e-couplers with draft gear. The locomotives shall be MU capable and utilize AAR standard connections, proprietary connections shall not be permitted.

   Q3.1: What is the expected maximum personnel capacity in the locomotive cab?

   Q3.2: What is the expected noise decibel level from the locomotive (exterior, Interior @ full power?)

   Q3.3: Can an FRA compliant event recorder be integrated? Which signals beyond the FRA requirement can be recorded?

   Q3.4: What roadway worker detection/collision warning systems could be provided?

4. Each locomotive shall adhere to the included WMATA Axle Loading drawing, the load on each axle shall fall within the range of 25%±5% of the total dead and live load.

5. The locomotive train linked together shall have tractive effort, in both directions, for a standard consist of 500 tons GVW of rolling stock (maximum) coupled at either end.

Washington Metropolitan Area Transit Authority (WMATA)
General Design Criteria for Locomotive Train

6. The locomotive consist shall have tractive effort to meet and maintain the speed vs grade curve, shown in Figure 1, in both directions, while coupled to 500 tons GVW rolling stock on rail with a coefficient of friction of 0.12.

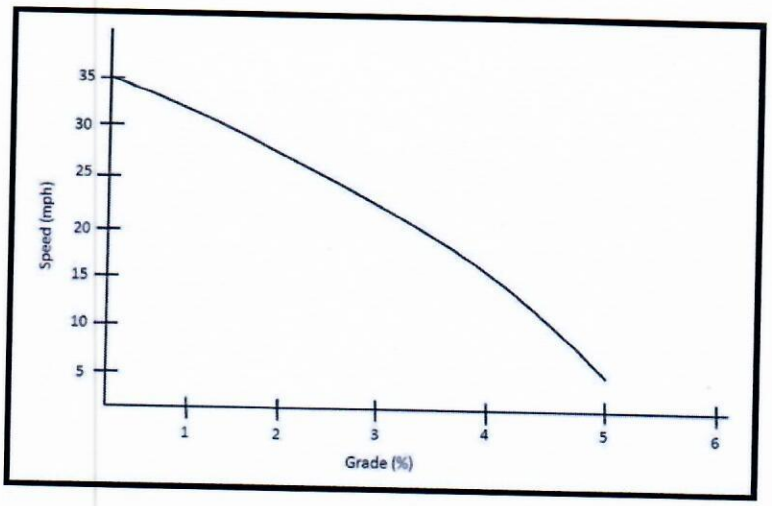

Figure 1 Speed Curve

Q6: Can a 3-locomotive consist achieve desired traction? Limitations for this target?

7. The locomotives shall be equipped with a parking brake on all wheels that is fail-safe spring-applied and power-released. The parking brake shall be capable of holding the locomotive(s) on a 5% grade faced in either direction.

8. WMATA prefers the locomotives utilize a standardized AAR control stand capable of providing all braking effort required for a 9 car consist weighing 500 tons utilizing conventional AAR two (2) axle, four (4) wheel trucks with ABD air brake systems.

9. The locomotive consist, with or without nine (9) coupled AAR compliant flatcars or any combination thereof, shall have braking effort sufficient to stop the consist at a rate of 3 mph per second from a maximum speed of 35 mph.

10. WMATA prefers a co-gen design that utilizes one engine for each truck, failure of one drive system shall not impact the other system.

11. WMATA prefers a diesel-electric all axle drive design that utilizes SCBT controlled VFD AC motors.

Q11: WMATA prefers the driveline described in section 10 & 11. Describe potential benefits to alternate driveline configurations? What is the impact in case of a truck or locomotive level failure?

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12. The engine(s) of the locomotive shall be water cooled, diesel fueled, four (4) cycle in operation, turbo charged and of proven design.

13. The engine shall be of Tier IV design. Use of DEF is not acceptable. Regeneration cycle must be user controllable for tunnel operations and shift completion.

14. The engine shall be capable of starting throughout the Washington DC metro area ambient conditions. Ether is prohibited.

15. Availability and reliability of the units is paramount due to the short time windows available to perform track work. Break-down at the work site is extremely detrimental to operations.

    Q15: What are the expected maintenance intervals of the major components? What is the expected service availability for the locomotives on a monthly/yearly basis?/How many service days are required annually?

16. Engine cooling system and air system intake shall be as close as practical to the track bed. Engine exhaust and engine cooling systems shall discharge as high as possible so that it will cause no adverse temperature rise in any other part of the equipment and so that a minimum of heat and exhaust gas can reach the operator.

    Q16: What impact does WMATA's small tunnel clearance have on the locomotive cooling design configuration?

17. Locomotives shall be delivered with complete Operation and Maintenance manual package. Diagnostic tools shall not obsolete for the locomotive life (20 years).

    Q17.1: Can you provide a fully integrated locomotive level maintenance manuals (not just collection of supplier manuals)? Estimate the cost of providing this as a percentage of the equipment cost.

    Q17.2: What is the diagnostic interface for maintenance personnel? What are the capabilities for diagnostics, troubleshooting, etc? Does the locomotive provide any predictive maintenance indications/information?

