

**NORTHEAST ILLINOIS REGIONAL COMMUTER RAILROAD CORPORATION  
D/B/A METRA**

**METRA REQUEST FOR PROPOSALS (RFP) NO. 177045**

**ELECTRONIC PROPOSALS** will be received by the Northeast Illinois Regional Commuter Railroad Corporation d/b/a METRA through its Bonfire portal before 4:00 p.m. local prevailing time, Chicago, IL (LPT/CT) on the day indicated below:

**DESCRIPTION**

RFP No. 177045

**All Electric Passenger Locomotives**

**RFP DUE DATE**

May 1, 2026

**NOTES:**

1. A Pre-Proposal/Site Visit will be held on 9:00 A.M. on Wednesday, January 28, 2026 at Metra's Rock Island 47<sup>th</sup> St. Yard located at 147 W. 47<sup>th</sup> St. Chicago, IL 60609.

All site visit participants are required to submit an email to [DWhitten@metrarr.com](mailto:DWhitten@metrarr.com) confirming their intent to attend the site visit. ALL ATTENDEES ARE REQUIRED TO WEAR HARD HATS, ORANGE SAFETY VESTS (CLASS II WITH REFLECTIVE STRIPING), SAFETY GLASSES (SIDE SHIELDS FOR PRESCRIPTION EYEWEAR), AND STEEL TOE SAFETY BOOTS FOR THE SITE VISIT. Each attendee will be required to sign a liability waiver to participate.

2. Questions regarding this RFP shall be submitted via Bonfire before 4:00 P.M. LPT/CT on February 19, 2026. Bonfire will not accept questions after this time.

This RFP can be downloaded, and the proposals shall be submitted through Metra's Bonfire Procurement Portal at: <https://metra.bonfirehub.com/portal/?tab=openOpportunities>.

All Proposals must be only in the form prescribed by METRA and must be made in accordance with this Request for Proposal. Metra reserves the right to accept any Proposal or any part thereof or reject any and all Proposals.

Any contract award resulting from this RFP may be subject to financial assistance by one or more funding agencies.

# REQUEST FOR PROPOSAL

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## ALL ELECTRIC PASSENGER LOCOMOTIVES

**RFP No. 177045**

**PRE-PROPOSAL DATE: January 28, 2026 9:00 A.M. LPT/CT**

**QUESTIONS DUE DATE: February 19, 2026 before 4:00 P.M. LPT/CT**

**PROPOSAL DUE DATE: May 1, 2026 before 4:00 P.M. LPT/CT**

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NORTHEAST ILLINOIS REGIONAL COMMUTER RAILROAD CORPORATION D/B/A METRA  
CONSTRUCTION & FACILITIES MAINTENANCE PROCUREMENT  
547 WEST JACKSON BOULEVARD  
CHICAGO, IL 60661

# **METRA REQUEST FOR PROPOSAL**

## **RFP No. 177045**

### **Request for Proposal Contents**

#### **RFP Instructions to Proposers**

This document, containing sections I-XVII, is provided as general information to prospective proposers regarding the RFP submittal requirements and evaluation procedures. This document will not be included as part of the resulting Contract.

#### **Contract Documents**

This document, containing sections 1-5, is provided as a sample of the resulting Contract terms and conditions. Any proposal deviations accepted by Metra will be incorporated into the final contract. All required certifications, schedules and/or forms provided as part of a proposer's proposal/BAFO will be incorporated into Section 5 of the resulting Contract.

**Section 1:** General Conditions

**Section 2:** Special Conditions

**Section 3:** FTA Clauses

**Section 4:** Technical Specifications and Appendices

**Section 5:** Certificates, Affidavits and Schedules

# **RFP INSTRUCTIONS TO PROPOSERS**

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## **REQUEST FOR PROPOSAL**

**RFP No. 177045**

### **ALL-ELECTRIC PASSENGER LOCOMOTIVES**

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NORTHEAST ILLINOIS REGIONAL COMMUTER RAILROAD CORPORATION D/B/A METRA  
CONSTRUCTION & FACILITIES MAINTENANCE PROCUREMENT  
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## I. INTRODUCTION

Northeast Illinois Regional Commuter Railroad Corporation (NIRCRC) D/B/A Metra is the public corporation (unit of local government) that is responsible for commuter rail transportation in Cook, DuPage, Kane, Lake, McHenry, and Will Counties of Northeastern Illinois. Metra's existence resulted from legislation enacted by the Illinois General Assembly in November 1983, which reorganized the Regional Transportation Authority (RTA). The RTA, formerly responsible for all levels of public transportation policy in the region, was reorganized as a planning and oversight agency. Legislation then established the Commuter Rail Division (Metra), along with the Suburban Bus Division (Pace) and the Chicago Transit Authority (CTA) as the direct operating subsidiaries of the RTA. Under this arrangement, each of the service boards is entrusted with responsibility for policymaking with respect to actual day-to-day operations, capital investments, fare levels, and the planning service and facilities for their respective systems.

Metra is one of the largest and most complex commuter rail systems in North America. The agency provides service to and from downtown Chicago with 242 stations over 11 routes totaling nearly 500 route miles and approximately 1,200 miles of track. Metra operates more than 700 weekday trains, providing about 290,000 passenger trips each weekday. Metra is responsible for 24 railyards, 565 grade crossings, 12 fuel facilities and 847 bridges.

## II. OBJECTIVES

Metra is seeking Request for Proposals (RFP), for the All-Electric Passenger Locomotives, as further defined in Technical Specifications, Specification No. M-25-002. Metra anticipates awarding a fixed price contract with economic price adjustment (FP-EPA), in accordance with the terms, conditions, and guidelines set forth herein.

## III. SOLICITATION SCHEDULE

The anticipated schedule for this procurement is outlined below for guidance. Metra reserves the right to modify the procurement schedule as circumstances may warrant.

Date	Time	Activity
1/12/26		Request for Proposal Issued
1/28/26	9:00 a.m.	Pre-Proposal /Site Visit
2/19/26	before 4:00 p.m.	Questions due
<b>5/1/26</b>	<b>before 4:00 p.m.</b>	<b>Proposals due</b>

\*All times are LPT (Local Prevailing Time)

## IV. COMMUNICATIONS

Questions regarding this RFP shall be submitted via Bonfire at the time and date indicated in III. Solicitation Schedule above. Questions submitted after this date and time will not be accepted.

Prospective Proposers and their representatives shall not make any contact with or communicate with any members of Metra, or its employees and consultants, other than the Senior Contracting Officer regarding any aspect of this solicitation or offer.

If it should appear to a prospective Proposer that the performance of the Work under the Contract, or any of the matters relating thereto, is not sufficiently described or explained in the solicitation or Contract documents, or that any conflict or discrepancy exists between different parts thereof or with any federal, state, or local law and any Metra ordinance, rule, regulation, or other standard or requirement, then the Proposer shall submit a written request for clarification to Metra within the time period specified below.

## **V. PRE-PROPOSAL/SITE MEETING INFORMATION**

A pre-proposal site meeting will be held on January 28, 2026 beginning at 9:00 A.M. LPT/CT. Attendance is encouraged, but not mandatory. Site Visit attendees will meet at Metra's Rock Island 47<sup>th</sup> St Yard located at 147 W. 47<sup>th</sup> St. Chicago, IL 60609.

All site visit participants are required to submit an email to [DWhitten@metrarr.com](mailto:DWhitten@metrarr.com) confirming their intent to attend the site visit. ALL ATTENDEES ARE REQUIRED TO WEAR HARD HATS, ORANGE SAFETY VESTS (CLASS II WITH REFLECTIVE STRIPING), SAFETY GLASSES (SIDE SHIELDS FOR PRESCRIPTION EYEWEAR), AND STEEL TOE SAFETY BOOTS FOR THE SITE VISIT. Each attendee will be required to sign a liability waiver to participate.

Proposers shall attempt to provide as many questions as possible via Bonfire to the Senior Contract Officer before the pre-proposal site visit. Metra will not respond to oral questions except those made at any pre-proposal conference. Responses made on behalf of Metra at the pre-proposal conference shall be unofficial responses. Any oral responses which are not confirmed by an addendum shall not be official or binding on Metra. Any responses to written requests shall be provided by Metra in the form of addenda only.

## **VI. QUESTIONS, CLARIFICATIONS AND OMISSIONS**

Prospective proposers may request, in writing, clarification or interpretation of any aspect of the RFP, a change to any requirement of the RFP, or any addenda to the RFP up until the time specified in III Proposed Schedule for the Procurement. Such written requests shall be made to the contact person. The prospective proposer making the request shall be responsible for its proper delivery to Metra, as identified above, on the form "Pre-proposal Request for Change or Approved Equal" (RFA) provided in Exhibit I.

Any request for a change to any requirement of the RFP must be fully supported with other pertinent information showing evidence that the change will result in a condition equal to or better than that required by the RFP, without substantial increase in cost or time requirements.

If it should appear to a prospective proposer that any of the matters relating to the RFP or Contract are not sufficiently described or explained in the RFP or Contract Documents, or that any conflict

or discrepancy exists between different parts of the RFP, Contract or any federal, state, local or Metra law, ordinance, rule, regulation or other standard or requirement, the prospective proposer shall submit a written request for clarification to Metra on or before the date and time specified in III. Proposed Schedule for the Procurement.

All RFA questions and responses will be provided to all prospective proposers. Any response that is not confirmed by a written addendum shall not be official or binding on Metra.

## **VII. ADDENDA**

Metra reserves the right to amend the RFP at any time. Any amendments to or interpretations of the RFP will be described in written addenda. Failure of any prospective proposer to receive the notification of addenda shall not relieve the proposer from any obligation under the RFP as clarified, interpreted, or modified. All addenda issued shall become part of the RFP. Failure to acknowledge in their proposals receipt of addenda may at Metra's sole option disqualify the Proposal. All clarifications and RFP revisions will be documented in an addendum and published on Bonfire.

## **VIII. TECHNICAL PROPOSAL AND SUBMITTAL REQUIREMENTS**

Each technical proposal shall provide complete information about any firm involved with this proposal, including any third-party vendors, so that Metra can evaluate the Proposer's stability and ability to support the commitments set forth in response to the Request for Proposal. Metra, at its discretion, may require a Proposer to provide additional supporting documentation or clarify requested information; however, failure to conform in all material aspects as instructed or failure to submit required documentation may cause a firm to be deemed (in Metra's sole discretion) non-responsive or may adversely affect the proposal's evaluation.

All Exhibits should be completed, dated, signed, and/or notarized (when applicable). The contract and exhibits submitted shall be the originals provided with the solicitation package and shall not be altered or modified.

If the proposal does not include all executed and required documents for the Contract Proposal, include a determinable price, or if a Proposer has failed to acknowledge an addendum, Metra may deem the proposal as non-responsive.

### **A. Submittal Instructions**

Complete proposal submittals are due no later than May 1, 2026 before 4:00 P.M. LPT. Metra does not accept late proposals. Bonfire will not accept late submittals.

### **B. Proposal Format**

Proposals are expected to be formatted in a logical manner, as outlined here and include the specific information detail in this section. Do not provide promotional or advertising information, unless this information is requested and/or is necessary to support the technical submittal.

**Proposals shall be comprised of four packages, and submitted and ordered in the appropriate sections as outlined below:**

## **1. Package 1: Eligibility and Certification Requirements Package**

- a. Transmittal Letter: Cover letter providing an executive summary of the proposal and table/list of contents contained in the proposal
- b. Proposal Form (Exhibit II)
- c. Proposal Deviation Form (Exhibit III), if applicable
- d. Pre-Award Evaluation Data Form (Exhibit IV)
- e. Debarment and Suspension Certification, Prospective Contractor (Exhibit V)
- f. Debarment and Suspension Certification, Subcontractor(s) (Exhibit V)
- g. Non-Collusion Affidavit (Exhibit V)
- h. Anti-Lobbying Certification (Exhibit V)
- i. Buy America Certification (Exhibit VI)
- j. Transit Vehicle Manufacturers (TVM) Certification (Exhibit VII)
- k. Upon request proposers must provide a copy of the three most recent annual financial statements audited by an independent third party. Proposers must provide the requested information within 10 days from the date of request.
- l. Letter indicating the proposer's ability to obtain the insurance coverage in accordance with the RFP requirements
- m. Letter indicating the proposer's ability to obtain a 100% Performance and Payment Bond (Form AIA 311- Exhibit VIII)
- n. DOT Prime/Subcontractor List (Exhibit IX)

## **2. Package 2: Technical Proposal Requirements Package**

- a. Proposal Deviation Form (Exhibit III), if applicable
- b. Technical Proposal

### **Section 1: Compliance with Specification (Metra Specification M-25-002),**

#### **i. Technical Elements**

Order of importance of Technical Elements is below:

- Battery Prime Mover System (PDRL P-15-01)
- Traction System (PDRL P-12-01)
- Battery Charging and Energy Monitor (PDRL P-5-01)
- Head End Power System (PDRL P-13-01)
- Battery System (PDRL P-12-02)
- Air Brake and Air Supply System (PDRL P-8-01)
- Truck System (PDRL P-10-01)
- Cab General Arrangement (PDRL P-6-01)
- Exterior General Arrangement and Rendering (PDRL P-4-01)
- Locomotive Weight (PDRL P-3-03)
- Locomotive Width (PDRL P-3-01) Pass/Fail
- Locomotive Height (PDRL P-3-02) Pass/Fail

#### **ii. Declaration to be with or without Proposal Deviations to Metra specification**

#### **iii. Itemized list of Proposal Deviations and the impact on Metra performance requirements**

#### **iv. Locomotive acceleration performance curves**

- 1. One curve based on 140 trailing tons and a 50kw HEP load
- 2. One curve based on 700 trailing tons and a 250kw HEP load

#### **v. Computer train simulations**

1. Locomotive Acceleration – This simulation shall calculate the train's highest adhesion demand, trip power consumption (kWh), time in eighth notch, and maximum speeds achieved between each station, based on:
  - a. A 1.2mph/sec average brake deceleration rate
  - b. Schedule for Rock Island train number 609 (Appendix A)
  - c. Operation profile of Rock Island territory between Chicago and Blue Island (Appendix B)
  - d. A train consisting of 8 gallery cars weighing 70 tons each
  - e. An average HEP load of 250kw
  - f. An average station dwell time of 45 seconds
2. Locomotive Range – This simulation shall demonstrate that the locomotive can complete a weekedaycycle with a single battery charge, based on:
  - a. A 1.2mph/sec average brake deceleration rate
  - b. Schedule for Rock Island District train numbers (Appendix C)
    - i. Weekday 605→620→615
  - c. Operation profile of the Rock Island District between Chicago and Blue Island (Appendix C)
  - d. A train consisting of 5 gallery cars weighing 70 tons each
  - e. An average HEP load of 150kw
  - f. An average station dwell time of 45 seconds
  - g. Between trips the locomotive will be in idle
  - h. At the end of day for storage the locomotive will shut down
  - i. Minimum 25% energy reserve at end of cycle
  - j. Time to recharge locomotive after train cycle followed above
3. Proposal should document a series of running tests demonstrating that the proposed locomotive meets or exceeds basic requirements. Performance equal to or better than an F40PH type locomotive operating with identical consist is required
- vi. Maintainability program plan inclusive of expected life-cycle costs throughout the locomotive's intended useful life, assuming an average of 2000 MWHRS annually. Life cycle costs should be laid out for the 20 year life of the locomotive and shall include all costs related to daily operation, preventative maintenance, and overhaul costs of components and/or systems.

**Section 2:** Firm Qualifications & Experience, Key Personnel Qualifications & Experience, Proposed Staffing Plan

- i. Documentation detailing recent examples of firms experience similar to Metra's project and operating in North America. Each example should include:
  - 1. Name of purchasing agency
  - 2. Contact person/reference
    - a. Name
    - b. Title
    - c. Email
    - d. Phone Number
  - 3. Size of Project
  - 4. Scope of Project
  - 5. Identification of differences from Metra scope
  - 6. Contract schedule of performance vs. actual schedule of performance
  - 7. Number of units manufactured and/or remanufactured
  - 8. Type/Model numbers of units provided
  - 9. Reliability statistics of locomotives provided in identified project
- ii. Detailed staffing plan which includes:
  - 1. Program organization chart including definitions of each function
  - 2. Authority, decision making responsibilities, placement, and reporting structure of all key program personnel including Program Manager, key suppliers/subcontractors who will interface regularly with proposer
  - 3. Commitment level/% of time each proposed staff will be dedicated to Metra project
- iii. Resumes of all key personnel listed on the organization chart including supplier/subcontractor personnel to include:
  - 1. Corporate title and affiliation
  - 2. Program title
  - 3. Number of years of relevant experience
  - 4. Number of years with firm
  - 5. Relevant education/training certifications

### **Section 3: Manufacturing/Remanufacturing Capabilities**

- i. Comprehensive description of its capability to complete the work to include:
  - 1. Current workload and backlog
  - 2. Proposed Business Continuity Plan in event of business interruption
- ii. Proposed location of where work will be performed to include:
  - 1. Size of facility
  - 2. Manufacturing equipment, resources, and capability
  - 3. Quality Control processes and procedures
  - 4. Number of years at facility
- iii. Quality Assurance plan
  - 1. Ration of inspection to production personnel
  - 2. Total number of QA personnel assigned to Metra project

**Section 4:** Production & Delivery Schedule

- i. Detailed standard warranty policies & procedures
- ii. Delivery schedule for option purchases, number of days after receipt of order/exercised option

**Section 5:** Warranty & Field Support

- i. Detailed standard warranty policies & procedures
- ii. Proposed field service support
  - 1. Field Support Documentation Plan
  - 2. Field support practices
  - 3. Availability and quantities of major components and spare parts proposer plans to stock during warranty period
  - 4. Local availability of proposed personnel during warranty period

**Section 6:** Training

- i. Detailed training plan & approach
  - 1. Identify training requirement from both operational and maintenance standpoint
  - 2. Identify training requirement for any and all new technology which differs from Metra's current equipment configurations
- ii. Sample training materials
- iii. Number of staff proposed for training and resumes of proposed training staff to include:
  - 1. Corporate title and affiliation
  - 2. Program title
  - 3. Number of years of relevant experience
  - 4. Number of years with firm
  - 5. Relevant education/training/certifications

**3. Package 3: Price Proposal Requirements**

Each price proposal shall be on the prescribed proposal form(s) and shall be for the entire Contract, including all proposal items.

- 1. Price Proposal (Special Conditions, Contract Section 2.7)
- 2. Form for Proposal Deviation (Exhibit III), if applicable

The proposer is required to complete and execute Metra's Price Proposal. The Contractor shall be liable for payment of all local taxes and should include these amounts in its price proposal.

**4. Package 4: Proprietary/Confidential Information Package Requirements**

Proposer is directed to collect and submit any information it deems to be proprietary or confidential in nature in a separate marked and sealed package. Any information that is provided in Package 4 that was requested as part of Packages 1, 2, or 3 should include a reference in the package of which it was requested, that the information was deemed to be proprietary/confidential and as such omitted from the requested package and provided

in Package 4. If there is no confidential information, then the proposer should include a statement to that effect. Subject package shall be submitted in accordance with the terms and conditions governing the submittal of proposer's proposal to this RFP. Blanket-type identification by designating whole pages or sections as containing proprietary information, trade secrets, or confidential commercial and financial information will not ensure confidentiality. The specific proprietary information, trade secrets, or confidential commercial and financial information must be clearly identified as such.

The Proposer is advised that Metra is a public agency and as such may be subject to certain state and/or local public records act provisions regarding the release of information concerning this RFP. If a request is received by Metra for the release of Proposer's propriety/confidential information, then the subject request will be referred to the Proposer for review and consideration. If Proposer declares the information proprietary/confidential and requests that it be withheld and Metra agrees to withhold the information, then the Proposer shall indemnify, defend, and hold Metra harmless from any legal action arising from such a declaration.

## **IX. REVIEW OF PROPOSALS FOR RESPONSIVENESS AND PROPOSER FOR RESPONSIBILITY**

Each proposal will be reviewed to determine if the proposal is responsive to the submission requirements outlined in this RFP and if the proposer is responsible.

A responsive proposal is one that follows the material requirements of this RFP, includes all documentation, is submitted in the format outlined in this RFP, is of timely submission, and has the appropriate signatures as required on each document. Failure to comply with these requirements may result in the proposal being deemed nonresponsive.

A responsible proposer is one that demonstrates the capability to satisfy the commercial and technical requirements set forth in this RFP. A proposer's failure to demonstrate that it is responsible may result in the proposal being rejected.

Any proposal found to be nonresponsive or any proposer that is found to be not responsible will not be considered further for award. Proposals that do not comply with the RFP instructions and requirements or do not include the required information may be rejected as insufficient and may not be further considered. Metra will provide written notification to proposers if their proposal has been deemed non-responsive. Metra reserves the right to waive minor informalities or irregularities in the proposals received and reserves the right to request a proposer to provide additional information and/or to clarify information.

## **X. EVALUATION COMMITTEE**

An evaluation Committee, which may include officers, employees, and agents of Metra, will be established. The evaluation committee will carry out the detailed evaluations, including establishing the competitive range (if applicable), carrying out negotiations, and making the selection of the proposer, if any, that may be awarded the Contract. The evaluation committee will make a recommendation based on the below evaluation criteria to the awarding authority – e.g., Board of Directors.

## **XI. PROPOSAL EVALUATION AND SELECTION PROCESS**

This is a competitive negotiated procurement of which Metra may or may not conduct discussions with proposers. If Metra determines discussions are necessary prior to award, Metra will open discussions with proposers who are within the competitive range. Metra reserves the right to award without discussions, negotiations, or any request for BAFO. Therefore, initial proposals should be submitted on the most favorable terms the Proposer can submit to Metra.

Proposals will first be evaluated for responsiveness to the submittal requirements within this RFP as further discussed in XVII.4 Review of Proposals for Responsiveness and Proposer for Responsibility. Proposals that do not evidence compliance may not be considered beyond the preliminary review. Proposals found to be responsive will then be evaluated to determine those proposals that represent acceptable offers that are technically responsive to the requirements of the RFP.

The responsibility of the proposer will also be evaluated. In order to qualify as a responsible proposer and to be eligible for award, in addition to other requirements herein provided, a proposer must be prepared to prove to the satisfaction of Metra that it has the integrity, skill, and experience to faithfully and successfully perform the Contract and that it has the necessary facilities and financial resources to perform the work in a satisfactory manner and within the time specified.

Finally, a determination will be made to identify which proposals are within a competitive range, if the competitive range process is used. Proposers not within the competitive range will be notified that its proposal is no longer being considered for award. Discussions and negotiations may then be carried out with only and all proposers within the competitive range. BAFOs may be requested from all within the competitive range.

Metra will award to the responsible proposer whose proposal is most advantageous and provides the best value to Metra. Accordingly, Metra may not necessarily award to the proposer with the highest technical ranking, nor to the proposer with the lowest price proposal, if doing so would not be in the overall best interest of the agency.

### **Proposals Not Within the Competitive Range**

Proposers submitting proposals that have been determined by Metra to not be in the competitive range, and cannot reasonably be made to be within the competitive range, will be notified in writing in accordance with Metra procedures. Such proposals will receive no further consideration.

### **Discussions with Proposers in the Competitive Range**

The proposers whose proposals are found by the Metra to be within the competitive range, or may be reasonably improved to be within the competitive range, will be notified of any questions or requests for additional information. Each such proposer may be invited for private interview(s) and discussion(s) with Metra to discuss answers to written or oral questions on any facet of the proposal.

In the event that a proposal that has been included in the competitive range contains conditions, exceptions, reservations or understandings to any Contract requirements as provided in this RFP

then said conditions, exceptions, reservations or understandings may be negotiated during these meetings. However, Metra shall have the right to reject any and all such conditions and/or exceptions, and instruct the proposer to amend its proposal and remove said conditions and/or exceptions; and any proposer failing to do so may cause Metra to find the proposal to subsequently be outside the competitive range.

No information, financial or otherwise, will be provided to any proposer about any of the proposals from other proposers. Proposers will not be given a specific price or specific financial requirements that they must meet to gain further consideration, except that proposed prices may be considered to be too high with respect to the marketplace or otherwise unacceptable. Proposers will not be told of their rankings among the other Proposers.

If the competitive range process is used, Metra will determine the competitive range after a careful analysis of the technical and price proposals. Such determination will be at Metra's sole discretion. Discussions and negotiations may then be carried out with only and all proposers within the competitive range. Best & Final Offers ("BAFOs") may be requested from all within the competitive range. Metra reserves the right to award without discussions, negotiations, or any request for BAFO. Therefore, initial proposals should be submitted on the most favorable terms the Proposer can submit to Metra. Metra will award to the responsible proposer whose proposal is most advantageous and provides the best value to Metra. Accordingly, Metra may not necessarily award to the proposer with the highest technical ranking, nor to the proposer with the lowest price proposal, if doing so would not be in the overall best interest of the agency.

## **XII. EVALUATION CRITERIA**

The following are the complete criteria by which proposals from responsible proposers will be evaluated and ranked for the purposes of determining any competitive range and to make any selection of a proposal for a potential award.