18. Anticipated delivery schedule is 390 days after award.

    Q18: How long after contract award could a final design be completed? How long after contract award can production start? What is the total production time for the train? Delivery method after production is complete?

Washington Metropolitan Area Transit Authority (WMATA)
General Design Criteria for Locomotive Train

WMATA System Specifications:

Trackwork Dimensions	
Rail	115 RE canted 1:40
Minimum radius of track curve *(See Note 6)*	225 feet
Minimum length of tangent between reverse curves	*(See Note 1)*
Shape of vertical curves	Parabolic
Length of vertical curves	*(See Note 2)*
Maximum grade	5%
Most restrictive crossover	No. 6 with 14-foot track centers
Maximum superelevation	6 inches
Restraining rail gap	1 7/8 inch
Gauge, tangent track and curves with radii of 1,425 feet and greater	4 feet, 8-1/4 inches
Gauge, tangent track and curves with radii of Between 350 and 1,425 feet	4 feet, 8-1/2 inches
Radius less than 350 feet with restraining rail	4 feet, 9-1/4 inches

Note 1: The most severe reverse-curve situation is that in which two No. 6 turnouts (of the same hand) face each other with 13.53 feet of tangent track between the points and 250-foot radius curves (in the same direction as the turnout) that continue beyond both frogs.

Note 2: The minimum length of vertical curve is determined by the formula $L = (G_1 - G_2)\ 100$ where L = Length in feet and $(G_1 - G_2)$ = Algebraic difference in grade in percent. No vertical curve will be less than 200 feet long.

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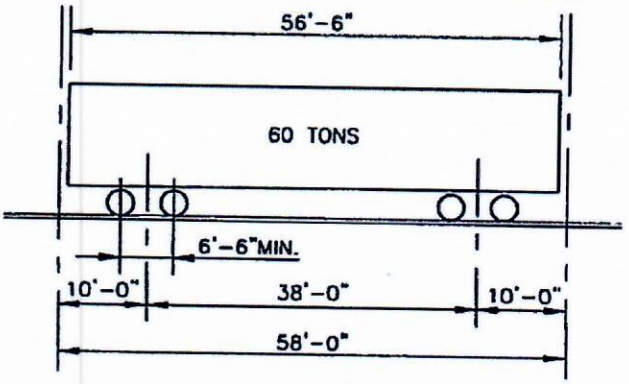
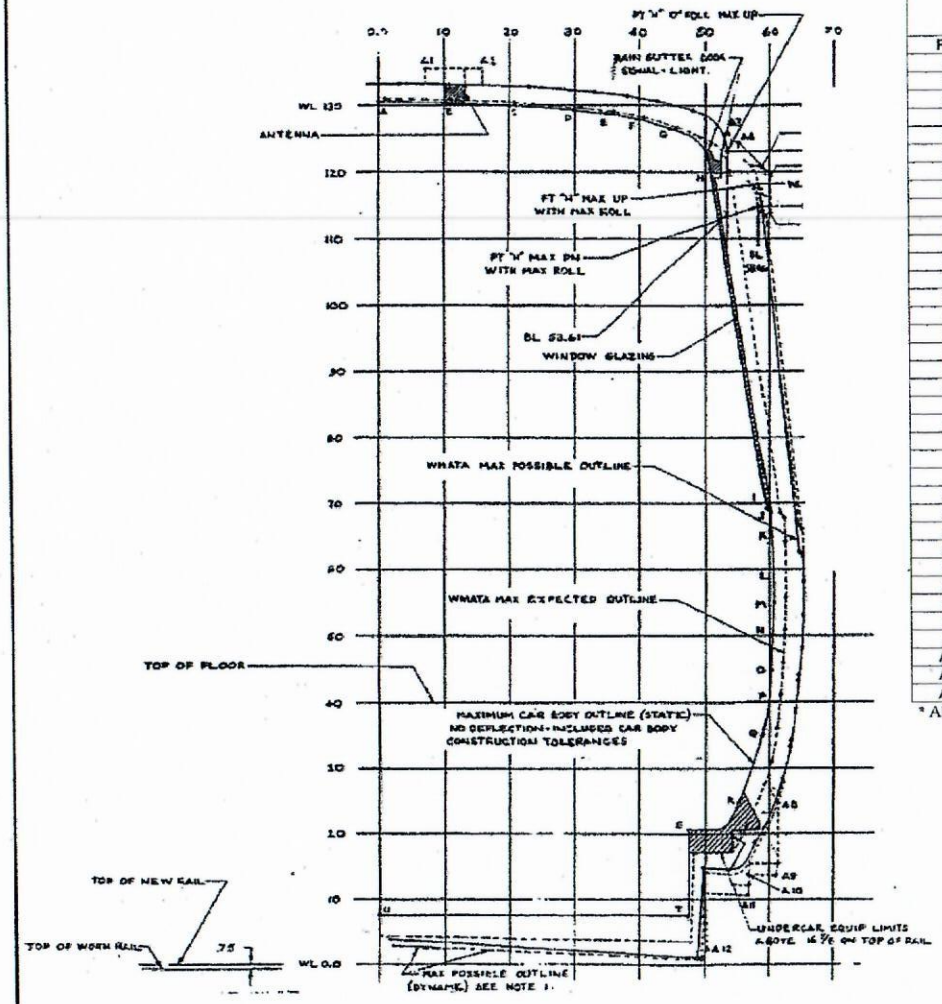
WMATA Axle Loading



1. DESIGN Loads — CAR — 80,000 LB.
   PAYLOAD — 40,000 LB.
   TOTAL CRANE CAR LOADING (LL) — 120,000 LB.
2. AXLE LOAD — 30,000 LB.
3. IMPACT — AS SPECIFIED
4. CENTRIFUGAL FORCE — [0.0012 x SPEED^2 (MPH) x DEGREE OF CURVE (DEG)] % LL
5. ROLLING FORCE — ±10% LL
6. LONGITUDINAL BRAKING AND TRACTIVE FORCE — 15% LL
7. LOADING COMBINATIONS — FOR COMBINATIONS OF ABOVE LOADS REFER TO SECTION E

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY	
DIVISION OF PLANNING, DEVELOPMENT, ENGINEERING AND CONSTRUCTION OFFICE OF CHIEF ENGINEER - FACILITIES	CRANE CAR DESIGN LOADING



	WMATA MAX. CAR BODY OUTLINE (STATIC)		WMATA MAX. EXPECTED DYNAMIC OUTLINE		MAX. POSSIBLE WMATA SPEC. (DYNAMIC)	
PT.	BL	WL	BL	WL	BL	WL
A	0.00	130.00	0.87	131.05	3.13	133.13
B	10.00	-	10.87	130.92	13.13	133.00
C	20.00	129.50	20.87	130.52	23.13	132.63
D	30.00	128.80	30.87	129.85	33.13	131.93
E	35.00	128.25	35.87	129.30	38.13	131.38
F	40.00	127.41	40.87	128.46	43.13	130.54
G	45.00	126.50	45.87	127.05	48.13	129.13
H	50.72	120.50	53.65	120.15	59.13	114.25
I	59.63	69.44	61.67	68.93	64.90	62.74
J	60.31	68.75	62.33	68.22	65.54	62.01
K	60.63	65.00	62.53	64.47	65.63	58.25
L	60.84	60.00	62.73	56.11	65.53	53.25
M	60.88	55.00	62.68	51.11	65.27	48.25
N	60.69	50.00	62.41	46.11	64.76	43.28
O	60.44	45.00	62.07	41.11	64.22	38.30
P	60.00	40.00	61.54	36.12	63.48	33.34
Q	59.16	35.00	60.61	31.14	62.33	28.40
R	55.50	25.00	56.78	21.20	58.07	18.64
S	47.50	20.81	48.71	17.15	49.83	14.95
T	47.50	6.88	48.46	3.23	48.98	1.04
U	0.00	6.88	0.97	4.06	1.58	3.94
	CARBODY APPENDAGES					
A1	10.09	132.86			7.20	135.52
A2	13.07	132.77			15.96	135.43
A3	50.95	123.25			53.84	125.91
A4	52.57	121.75			55.46	124.41
A5	50.95	123.25			58.83	121.07
A6	52.57	121.75			60.37	119.49
A7	52.57	119.44			60.25	113.81
A8	58.50	21.94			61.39	24.59
A9	58.50	20.81			61.20	13.66
A10	54.38	20.81			57.08	13.82
A11	54.38	17.63			56.96	10.65
A12	47.50	7.63			50.39	2.37

* All dimensions in inches

NOTES:
1. THIS OUTLINE INCLUDES CAR BODY TOERANCES, SUSPENSION MOTIONS AND MOVEMENTS PLUS THE FOLLOWING:

VERTICAL UPWARD		
	TRACK CONSTRUCTION TOLERANCE	0.25
	VERTICAL TRACK CURVATURE	0.59
	CAMBER (BETWEEN TRUCKS)	0.75
VERTICAL DOWNWARD		
	WHEEL WEAR	0.50
	RAIL WEAR	0.75
	VERTICAL TRACK CURVATURE	0.38
LATERAL MOVEMENT		
	TRACK CONSTRUCTION TOLERANCES	0.25
	WHEEL WEAR	0.25
	RAIL WEAR	0.50
	LATERAL OF WHEELS	0.41

2. THE MAXIMUM EFFECTED OUTLINE HAS BEEN USED FOR STATION CONSTRUCTION AND MUST NOT BE EXCEEDED BY CARS WHEN OPERATING THROUGH STATIONS
3. SEE DRAWING 7000-29 "UNDERFLOOR CAR CLEARANCE" FOR CLEARANCE TO RUNNING AND 3RD RAIL.

Key items illustrated on this drawing:

Rev	Date	Description
0	22 Oct 2007	Initial Release
A	27 Jan 2009	Redrew chart & notes
B	22 Feb 2009	Revised chart & notes

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

metro 7000 SERIES RAILCAR PROCUREMENT

Title: Dynamic Outline

FOR INFORMATION ONLY - DO NOT MANUFACTURE TO THIS DRAWING

Sheet No. 7000-04 | Rev: B