Any exceptions, conditions, reservations or understandings explicitly, fully, and separately stated on the Proposal Deviation Form, which do not cause Metra to consider a proposal to be outside the competitive range, will be evaluated according to the respective evaluation criteria and sub-criteria that they affect.

### **A. Technical Criteria**

1. Compliance with Metra Specification M-25-002
2. Firm Qualifications & Experience, Key Personnel Qualifications & Experience, Proposed Staffing Plan
3. Manufacturing Capabilities
4. Production and Delivery Schedule
5. Warranty & Field Support
6. Training

## **B. Price Criteria**

The Proposal will be evaluated based on the information submitted as part of the Price Proposal as well as the information submitted in response to M-25-002, including lifecycle costs and overall costs to Metra.

## **XIII. MINIMUM QUALIFICATIONS AND RESPONSIBILITY REQUIREMENTS**

1. Demonstrated successful experience in the construction of new, or in the remanufacturing of, locomotives.
2. Demonstrated capability, facilities, and personnel, to satisfactorily complete the specified work.
3. Evidence of sufficient financial strength, resources, and capability to finance the work to be performed and to complete the Contract in a manner satisfactory to Metra.
4. Ability to secure financial guarantees, if required, as evidenced by a letter of commitment from an underwriter, surety, or other guarantor confirming that the Proposer can meet and provide the required guarantee.
5. Ability to obtain required insurance with coverage values that meet minimum requirements, evidenced by a letter from an underwriter confirming that the Proposer can be insured for the required amount.
6. Evidence of sufficient human and physical resources to complete the Contract.
7. Evidence of satisfactory performance and integrity on contracts. Evidence shall be by client references.

## **XIV. TVM REQUIREMENTS**

This procurement is subject to the provision of 49 CFR 26.49. Accordingly, proposers are required to submit the Transit Vehicle Manufacturers (TVM) certification found in Exhibit VII.

## **XV. VALIDITY OF PROPOSALS**

By submitting your proposal, you are stating that the proposal is valid for 270 days after the proposal due date.

## **XVI. MODIFICATION OR WITHDRAWAL OF PROPOSALS**

A modification of a proposal already received will be accepted by Metra only if the modification is received prior to the proposal due date, is specifically requested by Metra, or is made with a requested BAFO. All modifications shall be made in writing and executed and submitted in the same form and manner as the original proposal.

A proposer may withdraw a proposal already received prior to the proposal due date by submitting to Metra, in the same manner as the original proposal, a written request for withdrawal executed by the proposer's authorized representative. The withdrawal of a proposal does not prejudice the right of a proposer to submit another proposal within the time set for receipt of proposals.

## **XVII. NEGOTIATION DELAY**

If a written Contract cannot be negotiated within thirty days of notification of the successful Proposer, Metra at its sole discretion at any time thereafter, terminate negotiations with that

Proposer and either negotiate a Contract with the next highest ranked Proposer or choose to terminate the RFP process and not enter into a Contract with any of the Proposers.

## **XVIII. RESERVATIONS**

Proposers should read and understand the solicitation and tailor their proposal to ensure compliance. Metra reserves the right to: (i) amend the solicitation; and (ii) reject any or all proposals/options submitted. Metra is not responsible for and will not pay any costs associated with the preparation and submission of your proposal. By submitting a proposal, Proposer agrees it shall not have any rights against Metra arising at any state of the solicitation from any negotiations that take place, or from the fact that Metra does not select a Proposer for negotiation, or because Metra chooses another Proposer with whom to contract. If your firm is selected, you shall not commence, and will not be paid for any work performed prior to the date all parties execute the contract and Metra issues a Notice to Proceed letter.

## **XIX. CONTRACT AWARD AND EXECUTION**

A Proposer's participation in this Request for Proposal is at its own risk. Whether or not Metra chooses to make an award or take any other permitted action under this Request for Proposal, Proposer will have no cause of action for failure to receive award.

## **XX. COST OR PRICE ANALYSIS**

Metra may make a cost or price analysis in conjunction with this Request for Proposal. If Metra cannot perform the needed analysis, Metra may obtain the services of a qualified firm to perform the analysis.

By submitting its proposal, the Proposer agrees to furnish, upon request from Metra, all information (including a list of subcontractors and suppliers and their prices) reasonably necessary for such analysis. Furthermore, Metra may request that the Proposer show, in detail, the kinds, quantities, and prices of direct material and direct labor used to develop prices/costs submitted in the proposal.

In addition, Metra reserves the right to request and receive information explaining any estimating process, including the factors, methods, and assumptions used to project from known data, and the contingencies used. Metra may require the Proposer to show how it computes and applies indirect costs and to show trend and budgetary data.

## **XXI. GOVERNING LAW AND FORUM**

This Request for Proposal and any resulting contract therefrom shall be governed by the laws of the State of Illinois, and venue for any disputes that may arise shall be either the Circuit Court of Cook County Illinois or the United States District Court for the Northern District of Illinois.

## **XXII. FOIA REQUIREMENTS**

Metra is subject to the Illinois Freedom of Information Act (5 ILCS 140/1 et seq., "FOIA"), and pursuant to FOIA, your proposal and any subsequent agreement is subject to disclosure. In

addition, from time to time, Metra may be required to produce certain “public records” as defined in Section 2 of the FOIA, that are in the possession of or under the control of proposer/operator. Upon Metra’s notification to proposer/operator of a request pursuant to the FOIA, proposer/operator will, within two (2) business days of Metra’s notice, either (i) produce the public records, (ii) notify Metra, in writing, that additional time is required to produce the public records, or (iii) notify Metra, in writing, that the public records do not exist or have been destroyed. In the event that proposer/operator requires additional time to produce the public records, the written notification under (ii), above, will provide an explanation for the delay and the date when the public records will be received from proposer/operator by Metra. Proposer/operator agrees that in no event shall a delay to produce records exceed five (5) business days.

### **XXIII. PROPOSAL PROTEST PROCEDURES**

Metra will use, if necessary, the applicable provisions of its Bid Protest Procedures ("Procedures") for this RFP. References under the Procedures to bid, bidders, and lowest bidder will mean proposal, Proposers, and highest ranked proposal, respectively. The Proposers have the right to protest the RFP. There are important time limits set forth in the Procedures which are summarized here, but this paragraph is not meant to be a substitute for the Procedures. For a complete copy of Metra's Procedures or any related questions, contact the Contract Agent. In general, the Procedures will control in the case of a discrepancy between this RFP and the Procedures. Deadlines contained in this Section will control over those set-out in the Procedures, and the roles of Department Head, Materials Management, and Executive Director, as used in the Procedures, may be adjusted as necessary.

### **XXIV. CONFLICT OF INTEREST**

Contractor agrees that the Contractor is prohibited from performing any work or services for Metra which conflicts with the role of the Contractor in any other contract between the Contractor and Metra. This paragraph is also applicable to all sub-consultants which are proposed to be used by the Contractor for the proposed services. The Contractor has sole responsibility for compliance with this provision.

The Contractor is prohibited from performing any work or services for Metra which would result in an organizational conflict of interest (OCI). An OCI occurs when, because of other activities or relationships with other persons, (1) a person is unable or potentially unable to render impartial assistance or advice to Metra or the person's objectivity in performing services to Metra is or might otherwise be impaired, or (2) a person has an unfair competitive advantage (the term “person” includes companies and other contracting entities). OCIs generally fall into three categories: (a) a person has access to non-public information a part of its performance of services to Metra that might provide that person with a competitive advantage in a future procurement; (b) a person, as a part of its performance of contract responsibilities to Metra, has set the ground rules for the performance of a future contract (e.g. defining the specifications); and (c) a person's work under one contract with Metra could entail evaluating its own work or that of a competitor,

either through an assessment of performance under another contractor through an evaluation of proposals.

In the event of an OCI, Contractor shall provide Metra with recommendations to avoid, neutralize, or mitigate the OCI. The Sr. Div. Director, General Administration in consultation with General Counsel shall make the final determination as to whether an OCI exists and whether the Contractor's recommendations to avoid, naturalize, or mitigate the OCI are sufficient. If awarded a Contract, any violation of this provision will constitute a material breach of the Contract, which is cause for termination of the Contract.

## **XXV. IDENTIFICATION OF SOURCE FUNDING**

Financial support of this project is provided through financial assistance grants from the Federal Transit Administration (FTA), State of Illinois, and Metra.

In addition, this procurement is subject to the provision of 49 CFR 26.49. Accordingly, proposers are required to submit the Transit Vehicle Manufacturers (TVM) certification found in Exhibit VII.

## **XXVI. CONDITIONS, EXCEPTIONS, LIMITATIONS, OR DEVIATIONS**

Prospective proposers are cautioned to limit exceptions, conditions, limitations, or deviations (Proposal Deviation) to the provisions of this RFP, as they may be determined to be so fundamental as to cause rejection of the proposal for not responding to the requirements of the RFP.

Any and all Proposal Deviations must be explicitly, fully, and separately stated in the proposal by completing Exhibit III, Metra Proposal Deviation Form, setting forth at a minimum the specific reasons for each Proposal Deviation so that it can be fully considered and, if appropriate, evaluated by Metra. All Proposal Deviations will be evaluated in accordance with the appropriate evaluation criteria and procedures and may result in the proposer receiving a less favorable evaluation than without the Proposal Deviation.

A Proposer may propose any equipment, material, article or process that, in its opinion, is equal to that designated and not otherwise specifically prohibited. All Proposal Deviations shall clearly and completely specify how the deviation meets or exceeds the required fit and/or function described in the Technical Specifications, and/or how the deviation is equal to or superior to that described in the Technical Specifications.

The Proposal Deviation Form must be included in the applicable proposal package, depending on which sections of the RFP are affected. If the deviation affects multiple packages of the proposal, a Proposal Deviation Form must be included in each package it applies to.

All accepted proposal deviations will become a part of the Special Conditions in the resulting executed Contract.

## **XXVII. SIGNING OF PROPOSAL FORMS**

Proposals shall include firm name (in the event the proposer is a joint venture, the names of the individual firms comprising the joint venture); business address; and the name, title, and business address of the responsible individual(s) with their telephone, e-mail, and address, who may be contacted during the proposal evaluation period. The proposer shall submit with its proposal a copy of the joint venture agreement. Proposals shall be signed by an official authorized to bind the proposer.

# **CONTRACT DOCUMENTS**

## **Sections 1, 2 and 3**

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# **REQUEST FOR PROPOSAL**

## **RFP N0. 177045**

### **ALL ELECTRIC PASSENGER LOCOMOTIVES**

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NORTHEAST ILLINOIS REGIONAL COMMUTER RAILROAD CORPORATION D/B/A METRA  
CONSTRUCTION & FACILITIES MAINTENANCE PROCUREMENT  
547 WEST JACKSON BOULEVARD  
CHICAGO, IL 60661

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# **1 GENERAL CONDITIONS**

## **1.1 DEFINITIONS**

The following are definitions of special terms used in this document.

Addenda/Addendum: Written modifications to the published solicitation issued by Metra.

Amendment: Any change to non-financial terms such as delivery and expiration dates, FOB terms, purchase order terms, and corrections of computer input errors.

Approved Equal or Equivalent: An item, material, or method offered as a substitute for that designated in the solicitation and/or contract documents, for which approval in writing has been obtained from Metra. The burden of proof that a substitute is in fact equal shall rest with the Contractor.

Authorized Representative: The person or firm authorized or empowered to act for, or on behalf of, the Parties in accordance with the terms of this Contract. For the Contractor, this party may be referred to as the Contractor's Representative.

Authorized Signer: The person who is executing the Contract on behalf of the Contractor who is authorized to legally bind the Contractor.

Bid: Includes the term "offer" or "proposal" as used in the context of a procurement or sale. A submittal to Metra in response to a solicitation.

Bidder/Offeror: One who makes a bid or submits a proposal. One who offers to perform a certain contract for a specified price.

Breach: Failure to comply with any of the material terms and/or conditions of contract.

Change: Any alteration in the contract documents modifying the scope of work, price, equipment, materials, facilities, services, site, performance, schedule, other material provision of the Contract, or any term that creates a material effect on contractor's performance of the Contract.

Change Order: A written document that alters the scope of work to be performed by the Contractor, changes the schedule of performance, increases or decreases the contract price, or increases or decreases the contract time.

Claim: A written demand or assertion by one of the contracting parties seeking, as a matter of right, the payment of money, the adjustment or interpretation of contract terms, or other relief arising under, or relating to, the Contract.

Contract: An agreement, including all exhibits and documents incorporated by attachment or reference, entered into by Metra for acquisition of supplies, services, construction, construction-related services, architectural services, engineering services, or the lease of real property.

Contract Modification: The term used for an interim action taken to extend the expiration date of a contract, or make other changes to the contract, prior to the issuance of a Change Order or Amendment.

Contract Time: The number of days, or portion thereof, allowed for completion of the Work, including all authorized time extensions. The date specified in the Notice to Proceed shall be the date on which the contract time begins, and the scheduled completion date shall be the date the Contract Time ends.

Contractor: The entity to whom the Contract is awarded.

Contractor's Representative: The person designated by the Contractor to act on its behalf.

Cure Notice: Written notice from Metra to the Contractor to cure a default or deficiency or to correct Work performed not in conformance with the Contract.

Days: Calendar days unless otherwise indicated.

Delivery: The time when equipment and/or services are turned over and fully accepted by Metra at its designated acceptance facility.

Defect/Defective: The condition of any part of the Work that does not meet the contract document requirements; causes the good and/or service to cease operating or to operate in a degraded mode; or inflicts damage or harm on any other portion of the work, prior to Final Acceptance or during the period of any warranty.

Dispute: A disagreement between Metra and the Contractor as to the merits, amount or remedy arising out of a Claim or asserted default.

Drawings: All drawings necessary or required for the prosecution of the Work.

Effective Date: The date on which the Contract becomes fully executed by the parties' Authorized Representatives in accordance with the terms of this Contract.

Equipment: Any and all machinery, vehicles, systems, assemblies, subassemblies, products, material fittings, devices, appliances, fixtures, apparatus, supplies and parts used by the Contractor or provided by the Contractor to Metra pursuant to, or in implementation of, the Contract.

Final Acceptance: Acceptance by Metra of all Work under the Contract, or a specified portion thereof, by the issuance of a Notice of Final Acceptance, or other appropriate document of acceptance, certifying that the Work, or portion thereof, has been fully completed in accordance with the Contract.

Final Payment: Payment made to the Contractor within 30 days of presentation of the Contactor's final invoice and issuance of Notice of Final Acceptance by Metra.

FTA: “FTA” means Federal Transit Administration, an Agency of the Department of Transportation of the United States Government.

Government: Any federal, state or local government and any political subdivision or any governmental, quasi-governmental, judicial, public or statutory instrumentality, administrative agency, authority, body, or entity other than Metra.

IDOT: “IDOT” means Illinois Department of Transportation.

Metra: The Commuter Railroad Division of the Regional Transportation Authority.

Notice of Intent to Claim: A written notice of a potential claim submitted by the Contractor to Metra within the time limits and under the circumstances specified in the Contract Documents.

Notice to Proceed (NTP): Written authorization from Metra to the Contractor that establishes the date that the Contractor is to start work and the Contract Time begins.

Notice of Termination: A written notice delivered by Metra to the Contractor terminating the Contract, either for convenience or for cause/default.

Parties: Term Contractor and Metra are sometimes collectively referred to as.

Pass-Through Warranty: A warranty provided by the Contractor but administered directly with the component supplier.

Project Manager: The individual designated by Metra or the Contractor to manage the Contract on a day-to-day basis.

Proposer: The legal entity that responds to Metra’s Request for Proposal.

Proposal: An offer submitted to Metra in response to Metra’s Request for Proposal.

Request for Proposal (RFP): The document issued by Metra and soliciting proposals with respect to the Work to be performed under the contract documents.

RTA: “RTA” means Regional Transportation Authority, a unit of local government, body politic, political subdivision and municipal corporation under the laws of the State of Illinois.

Specifications: All things described, stated, or referenced in the contract documents entitled Technical Specifications, Statement of Work, Scope of Work, or any other description of the Work.

Subcontractor: Any person, firm, partnership, corporation, or other entity, other than employees of the Contractor, that are hired or contracted for by the Contractor to perform work and/or furnish labor, or labor and materials, under the Contract.

Sub-supplier: Any manufacturer, company, or agency, providing components or parts to a Supplier for inclusion of work under the Contract.

Submittal: Any written or graphic document or sample prepared by or for the Contractor that is required by the contract documents to be submitted to Metra by the Contractor.

Superior Warranty: A warranty still in effect after all contractually required warranties have expired and administered directly between the Supplier and Metra.

Supplier: Any individual, partnership, firm, corporation, joint venture, or any combination thereof, who provides material or equipment, but not labor or services, to the Contractor and who is responsible to the Contractor by virtue of an agreement with the Contractor.

Suspension: A temporary stop, delay, interruption, or cessation.

Total Contract Price: The total amount payable to the Contractor plus the price of any options exercised, and/or Change Orders during the Contract Time.

Work: All designs, engineering, manufacturing, operations, materials, equipment, parts, and labor required to properly, timely, and to the satisfaction of Metra, provide all services and/or materials required in the Contract Documents, including all alterations, amendments, or extensions thereto made by Change Order; the successful completion of all required tests and all reliability periods; the remedy of all defects and completion of all necessary repairs and modifications resulting from the tests, the reliability periods, and warranties as required by the Contract Documents.

## **1.2 PERFORMANCE**

Contractor shall provide everything necessary to complete this Contract on order and in compliance with all obligations under this Contract, including, but not limited to the following: all permits, labor, materials, manuals, training, components, tools, equipment, insurance, transportation, facilities, services, etc., necessary to furnish and deliver the equipment specified in the Contract.

## **1.3 AUTHORITIES AND LIMITATIONS**

This Contract is made and shall be interpreted under the laws of the State of Illinois, and Contractor, and each of Contractor's sureties, agrees and consents that only the courts of the State of Illinois, the United States District Court for the Northern District of Illinois, the 7<sup>th</sup> Circuit Federal appellate courts, and the United States Supreme Court shall have jurisdiction over related controversies. Contractor and Contractor's sureties irrevocably consent to jurisdiction of said courts and waive any objection based on venue or forum non convenience.

The articles, sections, paragraphs or other headings shown are for convenience and reference only and in no way define, limit, or describe the scope or intent of this Contract.

The Contract is the entire agreement of the parties. It may not be modified or terminated orally, and no claimed modification, termination, or waiver shall be binding on Metra unless in writing signed by the Sr. Division Director, General Administration or his designee, collectively Metra's

Authorized Representative. No modification or waiver shall be deemed effected by the Contractor's acknowledgement or confirmation containing other or different terms.

All work shall be performed under the direction of the Sr. Division Director, General Administration, or his/her designee, who alone shall have the power to bind Metra and to exercise the rights, responsibilities, authorities, and functions vested in him by the Contract. Wherever any provision in this Contract specifies an individual (such as, but not limited to, Engineer, Inspector, Site Manager, or Architect) or organization, whether Metra or private, to perform any act on behalf of or in the interests of Metra, that individual or organization shall be deemed to be Metra's Sr. Division Director, General Administration's Authorized Representative under this Contract, but only to the extent so specific. The Sr. Division Director, General Administration may, through written instrument, at any time during the performance of this Contract, vest in any such Authorized Representatives additional power and authority to act for him.

The Contractor shall perform the Contract in accordance with any order (including but not limited to instruction, direction, interpretation, or determination) issued by an Authorized Representative in accordance with the authority to act for Metra's Sr. Division Director, General Administration. Contractor assumes all the risk and consequences of performing the Contract in accordance with any order (including but not limited to instruction, direction, interpretation, or determination) of anyone not authorized in writing to issue such order.

All Contract documents, conferences, letters, technical information, and drawings provided by the Contractor shall be conducted or offered solely in the English language using both the U.S. customary system of weights and measures and the Metric units of system of weights and measures.

#### **1.4 ORDER OF PRECEDENCE**

The order of precedence of the component parts of the Contract Documents, as amended, in accordance with this Contract shall be as follows:

- FTA Clauses
- Special Conditions
- General Conditions
- Plans and Drawings, if any
- Detailed Specifications

Any issued Addenda or Change Order shall be a part of the Contract and shall take precedence over any other part of the Contract wherever they conflict. The foregoing order of precedence shall govern the interpretation of the Contract in all cases of conflict or inconsistency therein, except as may be otherwise expressly provided in other parts of the Contract.

#### **1.5 MATERIALS AND WORKMANSHIP**

##### **1.5.1 Equipment/Supplies**

The Contractor shall be responsible for all materials and workmanship for the equipment/supplies procured, whether manufactured by the Contractor, Subcontractor, or purchased from another supplier. This provision excludes any equipment leased or supplied

by Metra, except insofar as such equipment is damaged by the failure of a part or component for which the Contractor is responsible, or except insofar as the damage to such equipment is caused by the Contractor during performance of the Work. Unless specifically provided for in the detailed specifications, all materials and parts furnished by the Contractor shall be new and free from defects.

### **1.5.2 Hazardous Material Identification and Safety Data Sheets**

Hazardous material includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including any revisions adopted during the term of the contract).

The Contractor must identify any hazardous material to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Safety Data Sheet (SDS) submitted under this contract.

During performance of this Contract, the Contractor shall notify Metra in writing if the Contractor determines that any other material to be delivered under this contract is hazardous.

The Contractor agrees to submit, for each item as required, a SDS, meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material. If during performance of this contract, there is a change in the composition of the hazardous material(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate data on the SDS, the Contractor shall promptly notify Metra and resubmit the data.

## **1.6 CONFORMANCE WITH SPECIFICATIONS AND DRAWINGS**

Materials furnished and Work performed by the Contractor shall conform to the requirements of the specifications and Contract. Notwithstanding the provision of drawings, technical specifications, or other data by Metra, the Contractor shall have the responsibility of supplying all parts and designs required to complete the Work as defined, even if such details may not be specifically mentioned in the drawings and specifications. Items that are installed by Metra shall not be the responsibility of the Contractor unless they are included in the Contract (such as warranty repairs). Unless otherwise specified in the specification and/or Contract, all product(s) and material(s) shall be of new construction, new production, or manufactured new with all new sub-components. Metra will not accept refurbished, recycled, or remanufactured product(s) or material(s) as being of new construction, new production, or manufactured as new.

## **1.7 INSPECTION AND TESTING**

### **1.7.1 General**

Metra shall at all times have access to the Work, the Contractor and, through the Contractor, its Subcontractors and Suppliers. The Contractor, Subcontractors, and Suppliers shall furnish every reasonable facility for ascertaining that the materials and the workmanship are in accordance with the requirements of the Contract. All Work done shall be subject to Metra's inspection and approval.

The Contractor shall inspect all materials, supplies, and equipment that are to be used, or incorporated in the Work. In addition, the Contractor shall conduct a continuous program satisfactory to Metra of quality control for all Work performed under the Contract. The Contractor shall have the primary responsibility for inspecting the Work. Metra's inspection is conducted to verify that the Contractor has performed its inspections properly. Any observation, verification, inspection, or approval of the Work by Metra shall not relieve the Contractor of any of its obligations to perform the Contract as prescribed. If, in the opinion of Metra, the Contractor fails to execute its responsibility for quality control and inspection on any part of the Work, then Metra, or its designee, may, at its option, conduct quality control and inspection activities in lieu of the Contractor at the Contractor's expense. Such inspection shall not relieve the Contractor of its liability for defective or unsuitable Work, as described in Section 1.7.2 *Non-Conforming Work*.

### **1.7.2 Non-Conforming Work**

If Metra determines that materials, equipment, or workmanship proposed for or used in the Work is non-conforming, then Metra shall have the right to reject such Work by giving the Contractor written notice that such Work is non-conforming. Metra, at its option, shall require the Contractor, within a designated time period as set forth by Metra, to either (1) promptly repair, replace, or correct all Work not performed in accordance with the Contract at no cost to Metra; or (2) provide a suitable corrective action plan at no cost to Metra for its acceptance. Once accepted by Metra, the Contractor shall implement the corrective action plan at no cost to Metra. If the corrective action plan as accepted by Metra does not remedy the defective or non-conforming Work, then the Contractor shall remain responsible for remedying the non-conforming Work to Metra's satisfaction and at no additional cost to Metra. The Contractor shall also be responsible for repairing all property and Work damaged by the Contractor at no cost to Metra. Under no circumstances shall the Contractor be entitled to additional time or money for the correction of defective or non-conforming work, or for the repair of damaged property. Metra facilities may not be used for repair work by Contractor, unless authorized by Metra.

Metra's inspection of the Work or right to reject non-conforming Work shall not relieve the Contractor of its full responsibility for performing the Work in full conformance with the Contract. No failure or forbearance of Metra in notifying the Contractor of non-conforming Work shall relieve the Contractor of its Contract responsibility to ensure that the Work is performed in accordance with the Contract.

### **1.7.3 Risk of Loss**

Risk of loss and property damage to the equipment shall pass to Metra upon (1) arrival of the equipment and/or services at Metra's location; (2) joint inspection by the parties; and (3) completion and execution of Conditional or Final Acceptance. However, Metra shall not be responsible for, and Contractor shall retain all risk of loss or damage due to, equipment failure or failure due to design or workmanship deficiencies, as well as all damage caused by Contractor's negligence or willful misconduct. Contractor resumes the risk of loss any time it removes the equipment from Metra's possession and control for any actions prior to Final Acceptance. Transfer of risk of loss shall not be deemed to transfer title or to constitute conditional or final acceptance of the equipment and/or services.

## **1.8 DELIVERY**

It is understood and agreed that time of delivery is of the essence of this contract. If the Contractor is delayed in the delivery of equipment or services purchased under the Contract by a cause beyond his control, it must immediately upon receiving knowledge of such delay, give written notice to Metra and request an extension of time for completion of the Contract. Metra will examine the request and determine if the Contractor is entitled to an extension. Metra will notify the Contractor of the decision in writing.

All materials shipped to Metra must be shipped F.O.B. destination. If prior delivery notification is specified, arrangements must be made by the Contractor with Metra's designated receiving location at least twenty-four (24) hours in advance to arrange for receipt of the materials. The material must then be delivered where directed and as agreed upon.

## **1.9 LIQUIDATED DAMAGES**

### **1.9.1 Generally**

Metra's need for equipment is of paramount importance to Metra's continuance of successful public service. Operating Metra's aging equipment increases capital costs, and thus Metra's need for reliable equipment increases over-time. For this reason and others, time is of the essence, and acceptance and operation of the equipment as scheduled is of vital importance to Metra. It is agreed that the liquidated damages described in this Contract shall not be construed and treated by the parties as imposing a penalty upon the Contractor and its sureties for failing to complete the work in a timely manner or to deliver the equipment as agreed, but as liquidated damages to compensate Metra for failure to deliver operable equipment within a planned schedule that complies with the Contract such that it is accepted for service (hereinafter sometimes referred to as acceptable equipment). Liquidated damages shall be assessed separately for each piece of equipment. Liquidated damages under this section are solely for damages arising out of the delay in delivery of acceptable equipment, and do not compensate Metra for damages for breach of warranty or other breach of this Contract to which Metra otherwise may be entitled, whether before or after termination of this Contract by Metra, including the extra costs of obtaining substitute equipment or performance from others. Payment of liquidated damages, and acceptance thereof by Metra, does not constitute a waiver or settlement of any claim for damages for such breaches (other than for delay in delivering acceptable equipment), and nothing in this section is intended to limit such claims.

### **1.9.2 Delivery and Acceptance Factor**

The Contractor shall provide a schedule for Metra approval based on the requirements in the solicitation. In the event Contractor fails to deliver equipment such that it is accepted on or prior to the date provided for in the approved schedule pursuant to this purchase order, Contractor or its sureties shall pay agreed liquidated damages at the rate of five hundred dollars (\$500) per day per locomotive until the locomotive is Conditionally Accepted. Permitting the Contractor to continue to deliver equipment after the required delivery dates or any extended dates shall in no way operate as a waiver by Metra of its rights to liquidated damages.

### **1.9.3 Accrued Liquidated Damages**

Metra may, but shall not be obligated to, deduct any liquidated damages payable to it from any money Metra otherwise owes or would owe Contractor. Liquidated damages are payable on Metra's demand. Additionally, Metra may, but shall not be obligated to, accept consideration in the form of additional quantities of Locomotives, parts, or other consideration. Liquidated damages for late delivery shall accrue over the term of the contract and shall be settled promptly thereafter, by wire transfer, unless Metra agrees to another form of payment. Liquidated damages will not exceed 20% of the Total Contract Price.

## **1.10 PAYMENT**

### **1.10.1 General Payment Conditions**

The amounts set forth in the price schedule are full compensation from Metra due Contractor for performance of this Contract. Contractor shall:

- Only accept orders accompanied by a Purchase Order from Metra.
- Provide timely invoicing for all purchases of products and services.
- Send all invoices to Accounts Payable and in contracts containing a Disadvantaged Business Enterprise Goal, include a copy to Metra's Office of Diversity of Civil Rights.
- Invoices must include:
  - The Purchase Order Number provided by Metra (see below for Release Notices).
  - The Item Number, as it corresponds to the Purchase Order, if applicable.
  - The Product Part Number.
  - A description of each Product or Service, as stated in the Purchase Order.
  - Itemized Quantity, Unit Price, and Invoiced Amount.
  - The Hours and Rates used, when applicable.
  - The Time Period covered by the invoice.
  - The Total Invoiced Amount for the invoice.
  - The Remit-To-Address.
- Invoices must be billed according to the Pricing Exhibits and include any required documentation.

Work not meeting the requirements of the Contract shall be made acceptable by Contractor, and unsuitable Work may be rejected by Metra, notwithstanding that payment for such Work may have been previously authorized and included in a progress payment. A deduction may be made from subsequent payments and withheld until such time as the correction of such unsuitable Work. The amount of the deduction will be set by Metra and the amount should be in proportion to the value of the non-conforming work.

### **1.10.2 Invoicing**

All invoices received by Metra will be approved or rejected and returned by Metra within 60 days. In the event the invoice is not directed to Accounts Payable, Metra may take an

additional 30 days for handling. Metra will pay all invoices submitted in accordance with this Contract within 60 days of its approval of the Contractor's invoice. Metra may request corresponding back-up documentation to corroborate any invoices.

#### **1.10.3 Grant Funded Invoicing**

Notwithstanding the invoicing provisions above, Metra may withhold payment until grant funds are received by Metra. Withholding under this provision must not exceed one year from Metra's final date for payment under Section 1.10.2..

If Contractor fails to invoice within two years of its providing equipment or services, Contractor bears the risk that grant funding may no longer be available to pay said invoices. If grant funding is withdrawn as a direct result of Contractor's performance under this Contract, Contractor will bear sole responsibility for its loss.

#### **1.10.4 Prompt Payment to Subcontractors and Suppliers**

The Contractor agrees to pay each Subcontractor and Supplier under this contract for satisfactory performance of its contract no later than 15 days from the receipt of each payment the Contractor receives from Metra. Any failure to comply with this section will be a material breach of this contract, and Metra reserves all its rights in law and equity for such breach. In addition, such breach will be consideration for the Contractor's responsibility status for future contracts with Metra. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of Metra.

The Contractor agrees to return retainage payments to each subcontractor and supplier within 15 days after the Subcontractors and Suppliers work is satisfactorily completed. Any delay or postponement of payment from above referenced time frame may occur only for good cause following written approval of Metra.

Contractor's failure to promptly pay its Subcontractors is subject to the provisions of 50 ILCS 505/9.

#### **1.10.5 Taxes**

The Contract price shall not include, and Metra shall not pay, taxes or fees from which Metra is exempt. Metra is exempt from various federal taxes, all state and unit of local government taxes, and registration and license fees. Contractor shall promptly notify Metra, and afford it the opportunity before payment of any taxes, to contest said claims in the manner and to the extent it may elect, and to settle or satisfy such claims.

### **1.11 TITLE AND WARRANTY OF TITLE**

The Contractor warrants that title to the equipment purchased will pass to Metra free and clear of all liens, claims, and encumbrances upon the first of either Metra's Conditional or Final Acceptance, and upon the associated payment.

The Contractor warrants that all articles of materials delivered hereunder shall be free from defect of material and workmanship and that all parts furnished will conform to samples, specifications and/or drawings as may be applicable, and will be fit for the purpose for which purchased. The

warranty period shall be for one (1) year, unless otherwise provided for in the Contract, from the date of delivery or date of final acceptance, whichever is later. Metra may return any nonconforming or defective items to the Contractor or require correction or replacement of the item at the time the defect is discovered, all at the Contractor's risk and expense. Acceptance of items by Metra or payment therefore shall not relieve the Contractor of its responsibilities hereunder.

## **1.12 LEGAL CLAUSES**

### **1.12.1 Notices**

Except as otherwise specified elsewhere in the Contract, all requests, notices, demands, authorizations, directions, consents, waivers, or other documents required or permitted under this Contract shall be in writing. Such communications shall be deemed to have been sufficiently served if sent by certified or registered mail with proper postage pre-paid, or hand delivered, or when received if sent by any other means, at the respective addresses shown below, or to such other address as either party may from time to time furnish to the other in writing.

If to Metra, a copy to both:

Metra 547 W. Jackson Blvd., 15th Floor Chicago, Illinois 60661 Attn: Chief Mechanical Officer	Metra 547 W. Jackson Blvd., 11th Floor Chicago, Illinois 60661 Attn: Contracting Agent
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If to Contractor, to its address set forth on its offer.

### **1.12.2 Indemnification**

To the full extent permitted by law, Contractor agrees to assume any and all risk and to indemnify, defend, and hold harmless Metra, RTA, and the Northeast Illinois Regional Commuter Railroad Corporation, and their respective directors, officers, employees, and agents (collectively referred to as "Indemnitees") from and against any and all claims, liabilities, losses, damages, demands, liens, encumbrances, judgments, awards, costs, suits, actions, proceedings, fees, expenses, and attorney's fees and other expenses of litigation or arbitration, which any of them may incur, sustain, or be subject to on account of:

- a) injury to, or death of any person; or property damage, arising out of the Contractor's performance of the Contract, or Contractor's failure to perform under the Contract, including, but not limited to, any contract warranty work;
- b) injury to, or death of any person; or property damage, arising out of the Contractor's use of Metra equipment, or arising out of any and all defects, or alleged defects, with respect to Metra equipment, regardless of whether the relevant Metra equipment, equipment materials, equipment design, or equipment workmanship was made or approved by Contractor, Subcontractor, or Supplier and regardless of any and all negligence on Metra's part in participating in the selection, purchase, or approval of relevant Metra equipment, equipment materials, equipment design, equipment workmanship, or equipment conditions; or

- c) injury to, or death of any person; or property damage, arising out of any and all misconduct, negligent acts, errors, or omissions of Contractor's officers, employees, servants, agents, Subcontractors, and Suppliers.
- d) any action that may be brought by Indemnitees to enforce the provisions of this indemnity.

Each party shall promptly notify the other in writing of the notice or assertion of such claim, demand, lien, encumbrance, judgment, award, suit, action, or other proceeding hereunder. The Contractor shall have sole charge and direction of the defense of such suit, action, or proceeding. Metra shall not make any admission that might be materially prejudicial to the Contractor unless the Contractor has failed to take over the conduct of any negotiations or defense within a reasonable time after receipt of the notice and authority above provided. Metra shall at the request of the Contractor furnish to the Contractor all reasonable assistance that may be necessary for the purpose of defending such suit, action or proceeding, and shall be repaid all reasonable costs incurred in doing so. Metra shall have the right to be represented therein by advisory counsel of its own selection at its own expense.

#### **1.12.3 Indemnitee Gross Negligence or Willful Misconduct**

The obligations of the Contractor under Section 1.12.2 shall not extend to circumstances in which the injury, death, or damages are caused solely by the gross negligence or willful misconduct of one or more of the Indemnitees.

#### **1.12.4 Intentionally Omitted**

#### **1.12.5 Suspension of Work**

Metra may, at any time and for any reason within its sole discretion, issue notice to the Contractor suspending, delaying, or interrupting all or any part of the Work for a specified period of time.

The Contractor shall comply immediately with any such written order and take all reasonable steps to minimize costs allocable to the Work covered by the suspension during the period of Work stoppage. Contractor shall continue the Work that is not included in the suspension and shall continue such ancillary activities as are not suspended. The Contractor shall resume performance of the suspended Work upon expiration of the notice of suspension, or upon written direction from Metra's Authorized Representative.

The Contractor shall be allowed an equitable adjustment in the Contract price (excluding profit) and/or an extension of the Contract time, to the extent that cost or delays are shown by the Contractor to be directly attributable to any suspension. However, no adjustment shall be made under this section for any suspension, delay, or interruption due to the fault or negligence of the Contractor. As soon as reasonably possible after receipt of the written suspension of work notice, the Contractor shall submit to Metra's Authorized Representative a detailed price and schedule proposal for the suspension, delay, or interruption.

### **1.12.6 Notice of Labor Dispute**

Whenever the Contractor or Metra has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of the Contract, they shall immediately give written notice thereof to the other party, including all relevant information.

In addition, the Contractor agrees to insert the substance of this clause in any subcontract in which a labor dispute may delay the timely performance of the Contract.

### **1.12.7 Force Majeure**

If the Contractor is delayed at any time during the progress of the Work by a cause as described below, then the time for completion and/or affected delivery date(s) shall be extended by Metra subject to the following cumulative conditions:

1. Such cause may include force majeure events such as any event or circumstance beyond the reasonable control of the Contractor, including but not limited to acts of God; earthquake, flood, and any other natural disaster; civil disturbance, strikes, and labor disputes; fires and explosions; war and other hostilities; embargo; or failure of third parties, including Suppliers or Subcontractors, to perform their obligations to the Contractor due to a force Majeure event described above;
2. The Contractor demonstrates that the completion of the Work and/or any affected deliveries will be actually and necessarily delayed;
3. The Contractor has taken measures to avoid and/or mitigate the delay by the exercise of all reasonable precautions, efforts and measures, whether before or after the occurrence of the cause of delay; and
4. The Contractor makes written request and provides other information to Metra as described below.

None of the above shall relieve the Contractor of any liability for the payment of any liquidated damages owing from a failure to complete the Work by the time for completion that the Contractor is required to pay for delays occurring prior to, or subsequent to the occurrence of an excusable delay.

Metra reserves the right to rescind or shorten any extension previously granted, if subsequently Metra determines that any information provided by Contractor in support of a request for an extension of time was erroneous; provided, however, that such information or facts, if known, would have resulted in a denial of the request for an excusable delay.

Notwithstanding the above, Metra will not rescind or shorten any extension previously granted if the Contractor acted in reliance upon the granting of such extension and such extension was based on information which, although later found to have been erroneous, was submitted in good faith by the Contractor.

No extension or adjustment of time shall be granted unless: (1) written notice of the delay is filed with Metra within 14 calendar days after the commencement of the delay, and (2) a written application therefore, stating in reasonable detail the causes, the effect to date and the probable future effect on the performance of the Contractor under the Contract, and the portion or portions of the Work affected, is filed by the Contractor with Metra within thirty (30) calendar days after the commencement of the delay. No such extension or adjustment shall be deemed a waiver of the rights of either party under the Contract. Metra shall make its determination within thirty (30) calendar days after receipt of the application.

#### **1.12.8 Termination for Convenience**

Metra may terminate this contract, in whole or in part, at any time by written notice to the Contractor when it is in Metra's best interest. The Contractor shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination. The Contractor shall in no less than 30 days unless otherwise approved by Metra, submit its termination claim to Metra to be paid the Contractor. If the Contractor has any property in its possession belonging to Metra, the Contractor will account for the same, and dispose of it in the manner Metra directs.

#### **1.12.9 Termination for Breach**

If the Contractor does not deliver equipment in accordance with the contract delivery schedule, or if the Contractor fails to comply with any other provision of the contract, Metra may terminate this contract for breach. Termination shall be effected by serving a notice of termination on the Contractor setting forth the manner in which the Contractor is in breach. The Contractor will only be paid the contract price for supplies delivered and accepted in accordance with the manner of performance set forth in the Contract in excess of Metra's actual or liquidated damages. Any such termination for breach shall not in any way operate to preclude Metra from also pursuing all available remedies against Contractor and its sureties for said breach.

Metra, prior to a termination for breach, will give notice allowing the Contractor an opportunity to cure. In such case, the opportunity to cure notice will state the time period in which cure is permitted and other appropriate conditions. Failure to abide by such notice, may in Metra's discretion, result in breach with no further cure opportunity.

If it is later determined by Metra that the Contractor had an excusable reason for not performing, such as a strike, fire, or flood, events which are not the fault of or are beyond the control of the Contractor, Metra, after setting up a new delivery of performance schedule, may allow the Contractor to continue work, or treat the termination as a termination for convenience.

#### **1.12.10 Intentionally Omitted.**

#### **1.12.11 Waivers of Remedies for Any Breach**

In the event that Metra elects to waive its remedies for any breach by Contractor of any covenant, term or condition of this Contract, such waiver by Metra shall not limit Metra's remedies for any succeeding breach of that or of any other term, covenant, or condition of this Contract.

### **1.12.12 Compliance with Laws and Regulations**

The Contractor shall at all times observe and comply with all applicable statutes, ordinances, regulations and codes of the Federal, State, City, and other local government agencies, which may in any manner affect the performance of the Contract.

### **1.12.13 Changes of Law**

Changes of law that become effective after the solicitation due date may result in changes that affect price. If a price adjustment is indicated, either upward or downward, then it shall be negotiated between Metra and the Contractor, and the final Contract price will be adjusted upward or downward to reflect such changes in law. Such price adjustment may be audited, where required.

### **1.12.14 Maintenance of Records; Access by Metra; Right to Audit Records**

#### **1.12.14.1      Records Retention**

The Contractor will retain, and will require its Subcontractors and Suppliers of all tiers to retain, complete and readily accessible records related in whole or in part to the contract, including, but not limited to, data, documents, reports, statistics, sub-agreements, leases, subcontracts, arrangements, other third party agreements of any type, and supporting materials related to those records.

#### **1.12.14.2      Retention Period**

The Contractor agrees to comply with the record retention requirements in accordance with 2 C.F.R. § 200.333. The Contractor shall maintain all books, records, accounts and reports required under this Contract for a period of at not less than three (3) years after the date of termination or expiration of this Contract, except in the event of litigation or settlement of claims arising from the performance of this Contract, in which case records shall be maintained until the disposition of all such litigation, appeals, claims or exceptions related thereto.

#### **1.12.14.3      Access to Records**

The Contractor agrees to provide sufficient access to grantor and its contractors to inspect and audit records and information related to performance of this contract as reasonably may be required.

#### **1.12.14.4      Access to the Site(s) of Performance**

The Contractor agrees to permit grantor and its contractors access to the sites of performance under this contract as reasonably may be required.

### **1.12.15 Intentionally Omitted**

### **1.12.16 Conflicts of Interest; Gratuities**

The Contractor is prohibited from engaging in any practice that may be considered as a conflict of interest under existing Metra policies and/or state law, and to refrain from

participating in any gifts, favors or other forms of compensation that may be viewed as a gratuity in accordance with existing policies and laws.

The Contractor shall take all reasonable measures to preclude the existence or development of an organizational conflict of interest in connection with its performance. An organizational conflict of interest occurs when, due to other activities, relationships or contracts, a firm or person is unable, or potentially unable, to render impartial assistance or advice to Metra; a firm or person's objectivity is or might be impaired; or a firm or person has an unfair competitive advantage in proposing for award of a Contract as a result of information gained in performance of the Contract.

Members of the Board, officers and employees of Metra, their spouses, their children, their parents, their brothers and sisters and their children, are prohibited from having or acquiring any Contract or any direct pecuniary interest in any Contract which will be wholly or partially performed by the payment of any funds or the transfer of property of Metra. Any firm, partnership, association or corporation from which any member of the Board, officer or employee of Metra is entitled to receive more than seven and one-half percent (7 ½) of the total distributable income, is prohibited from having or acquiring any contact or direct pecuniary interest in any contract which will be performed in whole or in part by payment of funds or the transfer of property of Metra. Any firm, partnership, association or corporation from which members of the Board, officers, employees of Metra, their spouses, their children, their parents, their brothers and sisters and their children are entitled to receive in the aggregate more than fifteen percent (15%) of the total distributable income, is prohibited from having or acquiring any Contract or direct pecuniary interest in any Contract which will be performed in whole or in part by the payment of funds or the transfer of property of Metra.

#### **1.12.17 General Nondiscrimination Clause**

In connection with performance of the Contract, the Contractor agrees that it will not, on the grounds of race, religious creed, color, national origin, ancestry, disability, marital status, sex, sexual orientation, or age, discriminate or permit discrimination against any person or group of people in any manner prohibited by federal, state or local laws.

#### **1.12.18 Modification of Contract; Waiver**

##### **1.12.18.1      Modification**

Any modification or amendment of any provisions of any of the Contract Documents shall be effective only if in writing, signed by Authorized Representatives of both Metra and the Contractor, and specifically referencing the Contract.

##### **1.12.18.2      Waiver**

In the event that either party elects to waive its remedies for any breach by the other party of any covenant, term or condition of the Contract, such waiver shall not limit the waiving party's remedies for any succeeding breach of that or of any other term, covenant or condition of the Contract.

### **1.12.19 Remedies Not Exclusive**

The rights and remedies of Metra provided herein shall not be exclusive and are in addition to any other rights and remedies provided by law.

### **1.12.20 Counterparts**

The Contract may be executed in any number of counterparts. All such counterparts shall be deemed to constitute one and the same instrument, and each of said counterparts shall be deemed an original thereof.

### **1.12.21 Severability**

Whenever possible, each provision of the Contract shall be interpreted in a manner as to be effective and valid under applicable law. However, if any provision, or part of any provision, should be prohibited or invalid under applicable law, such provision, or part of such provision, shall be ineffective to the extent of such prohibition or invalidating the remainder of such provision or the remaining provisions of the Contract.

### **1.12.22 Third Party Beneficiaries**

No provisions of the Contract shall in any way inure to the benefit of any third party, including the public at large, so as to constitute such person a third-party beneficiary of the Contract or of any one or more of the terms and conditions of the Contract or otherwise give rise to any cause of action in any person not a party to the Contract, except as expressly provided elsewhere in the Contract.

### **1.12.23 Assignment of Contract**

The Contractor agrees that neither this Contract nor any part of it or any of the monies due from this Contract may be assigned without the prior consent of Metra. Any successor or assignee under this Contract will be required to accede to all of the terms, conditions and requirements of this Contract as a condition precedent to such succession or assignment. Assignment of any portion of the work by subcontract must be approved in advance by Metra, in writing. Metra reserves the right to assign performance of all or part of the Contract as advertised, competed, evaluated, and awarded including base and option quantities.

### **1.12.24 Independent Parties**

The Contractor is an independent contractor with respect to the performance under this Contract, retaining control over the detail of its own operations, and the Contractor shall not be considered the agent, employee, partner, fiduciary or trustee of Metra.

### **1.12.25 Survival**

The following sections shall survive the nominal expiration or discharge of other Contract obligations, and Metra may obtain any remedy under law, Contract or equity to enforce the obligations of the Contractor that survive the manufacturing, warranty and final payment periods:

Intellectual Property  
Data Rights

Indemnification

Governing Law and Choice of Forum

Disputes

Maintenance of Records; Access by Agency; Right to Audit Records

Confidential Information

Parts Availability Guarantee

Warranty and Reliability

Liquidated Damages

## **1.13 INTELLECTUAL PROPERTY**

### **1.13.1 Intellectual Property Indemnification**

The Contractor shall indemnify, defend and hold harmless Metra (and its officers, directors, agents or employees) to the maximum extent permitted by law from and against any and all claims, liabilities, losses, damages or expenses (including attorneys' fees and related costs, whether or not litigation has commenced), whether direct or indirect, arising out of, relating to or in connection with any claim or allegation that the ownership, possession or use of any software, equipment, devices, processes or other materials provided by the Contractor under this Agreement infringe, misappropriate or violate the patent, copyright, trade-secret or other intellectual-property or proprietary rights of any third party. If any such software, equipment, devices, processes or other materials are held to constitute an infringement and their use enjoined (or if Metra reasonably determines that they are likely to be held to constitute an infringement and their use enjoined), then the Contractor, at the Contractor's sole cost and expense, shall do one of the following:

1. Secure for Metra the right to continue using the software, equipment, devices, processes, or other materials by suspension of the injunction or by procuring a royalty-free license, or licenses;
2. Replace such software, equipment, devices, processes, or other materials with non-infringing software, materials, equipment, devices, or processes; or
3. Modify them so that they become non-infringing.

If the amount of time necessary to proceed with one of these options is deemed excessive by Metra, then Metra may direct the Contractor to select another option or risk Metra terminating for breach.

Metra shall advise the Contractor of any pending patent suit related to the Contract against Metra and provide all information available. The Contractor's obligations under this section are discharged and Metra shall hold the Contractor harmless with respect to infringement caused by equipment or parts expressly specified by Metra if all requests for substitutes were rejected and the Contractor advised Metra of the potential infringement.

### **1.13.2 Intellectual Property Warranty**

The Contractor represents and warrants that any use of the equipment, devices, processes or other materials provided by the Contractor under this Agreement, or any part thereof, by Metra (or its officers, directors, agents, employees or transit users) will not infringe,

misappropriate or violate the patent, copyright, trade-secret or other intellectual-property or proprietary rights of any third party.

The Contractor further represents and warrants that it has or will have all appropriate licenses, agreements or ownership rights pertaining to all patent, copyright, trade-secret or other intellectual-property or proprietary rights needed for the performance of its obligations under the Contract — including without limitation that it will have all necessary rights to use patentable or copyrightable materials, equipment, devices, or processes not furnished by Metra used on or incorporated in the Work under the Contract. The Contractor assumes all risks arising from the use of any such patented or copyrighted materials, equipment, devices or processes.

### **1.13.3 Tooling Rights**

The Contractor, its Subcontractors, and Suppliers shall not sell, destroy, or otherwise dispose of their rights to the use of, the unique castings, patterns and forming or extrusion dies after their use in the production of the equipment without first offering them to Metra, with reasonable costs associated with the transfer to be borne by Metra, or, in the case of a proposed sale to another, without first offering them for sale to Metra at a fair market price. The Contractor shall be liable to Metra to the extent that the failure of the Contractor, its Subcontractors and Suppliers, to comply with this Section causes Metra to incur costs to have the tooling replicated.

For purposes of this Section the terms “sell” and “sale” shall not include transfer of these assets to a successor corporation or other entity that assumes the business and obligations of any Contractor, Subcontractor, Supplier or Manufacturer herein, including obligations arising under the Contract. Upon Contractor’s offer of any of the materials described above and Metra’s refusal, the Contractor’s obligation with regard to Tooling Rights, as it relates to the specific materials offered and refused, shall cease.

## **1.14 DATA RIGHTS**

### **1.14.1 Proprietary Rights/Rights in Data**

The Contractor hereby grants to Metra on behalf of itself and its Subcontractors, and Suppliers, (as to whom the Contractor represents and warrants that it has the power and authority to grant such sublicense), an irrevocable, perpetual, royalty-free, nonexclusive license and sublicense (“Technology License”) to use, itself or through its agents or assigns, for the approved purposes described below, without recourse to the original Contractor, Subcontractor, Supplier or Manufacturer all patented, copyrighted and unpatented technology, know-how, trade secrets and other proprietary rights, and documentation thereof which is included in the material and/or Equipment, including but not limited to all systems, subsystems, assemblies, subassemblies, components, software and interface systems and controls which are necessary for the operation, maintenance and repair, overhaul of the material and/or Equipment, and for the manufacture of parts which are unavailable for purchase, as defined below, all of which shall be designated the “Licensed Technology.”

#### **1.14.1.1 Uses**

Metra's rights under this Technology License shall be limited to its use for the following:

1. Evaluation and qualification for the purposes of future material and/or Equipment procurements of systems, subsystems and components of subsystems on the material and/or Equipment to be delivered under the Contract;
2. Preparation of specifications for future purchases employing some or all of the Licensed Technology;
3. Maintenance, repair, and refurbishment of the material and/or Equipment;
4. Overhaul of the material and/or Equipment;
5. Manufacture of parts for the material and/or Equipment that become unavailable for purchase. The term "unavailable for purchase" means that a part is no longer being manufactured; or an inventory of the part in sufficient quantities to meet Metra's needs is not available for purchase; or no supplier will sell a part to Metra or cannot supply the part according to a delivery schedule that meets Metra's needs; or that no supplier will offer the part at a commercially reasonable price. "Unavailable for purchase" can be demonstrated through a public solicitation receiving no adequate bids or proposals.

#### **1.14.1.2 Limits**

Metra shall not have the right under this Technology License either to use the Licensed Technology to manufacture itself, or to have manufactured for it by a third party as a sub-licensee of Metra, either the material and/or Equipment, systems, subsystems or components thereof, except as specified above.

### **1.14.2 Software Identification and Escrow Account**

#### **1.14.2.1 Software Identification**

The Contractor warrants that Exhibit 1.14.2 to the Contract sets forth a true and complete list of all software which is or may be included in the material and/or Equipment or which is necessary for the operation, maintenance and repair, overhaul of the material and/or Equipment ("Required Software") and accurately identifies whether such Required Software is (i) off-the-shelf software (including shrink-wrap or click-wrap end user licenses for mass market software) that is commercially available under non-discriminatory pricing terms on a retail basis for less than Five Hundred Dollars (\$500) per seat or less than Twenty Thousand Dollars (\$20,000) on an enterprise license basis ("Off-the-Shelf Software"), (ii) software owned the Contractor or licensed by the Contractor under terms which allows Contractor to sublicense such software to Metra pursuant to the Technology License set forth above (collectively, "Proprietary Licensed Software") (it being acknowledged that all Proprietary Licensed Software is being licensed by the Contractor to Metra under the terms of the Technology License set forth above), and (iii) software comprising proprietary works of third parties which does not qualify as Off-the-Shelf Software or Proprietary Licensed Software ("Proprietary

Third Party Software”). Prior to commencement of performance under this Agreement (or earlier, at Metra’s written request), the Contractor shall provide Metra with copies of any license documentation that may be necessary for Metra to execute in order to utilize the Proprietary Third Party Software and shall, to the extent requested by Metra, assist Metra in connection with the negotiation of such license documentation. At Metra’s written request, the Contractor shall provide Metra with copies of all license documentation that may be necessary for Metra to accept with respect to any Off-the-Shelf Software and, if the terms of such license documentation are unacceptable to Metra, the Contractor will identify substitute Off-the-Shelf Software to be used in lieu of the unacceptable Off-the-Shelf Software.

#### **1.14.2.2 Software Escrow**

Source code for the Proprietary Licensed Software and Proprietary Third Party Software (collectively, the “Proprietary Software”) and all related documentation required for the use and modification thereof, and any revisions or derivative works based on the Proprietary Software developed pursuant to the Contractor’s performance of the Contract (collectively, “Escrow Materials”) shall be deposited in an escrow account with a third party for no less than forty (40) years. The Contractor shall pay all initial and future costs related to the escrow account. The Escrow Materials shall immediately be obtainable and usable by Metra (i) in the event that Contractor fails to support the continued use of the Proprietary Software by Metra, (ii) Metra certifies that it requires access to the source code of such Proprietary Software in order to perform maintenance, repair or refurbishment of the material and/or Equipment; or (iii) upon termination or expiration of the term of the escrow.

### **1.15 CHANGES**

#### **1.15.1 Contractor Changes**

If the Contractor chooses to propose changed scope, then the Contractor must submit a notice of proposed change to Metra for its prior written approval. The notice should describe the proposed change, identifying the proposed change and stating the reasons for the change, including relevant circumstances, impacts on the schedule, and estimated cost impacts.

Upon receipt of the proposed change notice, Metra may choose to either reject the notice or to request Contractor to submit a detailed Proposal within a specified time period. If Metra accepts the proposed change notice, it may issue an Interim Change Notice specifying the proposed change and action that the Contractor should undertake. The Interim Change Notice may include a not-to-exceed amount for the change based upon the Contractor’s estimate. If Metra requests a proposal, then the Contractor’s proposal shall set forth any changes to the Total Contract Price, including, if applicable, a line item breakdown and per unit increases, Contract delivery schedule, and/or any technical requirements of the Contract.

Any Interim Change Notice issued by Metra must be formalized in a written Change Order approved by the Agency. Oral Change Orders are not permitted.

The Contractor shall be liable for all costs resulting from, and/or for satisfactorily correcting, any specification change not properly ordered by written modification to the Contract and signed by the Metra's Authorized Representative.

### **1.15.2 Metra Changes**

Metra may obtain changes to the Contract by notifying the Contractor.

Metra may issue an Interim Change Notice specifying the proposed change and action that the Contractor should undertake. Upon receipt of the Interim Change Notice and as soon as reasonably possible, but no later than thirty (30) calendar days, or a date agreed to by the parties, the Contractor shall submit to Metra's Authorized Representative a detailed price and schedule proposal for the Work to be performed. The Contractor's proposal shall set forth any changes to the Total Contract Price, contract delivery schedule, or any technical requirements of the Contract. This Proposal shall be accepted or modified by negotiations between the Contractor and Metra's Authorized Representative. At that time, a Change Order shall be executed in writing by both parties. Disagreements that cannot be resolved within negotiations shall be resolved in accordance with the Disputes clause. Regardless of any disputes, the Contractor shall proceed with the Work ordered.

Oral Change Orders are not permitted.

### **1.15.3 Claims**

#### **1.15.3.1 Notice of Intent to Claim**

The Contractor shall give to Metra a written notice of Intent to Claim within fifteen (15) calendar days after the parties have been unable to negotiate a pending change related to any act or event for which it intends to seek adjustment in the contract price, contract time, terms, or schedule. The notice shall set forth the basis of the claim and an estimate of any costs and time impacts involved.

The written notice of Intent to Claim shall set forth the following:

1. The reasons the Contractor believes additional compensation and/or allowance of additional time may be due;
2. The nature of the costs involved or time needed;
3. The Contractor's plan for mitigating such cost and delay; and
4. The Contractor's best estimate of the amount of potential claim and time extension, and basic facts supporting the amount and time claimed.

#### **1.15.3.2 Claim Submittal**

The Contractor shall submit its claim within thirty (30) calendar days after submitting the Notice of Intent to claim. The following must be provided with the Claim:

1. Detailed factual statement of the claim, with all necessary facts, events, locations, and affected Work.
2. Date of the event giving rise to the claim; if there are continuing or multiple events, provide all dates necessary to support the claim.
3. Names of all persons who made any statements with respect to, or are knowledgeable of, the facts and events giving rise to the claim.
4. Specific provisions of the Contract supporting the claim, with a statement of supporting rationale.
5. Identification of all documents including meeting minutes, transcriptions of oral communications, photographs, videos, tapes, and any other evidence supporting the claim.
6. Detailed analysis of a request for an extension of item.
7. Detailed breakdown of request for additional compensation.

Failure to submit sufficient detail to permit Metra to conduct a review of the claim may result in rejection of the claim.

Each claim the Contractor submits for an adjustment that is related to a delay for any cause shall include the following:

1. A time impact analysis and a revised schedule demonstrating how the delay is incorporated into the schedule;
2. Alternative proposal(s) and a revised schedule that demonstrate how the delay will be eliminated or mitigated.

The Contractor shall maintain cost records of all Work, which is the basis of any claim, in the same manner as is required for Changed Work in the Changes clause of this agreement.

### **1.15.3.3 Claims Process**

Within 30 calendar days after the receipt of the claim, Metra shall either render a decision, provide an estimated date when a decision will be made, or request that the Contractor submit additional information and details to establish the facts and contentions involved in the claim.

If Metra does not make a decision within 30 days after it receives all information required to evaluate the claim, or within any extended period mutually agreed to in writing by the parties, the claim shall be deemed rejected by Metra, and the Contractor shall be notified in writing. If the Contractor fails to comply with any provision of this Article in the time and manner specified, it shall waive any relief that might otherwise be due with respect to such claim.

Metra may at its discretion, unilaterally or in agreement with the Contractor, make payments or grant extensions of time on any part of a claim it determines to have been substantiated to its satisfaction. If the Contractor agrees to a final payment or

extension of time related to a certain, described portion of its claim, such agreements shall constitute an unconditional release of Metra from any further obligations related to that described portion of the claim.

If Metra finds the claim to have merit, in whole or in part, then Metra and Contractor will negotiate the terms of a Change Order in the Work in compliance with the Changes clause. If the Contractor and Metra are unable to reach agreement on a Change Order, then Metra may issue a unilateral Change Order. The unilateral Change Order shall constitute a final decision by Metra.

If any claim or portion thereof remains in dispute following a final decision by Metra, then the Contractor may pursue further resolution through the Disputes clause.

Pending final resolution of a claim, the Contractor shall proceed diligently with the performance of its obligations under the Contract in accordance with the written directions of Metra.

#### **1.15.3.4 No Claims after Final Payment**

In no event shall any claims be made after Final Payment. Failure by the Contractor to submit claims in a timely manner shall result in a waiver by the Contractor as to such claims.

#### **1.15.4 Disputes**

Except as otherwise provided in the Contract, any dispute concerning a question of fact arising under or related to the Contract that is not disposed of by agreement shall be decided in accordance with the following steps. However, by mutual agreement the matter may be taken immediately to any higher step in the dispute resolution process, or mutually agreed-to alternative dispute resolution process (which may include structured negotiations, mediation or arbitration) or litigation. Pending final resolution of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract and in accordance with Metra's decision, as the case may be.

**Notice of Dispute.** All disputes shall be initiated through a written dispute notice submitted by either party to the other party within fourteen (14) calendar days of the determination of the dispute.

**Negotiation between Authorized Representatives.** The parties shall attempt in good faith to resolve any dispute arising out of or relating to the Contract promptly by negotiation between individuals who have authority to settle the controversy and who are at a higher level of management than the people with direct responsibility for administration of the Contract. Any party may give the other party written notice of any dispute not resolved in the normal course of business as provided. Within fourteen (14) calendar days after delivery of the dispute notice, the receiving party shall submit to the other party a written response. The dispute notice and written response shall include: (1) a statement of the party's position and a summary of the arguments supporting that position; (2) any evidence

supporting the party's position; and (3) the name of the individual who will represent that party and of any others who will accompany the executive in negotiations. Within twenty-eight (28) calendar days after delivery of the dispute notice, the Authorized Representatives of both parties shall meet at a mutually acceptable time and place, and thereafter as they reasonably deem necessary, to attempt to resolve the dispute. All reasonable requests for information by one party to the other shall be honored.

**Referral to executive management.** If the matter has not been resolved by the Authorized Representatives within twenty-eight (28) calendar days of the dispute notice, then the dispute may be referred to executive management to settle the dispute and who shall likewise meet to attempt to resolve the dispute. Should the dispute not be resolved by negotiation between Authorized Representatives, Metra's Authorized Representative shall submit a written request for decision to the Metra's Executive Officer along with all documentation and minutes from the negotiations. The Executive Officer shall issue a written decision within fourteen (14) calendar days or a date mutually agreed upon receipt of a request. Within thirty (30) calendar days of the issuance of any administratively final and conclusive decision under this paragraph, the Contractor shall notify in writing of the Contractor's agreement with the final decision. Any dispute that is not resolved by the parties through the operation of the provisions of this paragraph, or any mutually agreed-upon alternative disputes resolution process pursuant, may be submitted to any court in Circuit Court of Cook County, Illinois. Pending final resolution of a dispute hereunder, the Contractor shall proceed diligently with the performance of its obligations under the Contract in accordance with the written directions of Metra.

**Alternative dispute resolution.** If agreed to by both parties, disputes may be resolved by a mutually agreed-to alternative dispute resolution process that may include structured negotiations different from above, such as mediation or arbitration.

## 1.16 ILLINOIS FREEDOM OF INFORMATION ACT (FOIA)

### 1.16.1 Generally

Metra is subject to the Illinois Freedom of Information Act (FOIA), 5 ILCS 140/1 *et seq.* Contractor should assume any materials provided to Metra will be subject to public disclosure. Under FOIA, Metra may exempt trade secrets and commercial or financial information marked as proprietary, privileged or confidential, if such disclosure of the information would cause competitive harm to the Proposer and only as the claim directly applies to the records requested. To the extent Contractor provides Metra records it believes are subject to this provision, it must clearly mark the header or footer of each page of the applicable material as "confidential." If Metra agrees the exemption is applicable, it will withhold the material unless and until it is directed to disclose the information pursuant to law, a court order, subpoena, or decision from the Illinois Attorney General.

### 1.16.2 Confidential Information

Metra shall employ sound business practices no less diligent than those used for Metra's own confidential information to protect the confidence of all licensed technology, software, documentation, drawings, schematics, manuals, data and other information and material

provided by the Contractor pursuant to the Contract that are marked in accordance with Section 1.16.1, to protect against disclosure of such information and material to third parties except as permitted by the Contract and required under law. The Contractor shall be responsible for ensuring that confidential commercial or financial information, trade secrets or proprietary information, bears appropriate notices as described above.

During the performance of the Work under the Contract, it may be necessary for either party (the “Discloser”) to make confidential information available to the other party (the “Recipient”). The Recipient agrees to use all such information solely for the performance of the Work under the Contract and to hold all such information in confidence and not to disclose same to any third party without the prior written consent of the Discloser. Likewise, the Recipient agrees that all information developed in connection with the Work under the Contract shall be used solely for the performance of the Work under the Contract, and shall be held in confidence and not disclosed to any third party without the prior written consent of the Discloser.

## **1.17 AMERICANS WITH DISABILITIES ACT**

The Contractor agrees to comply with, and assure that any subcontractor complies with all applicable requirements of 42 USC 12101 et seq.

## **1.18 APPROPRIATION**

Consistent with Metra’s enabling statute, if this Contract is for a period of longer than one year, it is subject to the appropriation of funds by Metra’s Board of Directors for each year beyond the first year of the Contract.

## **1.19 CERTIFICATIONS**

As a Condition of award the Contractor and all Subcontractors executed a set of certifications provided by Metra attached in Appendix A. Metra conditioned award of this Contract on the veracity of the executed certifications. If it is discovered that the Contractors’ certificates were false at the time of execution, Metra may terminate the Contract and require Contractor reimburse Metra for its costs in identifying and selecting a replacement contractor. In the event a Subcontractors’ certificates were false at the time of execution, Metra may require Contractor replace the Subcontractor at no additional cost to Metra.

## **1.20 INSURANCE REQUIREMENTS**

### **1.20.1 Requirements**

Requisition Number: PR0177045

Event: Passenger All-Electric Locomotives

Effective concurrently with the commencement of the Work, the contractor/vendor shall obtain and maintain throughout the life of the work, the insurance coverage as noted here. With the exception of Products Liability, all coverage needs to be written on an occurrence form. All insurers must carry an AM Best Rating of A-VII or better.

TYPE OF COVERAGE	AMOUNT REQUIRED
1. WORKERS COMPENSATION: a. Coverage A – Statutory b. Coverage B	\$ 1,000,000 Limits of Liability
2. COMPREHENSIVE GENERAL LIABILITY (BROAD FORM): Bodily Injury Liability & Property Damage Liability (combined)	\$ 10,000,000 Each Occurrence \$ 10,000,000 Aggregate
3. EXCESS COMPREHENSIVE GENERAL LIABILITY-EXCESS OF PRIMARY LIMITS (1), (2), and (4) Bodily Injury Liability & Property Damage Liability (combined)	\$ 10,000,000 Each Occurrence \$ 10,000,000 Aggregate
4. AUTOMOBILE LIABILITY: Bodily Injury Liability & Property Damage Liability (combined)	\$ 1,000,000 Combined Single Limit
5. PRODUCTS LIABILITY	\$ 10,000,000 Each Occurrence \$ 10,000,000 Aggregate

Additional Insureds shall be as follows: The Commuter Rail Division of the Regional Transportation Authority, a division of an Illinois municipal corporation, and its affiliated separate public corporation known as the Northeast Illinois Regional Commuter Railroad Corporation, both operating under the service mark Metra as now exists or may hereafter be constituted or acquired, and the Regional Transportation Authority, an Illinois municipal corporation.

All policies must:

1. Include a waiver of subrogation, thereby waiving Contractors' rights of subrogation against Metra and any additional insureds.
2. Include the Additional Insured Endorsement for all coverages including products and completed operations.
3. Be primary and non-contributory on all coverages.

4. All deductibles applicable to the insurance coverage shall be borne by the contractor/vendor. The certificate of insurance shall clearly state how defense costs, also known as “allocated loss adjustment expenses,” shall apply in terms of the deductible and the insurance limits. Self-insurance reserve programs are prohibited, unless approved by Metra’s Risk Management Department.
5. All Subcontractors retained or hired for the Work shall be required to maintain limits and term equivalent to those required of the prime contractor.

Should any of the above described policies be canceled before the expiration date thereof, notice will be delivered in accordance with the policy provisions. Contractor/Vendor will immediately notify Metra of the cancellation, non-renewal, material change or reduction in coverage of any required insurance policy. Such notice shall be sent certified mail to Metra, care of the Director of Risk Management, 547 W. Jackson, Suite 1500, Chicago, IL 60661.

In no event shall the failure by Metra to receive certificates of insurance required hereunder, or to receive them by the date(s) required hereunder, be construed as a waiver of the contractor/vendor’s obligation to obtain the required insurance coverages. Failure by Metra to demand any certificate of insurance or other evidence of full compliance with the insurance requirements set forth herein, or failure by Metra to identify a deficiency in the evidence provided, shall not be construed as a waiver of the obligation to procure or maintain the insurance required hereunder. The acceptance of delivery by Metra of any certificate of insurance does not constitute approval or agreement that the insurance requirements have been met or that the insurance policies identified in the certificates of insurance are in compliance with such requirements.

#### **1.20.1.1 Commercial General Liability Insurance**

The Commercial General Liability policy shall include the following coverage limits when limits are indicated:

\$10,000,000	per occurrence
\$10,000,000	aggregate
\$10,000,000	aggregate for completed operations and products liability

#### **1.20.1.2 Automobile Liability Insurance**

The Automobile policy shall include the following additional coverage limits:

Include all autos owned by the contractor/vendor as well as hired and non-owned autos used by the contractor/vendor and autos used by the contractor/vendors’ employees while on Metra property.

\$25,000	for Medical Payments
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\$1,000,000	for Property Damage (if not combined in single limit)
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### **1.20.1.3 Workers Compensation and Employers Liability Insurance**

Workers Compensation Insurance coverage should be at statutory limits.

As a minimum, the Employers Liability policy shall include coverage limits of:

\$1,000,000	for bodily injury by accident
\$1,000,000	for bodily injury by disease, each employee
\$1,000,000	Aggregate liability

## **2 SPECIAL CONDITIONS**

### **2.1 TERM AND ORDER PROCESS**

This Contract shall remain effective for all services described herein for a period of 96 months from the date Metra issues NTP. The Contractor agrees to complete each phase of the Work in accordance with the schedule and timelines described within this Contract. The Contractor shall complete production of all locomotives within 48 months of the date Metra issues NTP.

The Contractor shall supply a minimum of five (5) and up to a maximum of twelve (12) all-electric passenger locomotives and the specified parts in accordance with the Specification M-25-002. The first unit of the base order shall be conditionally accepted within 36 months of NTP and the final unit no later than 48 months after NTP.

### **2.2 PAYMENT AND PERFORMANCE BONDS**

Both a labor and material payment bond, and a performance bond shall be provided under this Contract, prior to NTP, each individually in the amount of one hundred (100%) of the base order total. Additional bonds, in the amount of one hundred (100%) of each option, shall be provided within thirty (30) days of Metra exercising an option. The surety on each bond must be responsible for one hundred percent (100%) of damages up to one hundred percent (100%) of the total. For any increase in the actual contract price through the duration of the contract, as amended, additional bonding in the amounts stated above must be provided within thirty (30) days' notice from Metra for Metra's review and approval. The surety must be on the most recently published Department of the Treasury's Listing of Approved Sureties (Department Circular 570) throughout the contract, and the surety will be required to assure, in writing, performance of the Contract. Additionally, any attorney-in-fact who signs any bond must attach to that bond an effective copy of his/her power of attorney, as well as a Jurat page. The acceptable bond forms are the February 1970 Edition of AIA Document A311, Performance Bond, and Labor and Material Payment Bond.

Unless otherwise agreed, the bonds shall be continuously in effect until completion of all of Contractor's obligations.

The Contractor's sureties shall be jointly and severally liable under its performance bond to Metra in the event that the Contractor shall breach any of its obligations under this Contract. Contractor acknowledges and agrees that for purposes of this Contract Metra shall not be deemed a merchant pursuant to the Uniform Commercial Code Section 2104.

### **2.3 DELIVERY AND ACCEPTANCE**

#### **2.3.1 Generally**

The contractor bears full responsibility for all costs for transport of locomotives to Metra, as well as for spare parts or components, training materials, manuals, and any related materials shipped to Metra's designated destination.

The contractor will use good-faith efforts to effectively manage third-party transportation with a carrier on a daily basis for locomotives destined for Metra. Contractor shall update Metra on a daily basis with respect to movement of locomotives.

### **2.3.2 Pre-Shipment Inspection and Fitness for Delivery**

A Fitness for Delivery certificate will be issued for each locomotive once it has successfully undergone pre-shipment inspection and testing through a Metra approved procedure. All non-conformities shall be addressed prior to shipment and the locomotive history book shall be complete and ready for review and approval by Metra or its designated representative. The Pre-Shipment Inspection report shall be forwarded to Metra and shall be recorded in the Vehicle History Book.

### **2.3.3 Notice of Arrival**

On arrival, each locomotive will be carefully inspected by representatives of Metra, the Contractor, and the carrier for damage, loss, vandalism, or other discrepancies incurred during shipping. The Contractor will be responsible for resolution of any noted issues prior to Metra issuing a notice of arrival and before the locomotive will be allowed to undergo testing. Any generated report and resolution shall be included in the Vehicle History Book.

### **2.3.4 Operational Testing**

After the notice of arrival, each locomotive will undergo operational performance tests. Testing will consist of shop testing the locomotive's subsystems and track testing with all subsystems operating. If Metra determines, in its sole discretion, that the locomotive does not pass one, all, or any combination of tests, Metra shall issue the Contractor a notice of rejection for the locomotive listing the items to be remedied or repaired.

### **2.3.5 Conditional Acceptance**

In lieu of a notice of rejection, Metra may issue Conditional Acceptance where the locomotives may, in Metra's sole discretion, operate in supervised revenue service.

### **2.3.6 Final Acceptance**

Final Acceptance will be issued when all initial corrective actions and any retrofits have been fully completed in response to any remaining Open Item(s), successful operational test runs have been completed, and the vehicle is considered to be fully compliant with the Contract by Metra and consequently ready to be released for general revenue service.

## **2.4 PARTS AVAILABILITY**

The Contractor agrees to continuously offer to supply, either directly or through a designated source, within a commercially reasonable period of time in the case of each part ordered, the spare parts and customer-accessible software necessary to maintain and repair the locomotives supplied under this Contract, at the then-current or last published in Contractor's catalogs, price list, or other general sales materials, for a period of forty (40) years after the date of the Final Acceptance of the last locomotive; provided, however, that if Contractor discontinues the general distribution of such part, it shall notify and give Metra the opportunity to make a one-time buy of its requirements. Parts shall be interchangeable with the original equipment.

On receipt of Metra's notice that Contractor has failed to comply with this section, then the Contractor shall provide Metra, within eight (8) hours of Metra's verbal or written request, the original suppliers' and/or manufacturers' part numbers, company names, addresses, telephone numbers, and contact persons' names for all of the specific parts not received by Metra so that

Metra may attempt to produce or make such parts, and Contractor shall be responsible to Metra for the damages caused by Contractor's, its Subcontractors', or Suppliers', breach of this provision during performance of the Contract, including the subsequent warranty periods. In addition, Contractor must provide to Metra, for such production and within seven (7) days of Metra's verbal or written request, the design plans, manufacturing location, and documentation necessary for those parts manufactured by the Contractor and the original suppliers' and/or manufacturers' part numbers, company names, addresses, telephone numbers, and contact persons' names for all of the specific parts not received by Metra. Contractor hereby grants to Metra an irrevocable license to use the Contractor's design and manufacturing documentation for the purpose of Metra procuring parts for the locomotives agreed to under this Contract and for no other purpose.

## **2.5 WARRANTY AND RELIABILITY**

### **2.5.1 General Warranties**

- 1) The Contractor warrants that, at the time of acceptance, all locomotives, equipment, Work, components and parts, (including and without limitation and as an example, data, manuals, and reliability information), furnished under the Contract shall be:
  - a. In full conformance with all requirements of all provisions of the Contract;
  - b. Free of any and all defects and Deficiencies;
  - c. Fit for their particular purpose;
  - d. Fit for the ordinary purposes for which such locomotives, equipment, Work, components and parts are used;
  - e. Free from any and all liens and other encumbrances;
  - f. Component data or information of the latest configuration employed by the Contractor, Subcontractor, or Supplier in commercial service;
  - g. Accurate, complete, and current.
- 2) The Contractor further warrants that, for the periods of time defined in this Section 2.5, all locomotives, equipment, Work, components and parts shall be, remain and perform free of any and all deficiencies, and shall be, remain and perform in full conformance with all requirements of all provisions of the Contract, and all warranties which extend to the future performance of each of such items.
- 3) **Warranties By Others:** All warranties and guarantees of any Subcontractor, or Supplier with respect to any locomotives, equipment, Work, components or parts, whether expressed or implied, are deemed to be for the benefit of Metra

and to be obtained by the Contractor for the benefit of Metra, regardless of whether or not such warranties and guarantees have been transferred or assigned to Metra by separate agreement. The Contractor shall enforce such warranties and guarantees on behalf of Metra; provided, however, that if directed by Metra, the Contractor shall require such Subcontractors, and Suppliers to execute such warranties and guarantees directly to Metra. The Contractor shall be jointly and severally liable for any such warranties or guarantees. To the extent that any such warranty or guarantee would be voided by reason of the Contractor's negligence in incorporating any equipment, component or part into the Work, the Contractor shall be responsible, at its sole cost, for correcting such error or omission, without cost or expense to Metra.

- 4) Equipment failures or performance deficiencies due to breach of the Contractor's or third party warranties described above is referred to in this Contract as a "Deficiency."

## **2.5.2 Availability and Reliability Warranty**

- 1) Availability is defined as the ability of the locomotive to be assigned to a train at the commencement of the calendar day, following the calendar day inspection pursuant to 49 CFR Part 229.21, with no defects found that prevent the locomotive from being dispatched. Reliability is defined as the ability to complete the train assignments of the calendar day without locomotive failure or degradation of performance such that it causes a train or trains to lose time or result in a schedule delay.

A locomotive delay is defined as a locomotive related, mechanical failure causing a revenue service train to be more than 5 minutes late at its destination terminal; or annulled either at its originating point or en route.

- 2) In addition to the other warranties provided under this Contract, the Contractor further warrants the availability and reliability of the locomotives, equipment, components, Work and parts in accordance with the Contract availability and reliability requirements set forth below. Failure to meet the Contract availability or reliability requirements shall also constitute a "Deficiency", and Contractor shall, at its sole cost and without cost or expense to Metra, take all actions required to correct as promptly as possible the Deficiency and to achieve the specified availability and reliability requirements. In cases where a "Fleet Deficiency" exists, the Contractor shall incorporate at its sole cost such correction into all previously delivered locomotives, equipment, components, Work and parts before it may resume deliveries of new locomotives or affected components. Such correction shall be incorporated into all undelivered locomotives, equipment, components, Work and parts prior to delivery.
- 3) The anticipated availability is 97% exclusive of days when a locomotive is undergoing periodic inspection, programmed maintenance, or is out of

service for any reason other than mechanical failure, as determined by Metra.

- 4) The anticipated reliability is 98% for a locomotive that is dispatched, from time of dispatch until the next calendar day inspection, at which time it becomes again subject to the availability target. This requirement is applicable only to mechanical failures, as determined by Metra.
- 5) Achievement of reliability targets will be calculated by dividing the number of days that each locomotive was available for service in any 92 day Federal Railroad Administration (FRA) inspection period into the number of days or part of a day that the locomotive became unavailable due to a failure. For example, if the locomotive was available for service for 88 days between inspections and periodic maintenance, but failed after entering service on 2 days, the reliability rate is 98%, calculated by dividing 86 days by 88 days.

### **2.5.3 Time Periods of the Warranties**

**Basic Warranty:** The warranty period will commence on Conditional Acceptance, unless there are Open Items. The warranty period as to each locomotive or any part or subsystem relating to an Open Item shall not commence until all Open Items have been corrected to Metra's satisfaction. The warranty period shall be effective for a time period of three (3) years (except as extended elsewhere in the Contract) after such Conditional Acceptance. The warranty for Special Tools, as defined in the technical specifications, including, without limitation, Diagnostic and Test Equipment shall be for a time period of three (3) years after Final Acceptance by Metra. For any locomotive or component that is Conditionally Accepted, the warranty shall commence on the date of Final Acceptance.

- 1) **Warranty for Certain Components:** Warranties shall commence upon Acceptance as provided in the Paragraph herein entitled Basic Warranty, but shall have time periods as follows:
  - a. The warranty on modifications to the carbody structure, underframe, truck frames, and the exterior coating and painting shall be for five (5) years.
  - b. The warranty on the gear units, traction motors, rotating electrical equipment, batteries, and braking equipment shall be for four (4) years.
  - c. The warranty on any component that Metra designates prior to Contract award as being non-service proven shall be for five (5) years.
- 2) **Subcontractor Warranties:** Any warranty from a Subcontractor or Supplier or manufacturer to the Contractor, which exceeds the above time periods,

shall be extended to Metra for the same time period as given to the Contractor.

#### **2.5.4 Warranty Notice**

Metra will provide the Contractor with notice of breach of any warranty, including, without limitation, notice of a Deficiency, within a reasonable time after Metra observes and verifies any failure, malfunction, or condition of, any locomotive, equipment, Work, component or part, that the failure, malfunction or condition arises from a Deficiency or other breach of warranty existing or occurring within any of the applicable warranty periods ("Notice").

#### **2.5.5 Corrective Work Requirements**

- 1) Promptly upon receipt of notice from Metra, but in any event not later than forty-eight (48) hours thereafter, unless Metra agrees to a longer interval, the Contractor, at its sole cost, and without cost or expense to Metra, shall commence and thereafter prosecute with due diligence using qualified personnel, all activities necessary to investigate, analyze, diagnose and determine the cause and extent of the Deficiency or other breach of warranty, and the proper correction action, in conformance with the provisions of this Contract and shall promptly report the causes, extent and proposed corrective action to Metra in writing.
- 2) Promptly upon the approval of Metra, the Contractor, at its sole cost, and without cost or expense to Metra, shall commence and thereafter prosecute with due diligence, using qualified personnel, appropriate action, within the time period and in the manner provided for in this section to correct the Deficiency. Corrective action shall include without limitation, adjustment, repair, replacement, reengineering and redesign as appropriate to fully and completely address and remedy the Deficiency or other problem in each affected locomotive, equipment, Work, component or part, so that the item and the locomotive shall perform as specified by the Contract, and to ensure that the Deficiency will not recur. The Contractor shall promptly and diligently pursue all corrections to their complete, satisfactory conclusion. All corrections shall comply with all requirements of the Contract and shall not result in any locomotive, equipment, Work, component or part failing to comply with any requirement of any provision of the Contract. All corrections shall employ and require only parts that perform comparably to that originally intended by the Contract, and of cost comparable to the cost of the deficient part prior to correction. The Contractor shall perform, at its sole cost, any tests that Metra may reasonably require to verify that any correction made by the Contractor will correct the Deficiency and that the correction will comply with all requirements of the Contract.
- 3) All corrections shall be without cost or expense to Metra. All costs and expenses of any correction shall be at the Contractor's sole cost. Contractor shall also bear all costs and expenses of removal, replacement and

reinstallation and testing of other equipment, components, Work and parts necessary to gain access to the Deficiency or to accommodate the correction. The Contractor shall also bear all transportation costs for or associated with any Deficiency or correction.

- 4) The Contractor shall provide, at its sole expense and at no cost or expense to Metra, all facilities and equipment necessary to carry out the investigations, analyses and diagnoses needed to determine the cause and extent of the Deficiency or other breach of warranty, and to complete all correction thereof and all associated Work.
- 5) The Contractor shall promptly provide to Metra, without cost or expense to Metra, all updated parts manuals and maintenance manuals that include all information related to any correction.
- 6) The Contractor shall reimburse Metra for all Metra costs and expenses reasonably incurred in the investigation, analysis, diagnosis or correction of any Deficiency.
- 7) The Contractor shall be solely liable for any and all injury, loss or damage to any person, or to any locomotive, equipment, Work, component or part, or other Metra property, caused by any Work performed to make any correction.
- 8) In addition to correction of any Deficiency, the Contractor, at its sole cost, shall correct without cost or expense to Metra any other locomotive, equipment, component, Work or part that was caused to be damaged or adversely affected by a Deficiency.
- 9) All corrected components and parts used, and repairs made, to correct deficiencies shall be subject to acceptance by Metra and shall be subject to the same requirements as are set forth in the Contract for the original components.
- 10) If a correction hereunder has required the Contractor to reengineer or redesign a component, the Contractor shall, without cost to Metra and at Contractor's sole cost, replace all Metra owned spare parts comprising that component with the corrected items or detail parts.

## **2.5.6 Fleet Deficiency Remedy**

- 1) A Fleet Deficiency exists when during the warranty period specific repairs, replacements, or modifications are necessitated by defects in design, material, or workmanship of the same kind or type are required. Metra may declare a fleet deficiency if failures of the same component in the same application exceeds a failure rate of thirty three percent (33%) during any period based on the average number of such components in service,

provided at least five (5) locomotives are in service, during such twelve month period.

- 2) Upon Metra's notice to the Contractor that a Fleet Deficiency exists, the Contractor shall promptly, but in any event not later than forty-eight (48) hours after such notice, unless Metra agrees to a longer interval, commence and thereafter prosecute with due diligence and using qualified personnel, all activities necessary to investigate, analyze and diagnose the cause and extent of the Fleet Deficiency and the proper correction thereof. The Contractor shall promptly provide a written report to Metra describing the cause and extent of the Fleet Deficiency and the Contractor's proposed correction thereof. The Contractor shall submit for Metra's approval and, following Metra approval, shall promptly implement and satisfactorily complete Metra approved corrections of all affected components, at the Contractor's sole cost and at no cost or expense to Metra, as promptly as practicable and in no event later than three (3) months after Metra's initial notice to Contractor of the Fleet Deficiency, and in compliance with the requirements Section 2.5.5 Corrective Work Requirements. The Contractor shall make the correction to all equivalent components in the fleet, not just those in which a failure or malfunction has occurred, including without limitation, all components for which any warranty period has expired, and to all equivalent Metra-owned spare parts.
- 3) The Fleet Deficiency remedy provided for in this paragraph is in addition to, and shall not be construed as a limitation of, any other rights or remedies provided for by this Article or any provision of this Contract or the law.

### **2.5.7 Timeliness**

Time is of the essence in the corrections of all Deficiencies to be undertaken under all applicable warranties. Unless otherwise directed in Metra's notice to Contractor of a Deficiency, the Contractor shall commence correction of the Deficiency at the time specified by Metra, but in no event later than forty-eight (48) hours after the Notice, unless Metra agrees to a longer interval. To ensure timely corrections, the Contractor shall make provisions to have available all necessary facilities and special equipment, and shall use such qualified engineers and product and system specialists as are necessary, including diversion of such persons from the Contractor's other operations or from the operations of its Subcontractors and Suppliers. Contractor shall also use additional shifts and Work on weekends and holidays, as necessary, to complete timely corrections in accordance with this Section.

### **2.5.8 Use of Metra-Owned Spare Parts**

At the sole discretion of Metra, as determined on a case-by-case basis, Metra owned spare parts may be utilized by the Contractor for correction purposes if the Contractor's replacement part is not immediately available. The Contractor must replace each borrowed part with an equivalent (like-for-like) part within thirty (30)

calendar days. Consequently a new part must be replaced with new, a UTEX part replaced with UTEX or new. All costs associated with replacing the spare parts shall be borne by the Contractor. In some cases, a Metra-owned replacement part may be manufactured or remanufactured by a different source than that of the Contractor. In instances where “non-OEM” components are utilized in the repair due to unavailability of an immediate contractor-supplied replacement, the Contractor will be responsible for all costs arising from the removal of a borrowed part and subsequent installation of the contractor’s part following the initial repair operation. Consequently, to avoid compensating Metra for repetitive repair operations, the Contractor is encouraged to maintain a sufficient quantity of spare replacement parts available for prompt delivery to Metra.

### **2.5.9 Delays and Disruption**

To prevent delays and disruption to Metra’s operations, Metra shall have the right to the continued use of any deficient locomotive, equipment, component, Work or part, until it can be taken out of service and made available to Contractor to correct the Deficiency.

### **2.5.10 Repairs by Metra**

At Metra's sole discretion and option, Metra may investigate, analyze, diagnose and perform the redesign, replacement, or repair of any Deficiency, as Contractor's agent, and Contractor shall pay Metra for such Work. Contractor shall, if required by Metra, supply components, materials, or equipment within ten (10) days after Metra's request in each case. Contractor shall pay Metra the cost of the warranty Work for: (a) outside engineering fees and (b) labor supplied by Metra by multiplying the number of man-hours of Metra labor actually supplied to correct the defect by the wage rate and percent shop overhead. The cost of moving the locomotives(s) if such ~ action is necessary, all applicable freight charges, and Metra's material additives in effect at the time on components, materials, supplies, or equipment furnished by Contractor (subject to yearly adjustment by Metra, based on Metra's material additive rate(s) in effect at time of Work), within thirty (30) days of Metra's invoice.

### **2.5.11 Warranties of the Corrective Components**

The Contractor warrants each corrected component for the remainder of the warranty originally applicable to the component, or for a period of one (1) year from the date of Metra’s acceptance of the corrected component, whichever is greater.

### **2.5.12 No Waiver**

No inspection, test, acceptance of, or payment to the Contractor for, any locomotive, equipment, component, Work or part, or for any other purpose shall relieve the Contractor from any duty under, or be deemed to be a waiver of any Warranty, or other right or remedy pursuant to, this Article, the Contract or the law.

### **2.5.13 No Increase in Maintenance or Operating Costs**

In no case shall any correction of any Deficiency, whether pursuant to any warranty or otherwise, call for, require or result in any increase in any maintenance, inspection or test requirement or frequency, or in any additional maintenance, inspection or test requirement, or operating costs beyond that specified in the Contract or in the original edition of the maintenance manual.

### **2.5.14 Metra Warranty Claim**

Where Metra undertakes its own repairs, Metra may file claims consistent with the notice provision no later than 90 days after performing said repairs. Metra shall submit to the Contractor a claim in writing for such costs and expenses ("Warranty Claim"). The Warranty Claim shall identify the Deficiency and the correction to which such costs and expenses are related, and shall provide such other information necessary to document the costs and expenses incurred by Metra and their relationship to the Deficiency and the correction. The Contractor shall reimburse Metra in a timely manner for all such costs and expenses within thirty (30) days after the Contractor's receipt of Metra's Warranty Claim.

## **2.6 LIQUIDATED DAMAGES**

### **2.6.1 Generally**

This Section is controlled by and intended to supplement the Liquidated Damages provision found in the General Conditions. Locomotives that unexpectedly have to be removed from revenue service and remain out of service cause significant damages to Metra's operations and reputation, and to the traveling public which depends upon Metra for timely and reliable daily service.

### **2.6.2 Removal from Service**

For all locomotives removed from service, Contractor or its sureties shall pay agreed liquidated damages at the rate of five hundred dollars (\$500) per day per locomotive until the locomotive is accepted back into service. Those damages are not readily susceptible to calculation. The parties to this Contract therefor agree that liquidated damages are appropriate compensation to Metra. These liquidated damages cover only damages associated with the loss of use of locomotives and do not compensate Metra for damages for breach of warranty or other breach of contract, such as damages for the cost of warranty work or the extra costs of obtaining substitute goods or performance from others. Payment of liquidated damages under this section, and acceptance thereof by Metra, does not constitute a waiver or settlement of any claim (other than for delay in delivering acceptable locomotives or delay in providing a warranty response or correction as required under this Contract) for damages for such breaches, and nothing in this section is intended to limit such claims.

### **2.6.3 Delayed Warranty Response or Effective Corrective Action**

In the event the Contractor breaches Section 2.5.5 Corrective Work Requirements, and the affected Metra locomotive remains out of service for more than 48 hours, Contractor shall pay to Metra as liquidated damages the sum of five hundred dollars

(\$500) per day for every full day thereafter until Contractor provides the services and equipment otherwise required by Section 2.5.5 to be provided within 48 hours after Metra's notice of a Deficiency, or until the locomotive is returned to revenue service, whichever is first.

In any instance in which a Deficiency causes a locomotive to become unavailable for service, and the Contractor fails to complete a Warranty correction to such Deficiency within a time sufficient to enable the locomotive to be tested and returned to service within ten (10) calendar days after the Deficiency caused the locomotive to become unavailable for service, the Contractor shall pay to Metra as liquidated damages the sum of Five Hundred Dollars (\$500.00) for each day that the locomotive is out of service, commencing with the first full out-of-service day after the expiration of the ten (10) day period. The ten (10) day period calculated pursuant to this paragraph shall not include reasonable transportation time to transport the locomotive from Metra to Contractor's repair facility. Note there is no cap or maximum on the amount of liquidated damages under this provision.

#### **2.6.4 Accrued Liquidated Damages**

For purposes of liquidated damages for this section, payable on Metra's demand. Metra may, at its discretion, choose to accrue liquidated damages under this provision until there is no further possibility of additional liquidated damages.

## **2.7 PRICE PROPOSAL**

### **2.7.1 Generally**

Pricing shall include all costs, including all costs for design, development, securing all necessary rights (including licensing, support and maintenance costs for any and all Required Software), manufacture, construction, fabrication, assembly, delivery, and all associated costs. No additional costs will be allowed, except for actual performance and payment bond costs. Price will be fixed for the base order of five (5) locomotives with a maximum of twelve (12) locomotives for the contract. A price adjustment will be allowed for locomotives purchased in years 2 through 7 based on the Producer Price Index for Railroad rolling stock manufacturing, published by the United States Department of Labor's Bureau of Labor Statistics (Series ID: PCU3365103365106; Base Date: 198406).

The proposed unit price and the index value for the month and year of the date proposals are received will serve as the Base Index Value to determine the unit pricing for the locomotives released in years 2 through 7. The Current Published Index Value will be the index value for the month and year of the date an option order is received. The unit pricing will be adjusted in accordance with the following example equation.

For Example: If the current published Index Value is 122.5, the Base Index Value is 122.1, and the base unit price is \$1,000,000, then the release order unit price would be:

$$122.5/122.1 \times \$1,000,000.00 = \$1,003,276.00$$

which represents a 0.3276% increase.

### **2.7.2 Base Index**

Producer Price Index for Railroad Rolling Stock Manufacturing; Locomotives, new and rebuilt, including parts; (Series ID: PCU3365103365106; Base Date: 198406)	
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### **2.7.3 Unit Pricing**

The pricing table below must be completed in its entirety. Incomplete pricing proposals may be rejected.

Actual quantities will consist of the base order, plus any options ordered.

## 2.7.4 Unit Prices

<b>Item Description</b>	<b>Unit Price</b>	<b>Quantity</b>	<b>Total Price</b>
Engineering Costs (A)	N/A	N/A	\$
Training and Document Costs (B)	N/A	N/A	\$
Train Simulator (Spec. M-25-002; Section 19.11.4) (C)	\$	1	\$
Warranty Costs (D)	N/A	N/A	\$
Payment & Performance Bond at 100% for all 12 Locomotives (for evaluation only)	\$	N/A	\$
All-Electric Passenger Locomotives (Base)	\$	5	
All-Electric Passenger Locomotives (Options)	\$	7	\$
<b>Spare Parts</b>			
A/C Unit Part # _____	\$	4	\$
Truck Complete Part # _____	\$	4	\$
Battery Bank (Lowest Replace Unit) Part # _____	\$	8	\$
Traction Motor Part # _____	\$	4	\$
Wheel-Axle-Gear Unit Part # _____	\$	4	\$
<b>Specialty Tools</b>			
Specialty Tools and Test & Diagnostic Equipment (Per Section 19.10 of Technical Specification M-25-002)	\$	1	\$
<b>Grand Total Cost</b>			<b>\$</b>

## **2.7.5 Milestone Payment Schedule**

Payments for the surety costs and line items A through C shall be made in accordance with the following schedule:

Item	Payment %	Cumulative %	Description
N/A	N/A	N/A	Reimbursement of actual Metra approved surety costs.
A	100	100	Engineering Design/Drawing Acceptance.
B.1	20	20	Metra's Approval of the Training Program.
B.2	80	100	On successful completion of training at each site.
D	100	100	Approval of Technical and Warranty Support plan.

Payments for individual locomotives shall be made in accordance with the following schedule:

E.1	33	33	Major Equipment Component Installation: to include installation and alignment of the batteries, HEP system, air compressor, high voltage cabinet and trucks.
E.2	33	66	Fitness for Delivery and approval for shipping from facility to Metra.
E.3	33	99	Final Acceptance of each locomotive. Acceptance to include completion and an acceptance of post-delivery testing and closure of Open Items.
E.4	1	100	Completion of the initial three-year warranty.

## **3 FTA CLAUSES**

### **3.1 NO GOVERNMENT OBLIGATIONS TO THIRD PARTIES**

Metra and the Contractor acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of the underlying contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this contract and shall not be subject to any obligations or liabilities to Metra, the Contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract. The Contractor agrees to include the above clause in each subcontract financed in whole or in part with Federal assistance provided by the FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

### **3.2 PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS AND RELATED ACTS**

The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 et seq. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying contract, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or the FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal Government deems appropriate.

The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. chapter 53, the Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5323(l) on the Contractor, to the extent the Federal Government deems appropriate.

The Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

### **3.3 ACCESS TO RECORDS AND REPORTS**

See General Conditions 1.12.14.

### **3.4 FEDERAL CLAUSES**

Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between Metra and FTA, as they may be amended or promulgated from time to time during the term of this contact. Contractor's failure to so comply shall constitute a material breach of this contract.

### **3.5 CIVIL RIGHTS REQUIREMENTS**

Metra is an Equal Opportunity Employer. As such, Metra agrees to comply with all applicable Federal civil rights laws and implementing regulations. Apart from inconsistent requirements imposed by Federal laws or regulations, Metra agrees to comply with the requirements of 49 U.S.C. § 5323(h) (3) by not using any Federal assistance awarded by FTA to support procurements using exclusionary or discriminatory specifications.

Under this Agreement, the Contractor shall at all times comply with the following requirements and shall include these requirements in each subcontract entered into as part thereof.

1. Nondiscrimination. In accordance with Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, sex, disability, or age. In addition, the Contractor agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.
2. Race, Color, Religion, National Origin, Sex. In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e et seq., and Federal transit laws at 49 U.S.C. § 5332, the Contractor agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. chapter 60, and Executive Order No. 11246, "Equal Employment Opportunity in Federal Employment," September 24, 1965, 42 U.S.C. § 2000e note, as amended by any later Executive Order that amends or supersedes it, referenced in 42 U.S.C. § 2000e note. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, national origin, or sex (including sexual orientation and gender identity). Such action shall include, but not be limited to, the following: employment, promotion, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.
3. Age. In accordance with the Age Discrimination in Employment Act, 29 U.S.C. §§ 621-634, U.S. Equal Employment Opportunity Commission (U.S. EEOC) regulations, "Age Discrimination in Employment Act," 29 C.F.R. part 1625, the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6101 et seq., U.S. Health and Human Services regulations, "Nondiscrimination on the Basis of Age in Programs or Activities Receiving Federal Financial Assistance," 45 C.F.R. part 90, and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.
4. Disabilities. In accordance with section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, the Americans with Disabilities Act of 1990, as amended, 42 U.S.C. § 12101 et seq., the Architectural Barriers Act of 1968, as amended, 42 U.S.C. § 4151 et seq., and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against individuals on the basis of disability. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

### **3.6 INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION (FTA) TERMS**

The provisions herein include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F or most recent version are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with Metra requests which would cause Metra to be in violation of the FTA terms and conditions.

### **3.7 CARGO PREFERENCE**

The Contractor agrees:

To use privately owned United States-Flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved whenever shipping any equipment, material, or commodities pursuant to the underlying contract to the extent such vessels are available at fair and reasonable rates for United States-Flag commercial vessels;

To furnish within 20 working days following the date of loading for shipments originating within the United States or within 30 working days following the date of leading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of-lading in English for each shipment of cargo described in the preceding paragraph to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DB 20590 and to the FTA recipient (through the Contractor in the case of a subcontractor's bill-of-lading);

To include these requirements in all subcontracts issued pursuant to this contract when the subcontract may involve the transport of equipment, material, or commodities by ocean vessel.

### **3.8 FLY AMERICA REQUIREMENTS**

*a) Definitions.* As used in this clause-

"International air transportation" means transportation by air between a place in the United States and a place outside the United States or between two places both of which are outside the United States.

"United States" means the 50 States, the District of Columbia, and outlying areas.

"U.S.-flag air carrier" means an air carrier holding a certificate under 49 U.S.C. Chapter 411.

*b) When Federal funds are used to fund travel, Section 5 of the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118) (Fly America*

- Act) requires contractors, recipients, and others use U.S.-flag air carriers for U.S. Government-financed international air transportation of personnel (and their personal effects) or property, to the extent that service by those carriers is available. It requires the Comptroller General of the United States, in the absence of satisfactory proof of the necessity for foreign-flag air transportation, to disallow expenditures from funds, appropriated or otherwise established for the account of the United States, for international air transportation secured aboard a foreign-flag air carrier if a U.S.-flag air carrier is available to provide such services.
- c) If available, the Contractor, in performing work under this contract, shall use U.S.-flag carriers for international air transportation of personnel (and their personal effects) or property.
  - d) In the event that the Contractor selects a carrier other than a U.S.-flag air carrier for international air transportation, the Contractor shall include a statement on vouchers involving such transportation essentially as follows:

#### **Statement of Unavailability of U.S.-Flag Air Carriers**

International air transportation of persons (and their personal effects) or property by U.S.-flag air carrier was not available or it was necessary to use foreign-flag air carrier service for the following reasons. See FAR § 47.403. *[State reasons]*:

The Contractor shall include the substance of this clause, including this paragraph (e), in each subcontract or purchase under this contract that may involve international air transportation.

### **3.9 TRANSIT EMPLOYEE PROTECTIVE AGREEMENTS**

Omitted.

### **3.10 DRUG AND ALCOHOL TESTING**

The Contractor agrees to participate in Metra's drug and alcohol program established in compliance with 49 CFR 655.

### **3.11 PATENT RIGHTS**

The following requirements apply to each contract involving experimental, developmental, or research work:

General - If any invention, improvement, or discovery is conceived or first actually reduced to practice in the course of or under the contract to which this Attachment has been added, and that invention, improvement, or discovery is patentable under the laws of the United States of America or any foreign country, Metra and Contractor agree to take actions necessary to provide immediate notice and a detailed report to the party at a higher tier until FTA is ultimately notified.

Unless the Federal Government later makes a contrary determination in writing, irrespective of the Contractor's status (a large business, small business, state government or state instrumentality, local government, nonprofit organization, institution of higher education, individual), Metra and the Contractor agree to take the necessary actions to

provide, through FTA, those rights in that invention due the Federal Government as described in U.S. Department of Commerce regulations, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," 37 C.F.R. Part 401.

The Contractor also agrees to include the requirements of this clause in each subcontract for experimental, developmental, or research work financed in whole or in part with Federal assistance provided by FTA.

### **3.12 COPYRIGHT AND RIGHTS IN DATA**

The following requirements apply to each contract involving experimental, developmental or research work:

The term "subject data" used in this clause means recorded information, whether or not copyrighted, that is delivered or specified to be delivered under the contract. The term includes graphic or pictorial delineation in media such as drawings or photographs; text in specifications or related performance or design-type documents; machine forms such as punched cards, magnetic tape, or computer memory printouts; and information retained in computer memory. Examples include, but are not limited to: computer software, engineering drawings and associated lists, specifications, standards, process sheets, manuals, technical reports, catalog item identifications, and related information. The term "subject data" does not include financial reports, cost analyses, and similar information incidental to contract administration.

The following restrictions apply to all subject data first produced in the performance of the contract to which this Attachment has been added:

Except for its own internal use, the Purchaser or Contractor may not publish or reproduce subject data in whole or in part, or in any manner or form, nor may the Purchaser or Contractor authorize others to do so, without the written consent of the Federal Government, until such time as the Federal Government may have either released or approved the release of such data to the public; this restriction on publication, however, does not apply to any contract with an academic institution.

In accordance with 49 C.F.R. § 18.34 and 49 C.F.R. § 19.36, the Federal Government reserves a royalty-free, non-exclusive and irrevocable license to reproduce, publish, or otherwise use, and to authorize others to use, for "Federal Government purposes," any subject data or copyright described in subsections (2)(b)1 and (2)(b)2 of this clause below. As used in the previous sentence, "for Federal Government purposes," means use only for the direct purposes of the Federal Government. Without the copyright owner's consent, the Federal Government may not extend its Federal license to any other party.

Any subject data developed under that contract, whether or not a copyright has been obtained; and

Any rights of copyright purchased by the Purchaser or Contractor using Federal assistance in whole or in part provided by FTA.

When FTA awards Federal assistance for experimental, developmental, or research work, it is FTA's general intention to increase transportation knowledge available to the public, rather than to restrict the benefits resulting from the work to participants in that work. Therefore, unless FTA determines otherwise, the Purchaser and the Contractor performing experimental, developmental, or research work required by the underlying contract to which this Attachment is added agrees to permit FTA to make available to the public, either FTA's license in the copyright to any subject data developed in the course of that contract, or a copy of the subject data first produced under the contract for which a copyright has not been obtained. If the experimental, developmental, or research work, which is the subject of the underlying contract, is not completed for any reason whatsoever, all data developed under that contract shall become subject data as defined in subsection (a) of this clause and shall be delivered as the Federal Government may direct. This subsection (c), however, does not apply to adaptations of automatic data processing equipment or programs for the Purchaser or Contractor's use whose costs are financed in whole or in part with Federal assistance provided by FTA for transportation capital projects.

Unless prohibited by state law, upon request by the Federal Government, the Purchaser and the Contractor agree to indemnify, save, and hold harmless the Federal Government, its officers, agents, and employees acting within the scope of their official duties against any liability, including costs and expenses, resulting from any willful or intentional violation by the Purchaser or Contractor of proprietary rights, copyrights, or right of privacy, arising out of the publication, translation, reproduction, delivery, use, or disposition of any data furnished under that contract. Neither the Purchaser nor the Contractor shall be required to indemnify the Federal Government for any such liability arising out of the wrongful act of any employee, official, or agents of the Federal Government.

Nothing contained in this clause on rights in data shall imply a license to the Federal Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Federal Government under any patent.

Data developed by the Purchaser or Contractor and financed entirely without using Federal assistance provided by the Federal Government that has been incorporated into work required by the underlying contract to which this Attachment has been added is exempt from the requirements of subsections (b), (c), and (d) of this clause, provided that the Purchaser or Contractor identifies that data in writing at the time of delivery of the contract work.

Unless FTA determines otherwise, the Contractor agrees to include these requirements in each subcontract for experimental, developmental, or research work financed in whole or in part with Federal assistance provided by FTA.

Unless the Federal Government later makes a contrary determination in writing, irrespective of the Contractor's status (i.e., a large business, small business, state government or state instrumentality, local government, nonprofit organization, institution of higher education, individual, etc.), the Purchaser and the Contractor agree to take the

necessary actions to provide, through FTA, those rights in that invention due the Federal Government as described in U.S. Department of Commerce regulations, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," 37 C.F.R. Part 401.

The Contractor also agrees to include these requirements in each subcontract for experimental, developmental, or research work financed in whole or in part with Federal assistance provided by FTA.

### **3.13 ENERGY CONSERVATION REQUIREMENTS**

The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

### **3.14 ASSIGNABILITY CLAUSE**

See General Conditions 1.12.23

### **3.15 TERMINATION**

See General Conditions 1.12.8 and 1.12.9

### **3.16 RECYCLED PRODUCTS**

The Contractor agrees to provide a preference for those products and services that conserve natural resources, protect the environment, and are energy efficient by complying with and facilitating compliance with Section 6002 of the Resource Conservation and Recovery Act, as amended, 42 U.S.C. § 6962, and U.S. Environmental Protection Agency (U.S. EPA), "Comprehensive Procurement Guideline for Products Containing Recovered Materials," 40 C.F.R. part 247.

### **3.17 SUSPENSION AND DEBARMENT**

The Contractor shall comply and facilitate compliance with U.S. DOT regulations, "Nonprocurement Suspension and Debarment," 2 C.F.R. part 1200, which adopts and supplements the U.S. Office of Management and Budget (U.S. OMB) "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 C.F.R. part 180. These provisions apply to each contract at any tier of \$25,000 or more, and to each contract at any tier for a federally required audit (irrespective of the contract amount), and to each contract at any tier that must be approved by an FTA official irrespective of the contract amount. As such, the Contractor shall verify that its principals, affiliates, and subcontractors are eligible to participate in this federally funded contract and are not presently declared by any Federal department or agency to be:

- a) Debarred from participation in any federally assisted Award;
- b) Suspended from participation in any federally assisted Award;
- c) Proposed for debarment from participation in any federally assisted Award;
- d) Declared ineligible to participate in any federally assisted Award;
- e) Voluntarily excluded from participation in any federally assisted Award; or
- f) Disqualified from participation in any federally assisted Award.

By signing and submitting its bid or proposal, the bidder or proposer certifies as follows:

The certification in this clause is a material representation of fact relied upon by Metra. If it is later determined by Metra that the bidder or proposer knowingly rendered an erroneous certification, in addition to remedies available to Metra, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The bidder or proposer agrees to comply with the requirements of 2 C.F.R. part 180, subpart C, as supplemented by 2 C.F.R. part 1200, while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

### **3.18 CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

The Contractor agrees:

- a) It will not use any violating facilities;
- b) It will report the use of facilities placed on or likely to be placed on the U.S. EPA “List of Violating Facilities;”
- c) It will report violations of use of prohibited facilities to FTA; and
- d) It will comply with the inspection and other requirements of the Clean Air Act, as amended, (42 U.S.C. §§ 7401 – 7671q); and the Federal Water Pollution Control Act as amended, (33 U.S.C. §§ 1251-1387).

### **3.19 BUY AMERICA REQUIREMENTS**

The contractor agrees to comply with 49 U.S.C. 5323(j) and 49 C.F.R. part 661, which provide that Federal funds may not be obligated unless all steel, iron, and manufactured products used in FTA funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 C.F.R. § 661.7. Separate requirements for rolling stock are set out at 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. § 661.11..

A bidder or offeror must submit to the FTA recipient the appropriate Buy America certification with all bids or offers on FTA-funded contracts, except those subject to a general waiver. Bids or offers that are not accompanied by a completed Buy America certification must be rejected as nonresponsive.

### **3.20 BREACHES AND DISPUTE RESOLUTION**

See General Conditions 1.12.9 and 1.15.4.

### **3.21 ADA ACCESS AND ACCESSIBILITY**

A third party contractor providing public transportation services must operate its services in compliance with 42 U.S.C. Sections 12101 et seq.; DOT regulations, “Transportation Services for Individuals with Disabilities (ADA)” using facilities and equipment that comply with 49 CFR Part 37; and Joint ATBCB/DOT regulations, “Americans with Disabilities (ADA) Accessibility Specifications for Transportation Vehicles,” 36 CFR Part 1192 and 49 CFR Part 38. Private entities must comply with the requirements of 49 CFR Part 37 applicable to public entities with which they contract to provide public

transportation services. The recipient should advise its third party contractors operating public transportation services to review the requirements for public entities in this context.

### **3.22 PRE-AWARD AND POST-DELIVERY AUDIT REQUIREMENTS**

The Contractor agrees to comply with 49 USC § 5323(m) and FTA's implementing regulation at 49 CFR Part 663. The Contractor shall comply with the Buy America certification(s) submitted with its proposal/bid. The Contractor agrees to participate and cooperate in any pre-award and post-delivery audits performed pursuant to 49 C.F.R. part 663 and related FTA guidance.

### **3.23 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT**

The Contractor shall comply with all federal laws, regulations, and requirements providing wage and hour protections for non-construction employees, in accordance with 40 U.S.C. § 3702, Contract Work Hours and Safety Standards Act, and other relevant parts of that Act, 40 U.S.C. § 3701 *et seq.*, and U.S. DOL regulations, “Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction (also Labor Standards Provisions Applicable to Non-construction Contracts Subject to the Contract Work Hours and Safety Standards Act),” 29 C.F.R. part 5.

The Contractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three (3) years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid.

Such records maintained under this paragraph shall be made available by the Contractor for inspection, copying, or transcription by authorized representatives of the FTA and the Department of Labor, and the Contractor will permit such representatives to interview employees during working hours on the job.

The Contractor shall require the inclusion of the language of this clause within subcontracts of all tiers.

### **3.24 SAFE OPERATION OF MOTOR VEHICLES**

#### **3.24.1 Seat Belt Use**

The Contractor is encouraged to adopt and promote on-the-job seat belt use policies and programs for its employees and other personnel that operate company-owned vehicles, company-rented vehicles, or personally operated vehicles. The terms “company-owned” and “company-leased” refer to vehicles owned or leased either by the Contractor or Metra.

#### **3.24.2 Distracted Driving**

The Contractor agrees to adopt and enforce workplace safety policies to decrease crashes caused by distracted drivers, including policies to ban text messaging while using an electronic device supplied by an employer, and driving a vehicle the driver

owns or rents, a vehicle Contactor owns, leases, or rents, or a privately-owned vehicle when on official business in connection with the work performed under this agreement.

# **CONTRACT DOCUMENTS**

## **Section 4**

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## **REQUEST FOR PROPOSAL**

### **RFP No. 177045**

### **ALL-ELECTRIC PASSENGER LOCOMOTIVES**

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NORTHEAST ILLINOIS REGIONAL COMMUTER RAILROAD CORPORATION D/B/A METRA  
CONSTRUCTION & FACILITIES MAINTENANCE PROCUREMENT  
547 WEST JACKSON BOULEVARD  
CHICAGO, IL 60661



## Mechanical Department

### Technical Specification for All-Electric Passenger Locomotive

**SPECIFICATION No. M-25-002**

**REVISION: First Issue**

**DATE: 04/29/2025**

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## RECORD OF REVISIONS

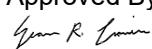
REVISION	PREPARED BY	DATE	DESCRIPTION	APPROVED BY	DATE
Draft	S. Cronin	04/29/2025	Draft Spec for All-Electric Passenger Locomotive		
First Issue	S. Cronin	04/29/2025	All-Electric Passenger Locomotive Specification	<i>Sean R. Cronin</i>	04/29/2025

NOTE: This document is to be considered "uncontrolled" when printed as a hardcopy from the network. The revision level must be verified prior to use.

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# 1 GENERAL REQUIREMENTS

## 1.1 GENERAL REQUIREMENTS

- 1.1.1 This specification covers new or remanufactured commuter passenger locomotives to be used in push-pull type passenger service transporting passengers in the greater Chicago Metropolitan Area and its environs. The locomotives are to be operated in trains that can range in size from two cars minimum to eleven cars maximum. The design of the locomotive shall provide a safe, comfortable ride at all speeds up to Metra's maximum authorized operating speed (79 mph). The locomotive car-body and trucks shall be designed for speeds up to 90 miles per hour.
- 1.1.2 Basic Features and Characteristics
- 1.1.2.1 Locomotive must be fully compatible with existing Metra rolling stock, including diesel-electric locomotives in multiple-unit operation, and passenger coaches of varying types and manufacturer's products, excluding "Metra Electric" EMU equipment only.
- 1.1.2.2 Locomotive must be capable of operating on any designated Metra District(s) with respect to weight and curve negotiation requirements/limitations
- 1.1.2.3 Locomotive must minimize maintenance and life cycle costs
- 1.1.2.4 Locomotive must have full width locomotive cab
- 1.1.2.5 Locomotive propulsion systems must be all-electric design.
- 1.1.2.6 Locomotive must be capable of producing at least 3000 GHP, or equivalent
- 1.1.2.7 Locomotive shall be conventional single battery prime mover design that emits zero emissions
- 1.1.2.8 Locomotive must have traction power sufficient for eleven (11) bi-level car train operation at typical and established Metra track speeds and schedules
- 1.1.2.9 Locomotive must be either four or six axle configuration (at least 4 powered axles)
- 1.1.2.10 Locomotive shall have electric propulsion with Alternating Current (AC) traction motors
- 1.1.2.11 Locomotive shall provide head end power with zero emissions of at least 500kW @ .8 Power Factor continuous
- 1.1.2.12 Locomotive must be equipped with microprocessor controlled, standard 26L compatible brake system, capable of operating in MU consists. A blended automatic brake system, using an optimal combination of pneumatic and dynamic braking shall be controlled by means of the automatic brake valve
- 1.1.2.13 Locomotive must comply with Clearance Diagram Metra Drawing M-2110 , Amtrak Drawing A99-0087, and have the capability to operate anywhere on the Metra system as assigned
- 1.1.2.14 Locomotive must have maintenance intervals not less than 184 days
- 1.1.2.15 Locomotive must have a design service life of 30 years, at a minimum. Service life should apply to the entire locomotive (except consumables) inclusive of prescribed scheduled maintenance overhauls and replacements
- 1.1.3 The locomotives are to be built in accordance with the requirements described in these specifications, and shall comply with all Federal Railroad Administration (FRA) regulations in effect at the time the Notice to Proceed is issued as well as the applicable standards of the Association of American Railroads (AAR) and/or American Public Transportation Association (APTA) in effect at the time the Notice to Proceed is issued.
- 1.1.4 All documents, correspondence, meetings, and technical information shall be offered and conducted in the English Language and using US customary system of weights and measures.

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1.1.5 Drawings and other data contained herein are considered part of these specifications. In case of conflict, these specifications shall govern. Where these specifications conflict with FRA regulations and/or AAR & APTA standards (or conflict between regulations and standards) the following hierarchy shall apply: 1) FRA Regulations, 2) these Specifications, 3) APTA Standards, and 4) AAR Standards. The Contractor and the Contracting Authority will jointly resolve any conflicts that exist.

1.1.6 As part of the design review the Contractor shall submit the drawings and documentation as required in sections 1.6, 1.7 and elsewhere in this specification where terms "approved", "approved manner", "approved by the Contracting Authority", "subject to approval" and "The Contracting Authority approval" appear. Without limitation, the Contractor shall also provide additional information or documentation related to the design and production of the vehicles if requested to do so by the Contracting Authority.

Metra shall review all documents submitted. All submittals will be documented as:

1.1.6.1 Approved: defined as the Contracting Authority concurs with the information in its submitted form. The material may be incorporated into the program.

1.1.6.2 Approved/Conditionally: defined as the Contracting Authority agrees in principle with the submitted information. However some details must be revised to make the information fully approved. The material must be resubmitted in revised form for approval.

1.1.6.3 Disapproved: defined as the Contracting Authority does not concur with the submitted details. The Contractor shall not incorporate the material into the program. The Contracting Authority's objections must be reconciled and the material must be resubmitted in revised form for approval.

1.1.6.4 Insufficient Information: defined as the information provided was illegible or insufficient to enable a complete review.

The Contracting Authority will respond within 20 working days to any review submittal, calculated from the date of receipt of documents by Metra to the date a response is sent to the Contractor, provided the Contractor submits such review material in a reasonable time sequence and manageable volume.

Revisions to the Contracting Authority approved documents and the Contractor's internal change requests affecting the Contracting Authority approved documents, shall be submitted to the Contracting Authority for approval as they are issued. No more than three approved drawing alterations (change requests) shall remain unincorporated on any drawing at any time, and no approved change request shall remain unincorporated into a drawing for a period greater than two months from the date of approval.

The Contracting Authority's approval of a drawing or document is for a limited purpose and it is not an approval for a deviation. Approval does not relieve the Contractor of the obligation of meeting all the requirements of this Contract. Approval of a drawing which contains a deviation from, or violation of these Specifications does not constitute authority for that deviation or violation unless such deviations have been specifically requested in writing and specifically granted by the Contracting Authority in writing according to all contract requirements.

1.1.7 The Contractor shall prepare and submit to each Contracting Authority for approval, prior to construction of the locomotives, copies (electronically in searchable PDF format and two (2) hard copies) of each drawing required by these specifications and all drawings necessary to demonstrate compliance with these specifications. This shall include, but not be limited to: clearance drawing, arrangement drawings, structural drawings, assembly drawings, sub-assembly drawings, integrated wiring schematics, and drawings of major equipment and apparatus. **[CDRL C-1-01]**

Drawings submitted by Subcontractors and Suppliers shall be thoroughly checked by the Contractor to ensure that they conform with the requirements of these specifications prior to submittal to the Contracting Authority.

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- 1.1.8 The Contractor shall submit, prior to the car-body testing, a stress analysis of the complete car-body structure and supports for equipment weighing over two hundred (200) pounds. This analysis shall show the calculated stresses, allowable stresses and the margin of safety for all elements for the specified load conditions. All critical joints shall be included in this analysis (manual calculations if necessary). In addition conformance to all referenced standards shall be demonstrated. The analysis shall, as a minimum, consist of a finite element analysis using recognized computer programs (Nastran, Ansys, etc.). **[CDRL C-1-02]**
- 1.1.9 A post-award conference shall take place no later than 20 working days after Notice To Proceed, at Metra's or the Contractor's facilities, as directed by METRA, to accomplish the following:
- 1.1.9.1 Introduce Metra's key personnel to the Contractor
  - 1.1.9.2 Confirm the Contractor's management team and key staff and the scope of supply of subcontractors
  - 1.1.9.3 Establish formal channels of, and procedures for, communication and documentation management system (e.g. letter, meeting numbering, online file management system)
  - 1.1.9.4 Establish an understanding of the Contractor's project control methodology and plans for initial activities before the start of formal progress reporting
  - 1.1.9.5 Discussion to familiarize the Contractor with Metra's intended operations and maintenance environment
  - 1.1.9.6 Identify the early information needs and decisions required by the Contractor from the Contracting Authority
- 1.1.10 The Contractor shall hold formal design review meetings with the Contracting Authority. The purpose of these meetings is to ensure that the requirements of these specifications are being met by the design. The schedule and location for these meetings shall be by mutual agreement. Design review material shall be submitted no later than 15 working days prior to each review meeting, and shall include the drawings, technical data, analyses, calculations and other items required for the review. Four types of design reviews shall be held:
- 1.1.10.1 Preliminary design review(PDR): Preliminary design review of system components shall be made at the 30% level of designs. The PDR shall include a review of the design concept, written descriptions of the functionality, schematics of the system wiring and drawings of each component showing dimensions and structural elements. The Contracting Authority retains the right to redline, comment, and request changes to improve design and/or functionality.
  - 1.1.10.2 Intermediate design review (IDR): An intermediate design review (IDR) shall be held when the design of the locomotive is approximately 60% complete. This shall represent an advancement of design of the locomotive from the preliminary design stage to development of draft production drawings, arrangements, component and material specifications and schematics for all systems, subsystems and components, which will be used by the Contracting Authority to evaluate the proposed design of the locomotive to a level of detail sufficient that the Contractor shall be able to proceed with the development of the locomotive design to the 95% draft final stage.
  - 1.1.10.3 Mockup development and review: Upon completion of the IDR stage of the design review process, the Contractor shall complete the assembly of full size mockups hard mockups of the following areas and systems of the locomotives; according the drawings as reviewed and approved at the IDR, for the Contracting Authority review and comment:

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1.1.10.3.1 Cab and console including all gauges, controls, switches, display panels, windows, mirrors, etc. Controls shall have simulated operation to evaluate the range of motion and effort required to operate the control equipment. If practical, the side representative side windows of the size/style proposed for installation shall be included in the mockup. Seats shall be installed to evaluate circulation, ease of getting into and out of the cab, and knee/leg room under desktop.

1.1.10.3.2 Prime Mover/Battery compartment

1.1.10.3.3 Locomotive underfloor components

1.1.10.3.4 Truck arrangement including suspension components and attachment points to the locomotive underframe

1.1.10.4 Final design review (FDR): Final design review (FDR) of system components shall be held at 95% or greater level of design. The FDR shall include a review of all documents and plans for the design as revised, including the written descriptions of the functionality, schematics of the system wiring, drawings of each component showing dimensions and structural elements. Redlines and comments from the IDR and mockup review shall be reviewed. Metra retains the right to provide additional comments during this process as production progresses and concerns are brought to the Customer's attention.

1.1.11 Progress review meetings shall be held at mutually agreed to time periods either at the Contracting Authority's headquarters or at the Contractor's (or its subcontractors') facilities as deemed necessary.

1.1.12 Whenever in this specification one or more brands, trade names, or catalog numbers of specific manufacturers are mentioned, it is in the intent of establishing identification, a basis of quality and durability and though the term "or approved equal" may not be inserted, it may be implied. Only substitutions equal to the specified items will be allowed and only when such substitution is necessary. Before furnishing and/or installing any product that is a substitution for the specified item, proof of equality shall be furnished by the Contractor, and the approval of the Contracting Authority's designated Mechanical officer must be obtained in writing before any such substitution is made.

## 1.2 PROJECT DRAWING DELIVERABLES

Project drawing deliverables shall comply with project specific specifications, the applicable Contracting Authority quality management plans, contractually required procurement documents, and this document. All contract drawing submittals to the Contracting Authority shall consist of both hardcopy and electronic formats, which shall conform to the requirements of this section.

### 1.2.1 Disposition for Problems, Questions, and Discrepancy

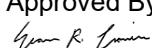
When problems, questions, and/or discrepancies are identified between this document, contractual documents, etc., the Contractor must inform the Contracting Authority and the work must be performed in accordance with the instruction for disposition from the Contracting Authority's Project Manager.

### 1.2.2 Submittal Intervals

As drawings for a project are developed, the Contractor shall periodically submit drawing set(s) to the Contracting Authority for review and comment. The submittal intervals shall be defined by the contract documents and/or agreement by the Contracting Authority with the Contractor.

### 1.2.3 Reviews and Approvals

Drawings will only be approved or accepted by the Contracting Authority as to arrangement and conformance to the specifications and related drawings. Approval or acceptance shall

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not be construed as relieving or mitigating the Contractor of their responsibility for design verification, dimensional accuracy, adequacy and suitability of materials and / or the equipment represented thereon, or for compliance with contract requirements.

**1.2.4 Electronic Delivery Media.**

Electronic delivery media shall be coordinated with the Contracting Authority's Project Manager to ensure compatibility with the Contracting Authority's hardware and software. Accepted media or file transfer methods:

- USB 2.0 Drive or better
- Establishment of a secure FTP site

**1.2.5 Media Labeling.**

All media shall have a label containing, but not limited to:

- 1.2.5.1 Preparation date of the media.
- 1.2.5.2 The project description.
- 1.2.5.3 Contractor name and contract reference.
- 1.2.5.4 Contract transmittal number.
- 1.2.5.5 Quantity of files.
- 1.2.5.6 Operating System and version, and application software used to create the files.
- 1.2.5.7 The utility or command used to write the files to the media.

**1.2.6 Electronic File Preparation.**

All electronic files shall be delivered in the Contracting Authority approved formats. Deliverable file format shall be coordinated with the Contracting Authority's Project Manager to ensure the Contracting Authority's ability to use the delivered files. Before a file is placed on the electronic delivery media, the following procedures shall be performed:

- 1.2.6.1 Drawing files shall be in their native format, not DXF, or other neutral format. File format must be approved by the Contracting Authority.
- 1.2.6.2 Only one drawing or one model shall be included in each CADD file.
- 1.2.6.3 Remove all unnecessary graphics outside the drawing border area and set the active parameters to a standard setting of those in the seed or prototype file.
- 1.2.6.4 Ensure all external reference files are attached without device or directory specifications. Include a list of files included in the deliverable in a text document on the media.
- 1.2.6.5 All deliverables shall be certified virus-free.

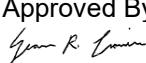
**1.2.7 Documentation.**

All drawing packages submitted to the Contracting Authority shall include, but not be limited to, a transmittal containing the same information as on the external media label, and:

- 1.2.7.1 A hardcopy list of files included in the deliverable.
- 1.2.7.2 A full size hard copy plot of each drawing file submitted on the media.
- 1.2.7.3 Person designated as point of contact.
- 1.2.7.4 Certification in the form of a signed statement, that the delivery data is free of known computer viruses, including the name(s) and release date(s) of the virus scanning software used to check the media.

**1.2.8 Quality**

As part of their contractual requirements to the Contracting Authority, the Contractor will be responsible for the quality assurance and quality control of the drawings, CADD files and other documents submitted to the Contracting Authority as part of the contract. The Contractor shall ensure compliance to this document, the Contracting Authority project specifications, applicable Contracting Authority quality management plans, and other contractually required documents. The Contracting Authority's review of the submittals shall not be construed as relieving or mitigating the Contractor of this responsibility.

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1.2.9      Ownership.

The following shall apply to the Contracting Authority contracts with electronic drawing deliverables:

The Contracting Authority shall have UNLIMITED RIGHTS to all information and materials developed for the Contracting Authority contracts and furnished to the Contracting Authority and documentation thereof, reports and listings, and all other items pertaining to the work and services pursuant to this agreement including any copyright. Unlimited rights are rights to use, to use, duplicate, or disclose text, data, drawings, and information, in whole or in part in any manner and for any purpose whatsoever without compensation to or approval from the Contractor. The Contracting Authority will at all reasonable times have the right to inspect the work and will have access to and the rights to make copies of the above-mentioned items. All digital files and data, and other products generated under the Contracting Authority contract shall become the property of the Contracting Authority. In no event shall the Contractor, Consultant or Vendor use its obligation to recognize and protect subcontractor or supplier as an excuse for failing to satisfy its contractual obligations to the Contracting Authority.

## 1.3 QUALITY ASSURANCE

1.3.1      The Contractor shall have a quality assurance program conforming to the Mechanical Department Quality Plan (MQP), the FTA Quality Management System Guidelines - 2019 issued October 2019 and the attached Quality Assurance Requirements. On a case by case basis, the Contracting Authority may approve the use of other quality guidelines recognized in the United States such as the quality assurance guidelines published by the Association of American Railroads. In addition, the Contractor's management shall submit a declaration of their commitment to quality and the implementation of the contractually required MQP and FTA QMS guidelines.

1.3.2      The contractor shall submit a copy of their quality assurance plan to the Contracting Authority for review. Metra shall be the sole judge of compliance of the Contractor's quality assurance plan and program to the Contracting Authority's requirements and the appropriate quality assurance standards.

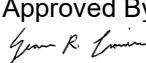
1.3.3      The Contractor shall provide an organizational chart to the Contracting Authority. The organizational chart shall depict the Contractor's overall management structure, reporting lines, authority and accountability among the Contractor's staff, subcontractors and the interfacing relationships between the Contracting Authority and the Contractor. A list of personnel assigned to the Contracting Authority's contract, their education, experience, accountability, and authority level shall also be provided.

1.3.4      Upon review by the Contracting Authority, any deviation or deficiencies in the quality assurance plan may render the bid non-responsive.

1.3.5      Submission of a bid gives the Contracting Authority the authority to perform assessments and inspections of the Contractor's and their subcontractor's facilities in order to perform a quality audit(s). Audit(s) shall be scheduled no later than 14 days from the Contracting Authority's notice to perform the audit.

1.3.5.1 The Contracting Authority may inspect tooling, procedure manuals, training programs, worker certification records, test gauges, inspection procedures, and subcontractor qualifications.

1.3.5.2 The audit will be styled after and include the items described in AAR Specification M-1003.

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- 1.3.6 The Contracting Authority's authorized representative(s) shall have, at all reasonable times, access to the Contractor's and their subcontractor's facilities for the purpose of inspecting materials, workmanship, quality, and compliance to this specification. Refusal to permit such inspection may be construed as non-compliance with the Contracting Authority's specification and risks in cancellation of the bid.
- 1.3.7 The presence of the Contracting Authority's representative(s) at the contractor's facility shall not in any manner supplant the contractor's own inspection, nor lessen the responsibility to meet all requirements of this specification. The Contracting Authority shall have the right to reject all products, material and/or workmanship that does not conform to this specification or accepted practices.
- 1.3.8 The Contractor shall submit the following with their Bids for review, the Contracting Authority shall be the sole judge of compliance of the Contractor's submittals to the Contracting Authority's requirements and the appropriate quality assurance standards:
- 1.3.8.1 Contractor's Quality Assurance Manual and Procedures **[CDRL C-1-03]**
  - 1.3.8.2 Contractor's organizational chart with personnel assigned to Metra's contract **[CDRL C-1-04]**
  - 1.3.8.3 Contractor's management's declaration of their commitment to quality and the implementation of the contractually required MQP and FTA QMS guidelines **[CDRL C-1-05]**
  - 1.3.8.4 Contractor's Project Quality Plan and Procedures **[CDRL C-1-06]**
  - 1.3.8.5 Contractor's ratio of Inspection to Production Personnel **[CDRL C-1-07]**
  - 1.3.8.6 Contractor's Software Quality Assurance Plan **[CDRL C-1-08]**
  - 1.3.8.7 Contractor's Supplier and Subcontractor Qualification, Quality Compliance, and Management Plan and Procedures **[CDRL C-1-09]**
  - 1.3.8.8 Contractor's List of all supplier and subcontractors, their qualifications, and quality certifications (ANSI-ASQ ISO) **[CDRL C-1-10]**
  - 1.3.8.9 Contractor's First Article Inspection (FAI) Plan and Procedures **[CDRL C-1-11]**
  - 1.3.8.10 Contractor's MRB Plan and Procedures **[CDRL C-1-12]**
  - 1.3.8.11 Corrective and Preventative Plan and Procedures **[CDRL C-1-13]**
- 1.3.9 The bidder shall correct all deviations or deficiencies determined by the Contracting Authority. Failure to correct such deficiencies or repetitive notation of deficiencies shall be cause for cancellation of the contract.
- 1.3.10 Only substitutions equal (or better in comparison) to the specified items will be subject for approval by the Contracting Authority's designated Mechanical officer and only when such substitution is necessary. Before furnishing and/or installing any product that is a substitute for the specified item, proof of equality and quality shall be furnished by the Contractor. Then the written approval of the Contracting Authority's designated Mechanical officer must be obtained before any such decision is made. The Contracting Authority shall have the right to reject or accept the proposed substitution.

#### 1.4 CONTRACT DELIVERABLES REQUIREMENTS LIST

<b>CDRL</b>	<b>Title</b>
C-1-01	Drawing Submittals
C-1-02	Car-Body Stress Analysis
C-1-03	Contractor's Quality Assurance Manual and Procedures
C-1-04	Contractor's Organizational Chart with Personnel Assigned to Metra's Contract
C-1-05	Contractor's Management's Declaration of their Commitment to Quality and the

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	Implementation of the Contractually Required MQP and FTA QMS Guidelines
C-1-06	Contractor's Project Quality Plan and Procedures
C-1-07	Contractor's Ratio of Inspection to Production Personnel
C-1-08	Contractor's Software Quality Assurance Plan
C-1-09	Contractor's Supplier and Subcontractor Qualification, Quality Compliance, and Management Plan and Procedures
C-1-10	Contractor's List of all supplier and subcontractors, their qualifications, and quality certifications (ANSI-ASQ ISO)
C-1-11	Contractor's First Article Inspection (FAI) Plan and Procedures
C-1-12	Contractor's MRB Plan and Procedures
C-1-13	Corrective and Preventative Plan and Procedures

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## 2 ABBREVIATIONS AND DEFINITIONS

AAR	Refers to the Association of American Railroads
AEES	Automatic Engine Stop Start (also referred to as “Idle Reduction System”)
Approved Equivalent	The term “approved equivalent” shall mean an item which is fully equivalent or superior in terms of form, fit, function, performance and properties, to the Specified item
ANSI	Refers to the American National Standards Institute
APTA	Refers to the American Public Transportation Association (formally known as the American Public Transit Association)
ASME	Refers to American Society of Mechanical Engineers
ASTM	Refers to American Society for Testing Materials
AWS	Refers to American Welding Society
BNSF RR	Refers to the Burlington Northern Santa Fe Railroad
Contracting Authority	Refers to the agency with whom the locomotive builder signs a contract with
CFR	Code of Federal Regulations
EMD	Electro-Motive Diesel
EPA	United States Environmental Protection Agency
FDR	Final Design Review
FRA	Refers to the Federal Railroad Administration of the United States Department of Transportation
Head End Power (HEP)	Electrical Power (480 VAC, 3-phase, 60 Hz power) produced by a locomotive used as the primary electrical power source by the cars
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz
IDR	Intermediate Design Review
IGBT	Insulated Gate Bipolar Transistor
IEEE	Refers to the Institute of Electrical and Electronic Engineers
LED	Light-Emitting Diode

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Low Voltage DC	Low voltage DC refers to nominal DC voltages of less than or equal to 80 VDC
Metra	Refers to the Commuter Rail Division of the Regional Transportation Authority
MHz	Megahertz
Mean Time Between Failures (MTBF)	The mean operating time between independent failures, measured in calendar days
Mean Time Between Component Failures (MTBCF)	The mean time between individual component failures
MU	Multiple Unit
MW Hrs	Megawatt Hours
NEMA	Refers to the National Electrical Manufacturers Association
NTP	Notice-to-Proceed
Open Items	Items not resolved and documented as incomplete or defective. It is the Contractor's responsibility to resolve and close these issues.
PA/IC	Public Address/Intercom
PCS	Pneumatic Control Switch
PDF	Portable Document Format
PDR	Preliminary Design Review
PM	Preventive Maintenance
RFI	Radio frequency interference
RFP	Request for Proposal
RMS	Root mean square
RTA	Refers to the Regional Transportation Authority
SAE	Society of Automotive Engineers
Special Tools	Tools which have been specifically designed or developed for the purpose of repairing, maintaining, diagnosing, or installing a particular component or system which cannot be performed with commercially available, "off-the-shelf" tools.
T/L	Trainline

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TMS	Train Monitoring System
ULSD	Ultra Low Sulfur Diesel Fuel
UP RR	Refers to the Union Pacific Railroad
US	United States of America
USB	Universal Serial Bus
VAC	Volt Alternating Current
Contractor	Refers to the firm with whom a contract is made by Metra for the construction of the locomotives described in this specification
OEM	Refers to the manufacturer of one or more components to be applied to the subject locomotives during the work performed under this specification
Sub-Contractor	Refers to any shop, manufacturer, or other company or agency performing work on the subject locomotives under this specification, under contract to, or for, the Contractor.

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### **3 DIMENSIONS, WEIGHTS, AND GENERAL DATA**

#### **3.1 PERFORMANCE**

- 3.1.1 Locomotive horsepower equivalent – 3000 HP minimum
- 3.1.2 Head-end power system capability – Capable of powering an 11-car Metra train
- 3.1.3 Acceleration – equal or better than F40PH type locomotive operating with identical consist
- 3.1.4 Maximum speed required (based on gear ratio): 90 mph
- 3.1.5 Metra locomotive operation in typical commuter service: (averages)
  - 3.1.5.1 Average speed of 30.5 mph, maximum speed 79 mph
  - 3.1.5.2 41,250 to 45,000 miles annually
  - 3.1.5.3 4,900 average running hours annually
  - 3.1.5.4 Frequent start-stop train operations service
  - 3.1.5.5 Average of 1,200 to 2,000 MWhrs annually

#### **3.2 DIMENSIONS**

- 3.2.1 Width of Locomotive: Not to exceed Metra Clearance Diagram M-2110 and Amtrak Drawing A99-0087. Car-body width shall be submitted as required. **[PDRL P-3-01]**
- 3.2.2 Height of Locomotive: Not to exceed Metra Clearance Diagram M-2110 and Amtrak Drawing A99-0087. Car-body height shall be submitted as required. **[PDRL P-3-02]**
- 3.2.3 Dimensional compliance with AAR Plate C and Metra drawing M-2110
- 3.2.4 Nominal Maximum width (over wind deflectors): 11 ft. 4 in.
- 3.2.5 Nominal maximum length over coupler faces: 74 ft.
- 3.2.6 Centerline of Coupler above top of rail: 2' – 10 ½"
- 3.2.7 Track Gauge: 4' – 8 ½"

#### **3.3 WEIGHTS**

- 3.3.1 Weight: Locomotive total weight shall be minimized. Locomotive weights shall be submitted at maximum loaded weight. All locomotives shall be weighed at Contractor's facility.. **[PDRL P-3-03]**
- 3.3.2 Weight (maximum)
  - 3.3.2.1 4-axle locomotive: 280,000 lbs.
  - 3.3.2.2 6-axle locomotive: 420,000 lbs.
- 3.3.3 Axle load (maximum per any axle): 70,000 lbs.
- 3.3.4 Locomotive weight end-to-end balance shall be within 5%

#### **3.4 CURVE NEGOTIATION**

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- 3.4.1 Minimum curve radius single unit: 193 ft. (30 degrees)
- 3.4.2 Minimum curve radius two units coupled together: 230 ft. (25 degrees)
- 3.4.3 Minimum curve radius unit coupled to 85 ft. car: 230 ft. (25 degrees)
- 3.4.4 The locomotives, and all appliances, shall conform to the clearance outlined in Metra drawing M-2110 as well as the clearance outlines for the following carriers within Metra's jurisdiction:
  - 3.4.4.1 Amtrak (Chicago Union Station) (Amtrak Drawing A99-0087)

The clearance diagram for the locomotive shall be submitted to the Contracting Authority for review and approval. **[CDRL C-3-01]**

- 3.4.5 Under worst condition of fully worn wheels, defective springs, fully loaded supplies, and maximum wear of parts, minimum allowable clearance above rail for car-body and truck parts is as follows:

Truck parts	0' – 2 ½"
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### 3.5 PROPOSAL DELIVERABLES REQUIREMENT LIST

<b>PDRL</b>	<b>Title</b>
P-3-01	Locomotive Width
P-3-02	Locomotive Height
P-3-03	Locomotive Weight

### 3.6 CONTRACT DELIVERABLES REQUIREMENT LIST

<b>CDRL</b>	<b>Title</b>
C-3-01	Clearance Diagram

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## 4 CAR-BODY EXTERIOR

### 4.1 STRUCTURE

- 4.1.1 The locomotive car-body structure shall be designed and constructed in full accordance with all applicable FRA, AAR and APTA standards, regulations and recommended industry practices in effect at the time of the proposal submission and the requirements of this specification.
- 4.1.2 The contractor shall submit as part of the proposal, a general arrangement drawing of proposed design and artist rendering of the exterior of locomotive. The drawing shall include views to show details of end locomotive arrangement and identify location of major components/systems. **[PDRL P-4-01]**

### 4.2 CRASHWORTHINESS

- 4.2.1 The locomotive structure shall be constructed to AAR S-580 standards, APTA standards and FRA regulation 49 CFR Part 229 for crashworthiness, including anti-climbers and collision posts.

### 4.3 UNDERFRAME / STRUCTURAL ELEMENTS

- 4.3.1 The car-body structure shall resist a static-end load of 800,000 lbs minimum buff applied to the draft stops without permanent deformation of any member of the structure. (New Locomotive Only)
- 4.3.2 The Contractor shall submit a test procedure that describes in detail the steps taken to prove the car-body structure is compliant with APTA and FRA regulations. (New Locomotive Only) **[CDRL C-4-01]**
- 4.3.3 Two vertical collision posts shall be provided at the front end of the locomotive that meet or exceed the requirements of 49CFR Part 229 Subpart D. An end nose plate assembly shall be attached to the collision posts and meet or exceed the requirements of AAR Standard S-580-(2008) *Locomotive Crashworthiness Requirements*. (New Locomotive Only)
- 4.3.4 Two full-height corner posts shall be provided at the front end of the locomotive that meet or exceed the requirements of 49CFR Part 229 Subpart D. An end nose plate assembly shall be attached to the collision posts and meet or exceed the requirements of AAR Standard S-580-(Latest Revision), *Locomotive Crashworthiness Requirements*. Final design review of the end structure shall be submitted to Metra for review and approval. (New Locomotive Only) **[CDRL C-4-02]**
- 4.3.5 Truck attachments shall be supplied to permit lifting trucks with car-body. Horizontal ultimate shear of each truck attachment in any direction shall be 250,000 lbs minimum, per AAR Standard S-580-(Latest Revision) *Locomotive Crashworthiness Requirements*. Final design review of the underframe shall be submitted to Metra for review and approval. (New Locomotive Only) **[CDRL C-4-03]**
- 4.3.6 The locomotive car-body shall be supplied with four jacking pads, with a minimum clearance of 3 in. from the surrounding structure, integral with side sills at or near outer points of

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attachment of trucks to mainframe. Pads are not to be obstructed by conduit, piping or cables. It shall be possible to lift or jack either end of the locomotive. Lift pad accessibility should be unobstructed. The jacking pads shall be suitable to lift the locomotive either by means of jacks or overhead lifting devices, e.g. slings. The location of the jacking pads will be submitted to Metra for approval. **[CDRL C-4-04]**

- 4.3.7 Both the end frame below the bottom of the platform structure shall be capable of withstanding a 400,000 lb load without yield (200,000 lb on either side of coupler). The load shall be applied as follows:
- 4.3.7.1 100,000 lb on each side of the coupler distributed so that the bottom 1/3 resists 50,000 lb and the top 2/3 resists 50,000 lb.
- 4.3.7.2 100,000 lb on the outer edge of each end plate distributed so that the bottom 1/3 resists 50,000 lb and the top 2/3 resists 50,000 lb.
- 4.3.7.3 Suitable bracing shall be incorporated to effectively distribute the load to each main load carrying location should the load be concentrated anywhere on the end plate.
- 4.3.8 A rub rail shall be provided at the No. 2 end of the locomotive structure to provide protection in case of contact with a car diaphragm.

#### 4.4 COMPONENTS AND SAFETY APPLIANCES

- 4.4.1 Locomotive design shall comply with all applicable 49 CFR Part 231 safety appliance regulations, with a minimum clearance of 2-1/2 in. clearance for all handholds. The location and design of safety appliances shall be subject to Metra review and approval. **[CDRL C-4-05]**
- 4.4.2 Horizontal grab handles needed to facilitate servicing shall be arranged as necessary. Their necessity and arrangement shall be reviewed and approved by the Customer. Every effort shall be extended to provide servicing access from inside locomotive car-body. A horizontal grab handle shall be located on each side of coupler on the front and rear ends of the locomotive. The geometry and locations of the grab handles shall comply to the maximum extent practicable with 49CFR Section 231.30(g).
- 4.4.3 Side and ladder steps shall be open-grating which will self-clear of snow and ice and of sufficient depth to gain secure foothold.
- 4.4.4 Grab handles and handholds shall be of one-piece wrought steel and shall provide at least 2.5 in. minimum radius handhold clearance.

#### 4.5 CAB AND SHORT HOOD ARRANGEMENT

- 4.5.1 A full width operator's cab and nose arrangement shall be provided. The cab maximum sound level must comply with 49 CFR Part 229.121 for new locomotives. Final design review of the cab and short hood arrangement shall be submitted to Metra for review and approval. **[CDRL C-4-06]**
- 4.5.2 The flooring system and material shall comply with 49 CFR Part 238.103.
- 4.5.3 Glazing
- 4.5.3.1 Each front windshield shall be certified glazing materials, meeting all applicable requirements of FRA regulation 49 CFR Part 223 for front facing windows. The windshields shall be electrically heated. The windshields shall also be treated with Dupont Spall Shield, or an approved equivalent for shard containment.

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- 4.5.3.2 Side windows shall meet FRA 49 CFR Part 223 requirements and feature a combination of fixed and sliding windows in the manufacturer's standard configuration.
- 4.5.3.3 Windows shall be weatherproofed such that they seal, when closed. Windows must be equipped with a robust latching method against entrance of moisture, dust, fine sand, snow, external noise and combustion fumes into the operating cab and compartments. Mechanical means of fastening seals and gaskets shall be provided
- 4.5.3.4 Rain gutters shall be installed over the cab windows, where appropriate. Consideration must be given to the car-body design to ensure liquid captured in the gutters do not flow on areas of crew access or where maintenance personnel may stand for routine operations.

#### 4.5.4      Doors

- 4.5.4.1 A door from the cab to the engine room shall be provided if applicable. The door shall be hinged to open into the engine room. A positive latching mechanism shall be provided. The handle on the mechanism shall provide sufficient clearance for a gloved hand. A secondary door may be provided, if necessary, to control noise and temperature differences from the engine room.
- 4.5.4.2 Exterior entry doors shall be lockable from the interior and exterior of the locomotive. All latch/lock mechanisms used on exterior doors shall be keyed (Metra's standard coach key, Drawing M-250). The locks shall be weather resistant.
- 4.5.4.3 Doors shall be weatherproofed such that they seal, when closed. Doors must be equipped with a robust latching method against entrance of moisture, dust, fine sand, snow, external noise and combustion fumes into the operating cab and compartments. Mechanical means of fastening seals and gaskets shall be provided
- 4.5.4.4 Rain gutters shall be installed over the cab doors, where appropriate. Consideration must be given to the car-body design to ensure liquid captured in the gutters do not flow on areas of crew access or where maintenance personnel may stand for routine operations.

### 4.6 LONG HOOD ARRANGEMENT

- 4.6.1      Locomotive rear platform or door threshold height shall be compatible with coach car end door platform height (~4 ft. 3 in. above top of rail). Final design review of the long hood arrangement shall be submitted to Metra for review and approval. **[CDRL C-4-07]**
- 4.6.2      The long hood shall have bolted top hatches to facilitate the removal of equipment. Provisions for lifting by a crane shall be incorporated into the design.
- 4.6.3      If the locomotive design incorporates a full width car-body design, one door shall be provided for exiting the rear of the long hood. The door shall be hinged type opening into the locomotive. The door shall have a fixed window and latch/lock mechanism.
- 4.6.4      The builder's standard arrangement of service doors shall be provided.
- 4.6.5      A spare cable and brake hose rack shall be located on the inside of the long hood in a location not to interfere with personnel passage, or access to cabinets and equipment.

### 4.7 DRAFT GEAR AND COUPLER ARRANGEMENT

- 4.7.1      Couplers shall conform to AAR Type "F" tightlock design and be compatible with existing equipment. Final design review of the draft gear and coupler arrangement shall be submitted to Metra for review and approval. **[CDRL C-4-08]**
- 4.7.2      Couplers shall be alignment control type.

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4.7.3 Couplers shall be equipped with an AAR standard top-operated uncoupling mechanism for operation from either side of the locomotive.

4.7.4 The coupler height from the rail to the centerline of the drawbar shall be 34-1/2 in. (+0"/-2"), when unit is fully loaded.

#### 4.8 PILOT

4.8.1 A snow plow type pilot shall be applied to the No. 1 end of the locomotive. The design of the pilot shall protect the uncoupling mechanism, MU and HEP receptacles, and air brake hoses. Access doors for this purpose are allowed and shall have positive hold-down latches, if utilized. The design of the pilot shall be subject to Metra review and approval. [CDRL C-4-09]

4.8.2 The pilot shall be bolted in place with Grade 8 bolts, with provisions for height adjustment.

#### 4.9 WALKWAYS

4.9.1 There shall be an anti-skid surface for all walkways.

4.9.2 If the design incorporates a fixed crossover platform at the No. 2 end, a railing and appropriate handholds shall be provided. The surface of the platform shall receive an anti-skid treatment.

4.9.3 Aisle passageways shall be a 20 in. minimum, unless otherwise approved by Metra Chief Mechanical Officer or designee. Interior aisle ways shall be provided with an anti-skid surface to prevent slipping. If car-body style is not full width and has exterior walkways, exterior walkways shall be provided with an anti-skid surface to prevent slipping.

4.9.4 All doorway headers and other low clearance areas shall be protected by anti-bump padded strips.

#### 4.10 FIRE SUPPRESSION

4.10.1 At a minimum, three (3) dry chemical type 3A-B C fire extinguishers, or approved equal dependent on battery chemistry design, shall be supplied. One shall be located in the cab, and two shall be located in the battery room/compartment. Quick-release clamps shall be used to secure fire extinguishers. Locations shall be chosen to minimize obstruction to the walkways.

#### 4.11 LIGHTING AND LAMPS

4.11.1 A 74VDC battery circuit lighting system shall be applied. The design of the lighting system shall be subject to Metra review and approval. [CDRL C-4-10]

4.11.2 Dual sealed beam, PAR56 type 200 watt, 32 volt headlights in compliance with 49 CFR Part 229.125 shall be mounted at the No. 1 and No. 2 end of the locomotive. (Refer to 4.11.3)

4.11.3 Use of LED lighting technology is encouraged, with the exception of headlamp and ditch light applications, where halogen is preferred. LED headlamps will be considered, but will be subject to Metra review and approval.

4.11.4 Front headlight operation shall be provided by a selector switch with "OFF", "DIM", "AUX", "DIM" and "BRIGHT+AUX" positions. Rear headlight operation shall be provided by a selector switch with "OFF", "DIM" and "BRIGHT" positions.

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4.11.5 Two (2) 200watt, 32 volt ditch lights shall be installed, one on each side of the no. 1 end of the locomotive. Ditch light control shall be integral with the front headlight switch. Operation of the horn shall cause the ditch lights to flash alternately, at a rate of roughly one lamp per second when the headlights are on. Flashing shall continue, for a period of 20 seconds after the horn button is released.

4.11.6 A white oscillating (elliptical pattern) signal light, Trans-Lite no. FG-4509-1 or an approved equivalent solution is desired, mounted on the no. 1 end on the centerline of the locomotive. A manual control switch shall be provided if this light is included. The design of the oscillating light shall be subject to Metra review and approval. **[CDRL C-4-11]**

4.11.7 Two (2) red 60 watt equivalent marker lights in compliance with 49 CFR Part 221.14 shall be applied at the no. 1 end of the locomotive. Each light shall be aimed parallel to the rail.

4.11.8 LED Ground lights shall be provided above each truck and step ladder location on both sides of the locomotive. Locations will subject to Metra design review and approval.

4.11.9 LED Platform or rear door lighting shall be provided of sufficient brightness to assure safe passage between units shall be provided at the no. 2 end of the locomotive.

4.11.10 A roof-mounted strobe or beacon lamp shall be installed as an indication of a Layover System operation malfunction.

4.11.11 LED engine compartment lighting shall be installed.

4.11.12 The cab shall be equipped with a light burnout detection panel that notifies operating crew and/or Mechanical personnel that an exterior lamp has failed. The burnout detector panel shall have provisions to monitor the oscillating light, both headlights, and both ditchlights. The Contractor shall submit the design of this system for Metra review and approval.

4.11.13 Inside the cab on the engineer console a momentary push button or Metra approved alternative device located adjacent to the headlight/ditch light switches that when depressed will momentarily turn off the ditch lights, dim the headlights, and turn off the Mars light. When the momentary push button is let go the headlights, ditch lights, and Mars light revert back to whatever mode of operation the headlight/ditch light switches were set to.

#### 4.12 PROPOSAL DELIVERABLES REQUIREMENT LIST

PDRL	Title
P-4-01	Exterior General Arrangement and Rendering

#### 4.13 CONTRACT DELIVERABLES REQUIREMENT LIST

CDRL	Title
C-4-01	Car-Body Strength Test Document
C-4-02	End Structure Design
C-4-03	Underframe Design
C-4-04	Jacking Pad Location
C-4-05	Safety Appliance Location
C-4-06	Cab and Short Hood Arrangement and Design
C-4-07	Long Hood Arrangement and Design
C-4-08	Draft Gear and Coupler Design
C-4-09	Pilot Design

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C-4-10	Lighting Locations and Design
C-4-11	Oscillating Light

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## **5 BATTERY CHARGING AND ENERGY MONITOR**

### **5.1 GENERAL REQUIREMENTS**

- 5.1.1 The energy charging capacity shall be sized to, at a minimum, meet the locomotive range requirement). The energy charging shall be designed with both a quick charging capability and slow charging capability. The final design of battery charging and energy monitor shall be subject to Metra review and approval. **[CDRL C-5-01] [PDRL P-5-01]**
- 5.1.2 Two (2) energy level indicators, one each side of the locomotive exterior shall be provided.
- 5.1.3 An advanced fuel or energy monitoring system with in-cab fuel or energy level display is required.

### **5.2 BATTERY CHARGING**

#### **5.2.1 PROPULSION BATTERY CHARGING [CDRL C-5-02]**

- 5.2.1.1 Battery charging shall be performed by an overhead 1500 VDC source (FAST CHARGE) to connect by way of locomotive pantograph or equivalent system.
- 5.2.1.2 Typical Battery charge duration dependent on charge power available.

#### **5.2.2 DC FAST CHARGE PANTOGRAPH [CDRL C-5-03]**

- 5.2.2.1 DC Fast Charging via DC Catenary source or equivalent system..
- 5.2.2.2 Pantograph and High Speed Circuit Breaker Mounting Provisions shall be roof mounted
- 5.2.2.3 Electric or air operated pantograph operation to be provided.

#### **5.2.3 480V AC BATTERY CHARGING [CDRL C-5-04]**

- 5.2.3.1 480V AC (SLOW CHARGE) battery charging shall be performed through a head end power female receptacle as stated in Section 14.3.7 of this Specification.

### **5.3 PROPOSAL DELIVERABLES REQUIREMENT LIST**

<b>PDRL</b>	<b>Title</b>
P-5-01	Battery Charging and Energy Monitor Design

### **5.4 CONTRACT DELIVERABLES REQUIREMENT LIST**

<b>CDRL</b>	<b>Title</b>
C-5-01	Battery Charging and Energy Monitor Design
C-5-02	Propulsion Battery Charging
C-5-03	DC Fast Charge Pantograph
C-5-04	480V AC Battery Charging

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## **6 LOCOMOTIVE CAB**

### **6.1 GENERAL REQUIREMENTS**

6.1.1 The cab arrangement provided shall be the manufacturer's standard arrangement, with an operator and an observer station, and one additional seat or "jump seat" provided. The locomotive shall be designed to minimize the transmission of engine noise and vibration to the cab. All interior cab materials, including but not limited to ceiling material, floor material, console surfaces and interior side walls must conform to the smoke and flame requirements of FRA regulations, 49 CFR 238.103. In addition the Contractor shall conduct the fire safety analysis as required by Section 238.103[c], or provide documentation of prior testing ensuring compliance. All test results or documentation shall be completed and submitted to Metra prior to delivery of the first vehicle in the order. No vehicle will be accepted until a complete fire safety analysis per 238.103[c] has been submitted, reviewed and approved by Metra. Compliance with AAR S-580 emergency egress requirements as applicable to the locomotive proposed is required. The cab general arrangement is subject to Metra Design Review approval. **[CDRL C-6-01]**

6.1.2 The contractor shall submit as part of the proposal, a general arrangement drawing of proposed cab and artist rendering of the cab interior. Information on line of sight for operator shall be included. **[PDR P-6-01]**

### **6.2 CAB SEATS**

6.2.1 At least two (2) fully-adjustable cab seats with vinyl upholstery (preferred) material (meeting smoke and flame requirements) shall be provided. The seats will have vertical, horizontal, reclining and rotational adjustments.

6.2.2 Operator's and observer's seats shall withstand the loading requirements of FRA regulation 49 CFR 238 and comply with APTA PR-CS-S-011-99.

6.2.3 The builder's standard jump seat or additional third seat shall be provided.

### **6.3 HEATING, VENTILATION, AND AIR CONDITIONING.**

6.3.1 An HVAC system shall be included in the locomotive design. The HVAC unit shall be designed to provide a climate controlled environment for the locomotive occupants. The HVAC system should be capable of cooling the cab to +75°F at an outside temperature of +105°F, and heating the cab to +65°F with an outside temperature of -22°F. The HVAC system and type of refrigerant will be subject to Metra design review and approval. **[CDRL C-6-02]**

6.3.2 The HVAC unit shall be mounted inside the locomotive car-body or on the cab roof.

6.3.3 Manual control shall be provided for cooler/warmer adjustment.

6.3.4 Layover power to the HVAC system to be provided either by the HEP or ground power.

6.3.5 Side wall strip heaters may be applied to meet requirements.

6.3.6 A ventilation system shall provide a nominal 60 cfm supply of air to the cab at all times. Positive air circulation and fresh air ventilation of the cab compartment shall prevent the

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entrance of dust, sand, fumes, liquids, or precipitation into the locomotive cab with doors and windows closed.

6.3.7 A cab air circulation fan with separate ON-OFF switch is required.

#### 6.4 WINDSHIELD WIPERS

6.4.1 The locomotive shall be equipped with an electric wiper system, for each front facing window.

6.4.2 Windshield wiper controls shall be provided in the cab as appropriate for the convenient access by the operator and observer. The operator shall be able to control all wipers from a position where he is seated in Operator's seat.

#### 6.5 REFRIGERATOR

6.5.1 A refrigerator shall be provided. The refrigerator shall have a minimum capacity of 2 cu. ft. and shall be arranged for the storage of bottled water.

#### 6.6 CAB INTERIOR LIGHTING

6.6.1 Ceiling mounted light fixture(s) shall be provided.

6.6.2 Two high intensity reading lights are desired.

6.6.3 Lighting is required for the short hood compartment (if applicable).

6.6.4 Emergency egress lighting provided in compliance with AAR S-580.

#### 6.7 CAB ACCESSORIES

6.7.1 Three (3) folding coat hooks shall be provided. Hooks shall be flush with wall when retracted. Hooks shall be between five (5) and six (6) feet above the floor in locations to be approved by Metra.

6.7.2 Inspection card holders with clear plastic inserts shall be installed in the cab at a location to be approved by Metra. A clip to hold track warrants and other data shall be installed on the Engineer's side console, and the left hand console. Card holder construction shall 49 CFR Part 238.103.

6.7.3 Sun visors shall be provided on both sides of the cab.

6.7.4 The builder's standard fusee and torpedo holder box, with cover shall be provided.

6.7.5 A waste container, capable of holding a plastic liner, shall be provided in the cab.

6.7.6 The operator's console and the observer's station shall have cup holders with a minimum diameter of 3 in.

6.7.7 A retractable full length wind deflector/mirror, Prime Mfg. SC875-28, or approved equivalent, shall be provided on each side of the locomotive.

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6.7.8 At a minimum, two grounded duplex electrical receptacles for 110VAC power shall be provided in the cab area.

#### 6.8 PROPOSAL DELIVERABLES REQUIREMENT LIST

<b>PDRL</b>	<b>Title</b>
P-6-01	Cab General Arrangement

#### 6.9 CONTRACT DELIVERABLES REQUIREMENT LIST

<b>CDRL</b>	<b>Title</b>
C-6-01	Cab General Arrangement
C-6-02	Cab HVAC Design

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## **7 LOCOMOTIVE CAB CONTROLS AND EQUIPMENT**

The controls listed below and their arrangement as well as the indicators and alarms detailed in this section should be based on the manufacturer's standard design. The locomotive cab controls general arrangement shall be subject to Metra design review and approval. [CDRL C-7-01]

### **7.1 OPERATOR CONTROLS**

- 7.1.1 Master Controller, with single throttle handle (manual control of dynamic braking is not required).
- 7.1.2 Reverser, with removable handle (integral with the controller)
- 7.1.3 Brake valve equipment with automatic & independent handles
- 7.1.4 Air pressure indicators (digital preferred)
- 7.1.5 Speed indicator
- 7.1.6 Load ammeter
- 7.1.7 Sand operating control
- 7.1.8 Horn operating control
- 7.1.9 Bell operating control
- 7.1.10 Alerter reset push-button
- 7.1.11 Front headlight/ditch light control selector switch
- 7.1.12 Rear headlight control selector switch
- 7.1.13 Attendant call push-button (momentary)
- 7.1.14 Signal (Mars) light control selector switch (If applicable)
- 7.1.15 PA/IC control panel
  
- 7.1.16 MU valve
- 7.1.17 Desk light switch (If applicable)
- 7.1.18 Radio
- 7.1.19 HVAC control selector switches
- 7.1.20 Truck/ground lights switch

### **7.2 ADDITIONAL CONTROLS**

- 7.2.1 Head end power control panel

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- 7.2.2 Propulsion Battery RUN/STOP switch
- 7.2.3 Blended brake lockout reset
- 7.2.4 Gauge light dimmer provision (if applicable)
- 7.2.5 Window defroster switch
- 7.2.6 Gauge light switch (if applicable)
- 7.2.7 Marker light switch
- 7.2.8 Blended & dynamic brake cut-out provision
- 7.2.9 Propulsion Battery run switch
- 7.2.10 Generator field switch
- 7.2.11 Control & fuel pump switch
  
- 7.2.12 Traction motor cutout provision
- 7.2.13 Layover protection switch
- 7.2.14 Propulsion Battery room light switch
- 7.2.15 Front number light switch
- 7.2.16 Layover alarm test switch
- 7.2.17 Step/platform light switch
- 7.2.18 Emergency power cutoff, prime mover stop push-button
- 7.2.19 Isolation switch

### 7.3 CAB INDICATORS AND ALARMS

- 7.3.1 Lights at the operator's console (as appropriate, some indicators may be microprocessor display) (suggested color coding)
  - 7.3.1.1 Brake warning - amber
  - 7.3.1.2 PCS open - red
  - 7.3.1.3 Wheel slip - white
  - 7.3.1.4 Doors closed - green
  - 7.3.1.5 Sanding light - white
  - 7.3.1.6 OSC headlight – white (if applicable)
  - 7.3.1.7 Windshield defroster - amber
  - 7.3.1.8 Hot battery – red (if applicable)
  - 7.3.1.9 No power/chrg. - red
  - 7.3.1.10 Battery pump - green (if applicable)
  - 7.3.1.11 Filter motor trip - amber

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- 7.3.1.12 L/O system - white
- 7.3.1.13 Blended brake - amber
- 7.3.1.14 Ground relay - red
- 7.3.1.15 Air compressor - red
- 7.3.1.16 Lift Deployed - amber
- 7.3.1.17 Lift Override - red
- 7.3.1.18 HEP indicator lights
- 7.3.1.19 Alerter

#### 7.3.2 Alarms in the Cab

- 7.3.2.1 Alerter
- 7.3.2.2 Ground relay
- 7.3.2.3 Conductor's signal buzzer
- 7.3.2.4 Prime Mover Fault/Attendant Call Buzzer

### 7.4 SPEED INDICATOR

7.4.1 A solid state analog speed indicator shall be provided. The indicator shall be mounted in the general line of sight, while facing forward. The above function can be incorporated on the builder's integrated electronic display (if provided)

### 7.5 EVENT RECORDER

7.5.1 An event recorder system, Bach-Simpson ERS 54000 Series compatible and meeting the requirements of 49CFR Section 229.135 shall be installed to record operating parameters of the locomotive. All onboard system time clocks shall be synchronized and integrated with crash-hardened memory. The recorder should be fully integrated with Wabtec I-ETMS® system with compatibility via Legacy Link. Parameters to be monitored and channel assignment shall be configured in compliance with existing Metra protocols, and are subject to Metra approval. **[CDRL C-7-02]**  
Download data and analysis software shall be provided. The event recorder system shall be configured to operate in a fail-safe manner, whereby the loss of power shall cause a penalty brake application.

### 7.6 ALERTER – VIGILANCE MONITOR

7.6.1 An alerter system which monitors the action of the locomotive operator is required, meeting the requirements of 49CFR Section 229.140. Design and details of the alerter system are subject to Metra review and approval. **[CDRL C-7-03]**

7.6.2 The alerter shall be reset through the following operator's actions:

- 7.6.2.1 Throttle Change
- 7.6.2.2 Generator Field
- 7.6.2.3 Horn Use
- 7.6.2.4 Change in Direction of Travel
- 7.6.2.5 Independent Brake Application (Brake Cylinder Pressure)
- 7.6.2.6 Automatic Brake Application or release (more than 5 psi)
- 7.6.2.7 Alerter Reset Button
- 7.6.2.8 Bell Use
- 7.6.2.9 Change of State of the Headlight Switch
- 7.6.2.10 Radio Microphone Operation

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7.6.3 A dedicated cutout function, with seal, shall be provided in a visually accessible location, to cutout the alerter magnet valve in case of failure.

7.6.4 Alerter reset intervals shall be speed dependent, in accordance with 49 CFR Part 229.140, as locomotive speed increases, the alerter must be acknowledged more frequently.

## 7.7 COMMUNICATION SYSTEM

Design details and drawings for cab communication system shall be subject to Metra design review and approval. **[CDRL C-7-04]**

7.7.1 The locomotive shall be equipped with a radio with internal microphone and remote audio connector. Radio specifications will be provided by Metra.

7.7.1.1 One handset with push-to-talk switch, coiled cord and AAR connector shall be provided at the operator's station.

7.7.1.2 A standard 4" railroad style antenna shall be supplied. The antenna shall be mounted on the roof of the locomotive in an approved location, utilizing an antenna ground.

7.7.2 A public address/intercommunication system, including radio interface shall be provided.

7.7.2.1 One PA Amplifier (power amplifier) shall be required for each locomotive and designated to provide audio input, amplification, audio output and regulated voltage for the control units.

The PA amplifier includes: Transient suppression, Power supply line isolation (DC/DC Converter), Regulated voltage supply, Compressor pre-amplifier, and Power amplifier.

The output shall be a 70.7 volt line capable of a continuous power output of not less than 25 watts with an output level adjustment and shall remain  $\pm 3$  db throughout the specified temperature range.

Total Harmonic Distortion of power amplifier shall not exceed 2% at the output of the amplifier into rated load at full rated power over the 300 Hz to 3 KHz frequency range. Power amplifier's frequency response shall be +2dB at 200 Hz to 5 KHZ (referenced at 1 KHZ). The hum and noise level of the power amplifier shall not be less than 60 db below the rated output when measured at the output.

The output of the power amplifier shall not decrease more than 6 db from its full rated output at normal voltage when voltage is 35% below normal. The power amplifier must provide protection against transient voltage spikes up to 2,500 volts at 50 watt seconds. Short and open circuits shall not impose damage to the power amplifier.

7.7.2.2 An "AAR Base" or approved equivalent shall be provided in each locomotive to serve as a junction box for wiring to the P.A. System. The locomotive and train wiring shall terminate on barrier terminal strips. The AAR Base also serves as an amplifier mounting base.

7.7.2.3 An Engineer's Control Unit (OCU) located in an approved location. The OCU shall be designed to provide: audio input amplification; audio output; public address; intercom and control of the radio to PA functions. The OCU shall have the following: An indicator light or LED shall indicate that the handset has gone off-hook and an intercommunication link has been made. A second LED shall indicate that the system is in PA mode.

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- 7.7.2.3.1 Intercom mode is accomplished by removing the handset and talking. Pressing the push to talk switch in the handset will initiate the PA function, turn on the PA indicator, and turn off the intercom indicator.
- 7.7.2.3.2 A push button switch shall be provided to allow selection of the Radio to PA mode.
- 7.7.2.3.3 A handset microphone with coiled cord shall have built in a pre-amplifier and push-to-talk switch. The output shall be -15 dam with 600 ohm output impedance and sound pressure of 30 microbars, 300 Hz. Frequency response shall be 300 Hz to 1 KHz using 3 dB/Octave with 2% maximum THD.
- 7.7.2.3.4 Line amplifier output shall be +20 dam on 600 ohm balanced line level output. Power output shall be a minimum of six (6) watts continuous power adjusted to three (3) watts at less than 1% THD. Microphone input shall be -7 dB unbalanced at AGC threshold. Line level shall be internally set to +10 dam balanced at full output. Frequency response shall be from 100 Hz to 10 KHz ±3 db referenced to 1 KHZ (compressor) and 100 Hz to 5 KHZ ±1 db (line amplifier). Noise shall not be greater than 55 db below full rated output. Automatic gain control shall have a range of 3dB ±2 dB, maximum distortion of 2%. Attack time shall be 10 m sec. and release time 800 m sec.
- 7.7.2.4 A speaker assembly shall be provided. The speaker shall be rated for 15 watts RMS contiguous power with an impedance of 8 ohms for radio output. The assembly shall have a control to adjust the output volume.

## 7.8 CAB DIGITAL VIDEO RECORDING SYSTEM

- 7.8.1 The Contractor shall propose a new CDVRS system. The Contractor will provide its Cab Digital Video Recording System kit, with LDVR, microphones and cameras. The contractor shall comply with all applicable FRA requirements in effect at the time the bids are submitted. In addition the contractor will be required to meet or exceed 49 CFR Part 229.136. The Contractor shall be responsible for all ancillary equipment and materials needed to complete the installation of the CDVRS. Contractor shall be responsible for the successful completion of the on-board diagnostic testing prior to delivery to Metra. The Contractor shall work with Metra to determine the best locations for CDVRS equipment and submit a final design for review and approval by Metra. **[CDRL C-7-05]**
- 7.8.2 The CDVRS shall be composed of one central recorder, dual forward-facing camera, two rearward-facing cameras, one on engineer's side and one on fireman's side, at a minimum two inward facing cab camera(s), two exterior mounted microphones, one cab mounted microphone, solid state drive storage memory, crash hardened memory and all applicable interconnections. The CDVRS system shall be powered from a separate low voltage circuit breaker (on the breaker panel). A terminal board panel will be applied in a dry location near the central recorder for all CDVRS (power and signal) connections to be made. Hardware is to exhibit the smallest area footprint inside the cabs and use the least mounted hardware as possible. The inputs and outputs of the DVR are to exhibit railroad grade connections. The design and arrangement of the CDVRS shall be approved by Metra prior to build of the first locomotive.
- 7.8.3 The DVR recorder shall be a digital Internet Protocol (IP) based system and support digital IP cameras. The recorder shall have no less than 8 IP video channel inputs. The recorder shall have no less than 3 audio channel inputs. The DVR recorder video channels shall be used to capture and record video from multiple connected cameras simultaneously. The recorder audio channels shall be used to capture and record bell sounds, horn sounds, and have the ability to record cab compartment audio from multiple connected microphones simultaneously. The DVR recorder shall be capable of simultaneous playback, remote access, and recording. A

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removable hard drive shall be incorporated into the DVR recorder unit. The removable drive shall have security measures to allow only authorized personnel to remove the drive. The DVR recorder shall have a minimum of 1TB solid state storage capacity and the capacity to record at least 12-hour continuous recording capability per 49 U.S.C 20168(b)(1) and the recordings must accessible for review during an accident or incident investigation per 49 U.S.C 20168(b)(3). The hard drive capacity shall be sized to archive not less than 10 calendar days of video. The DVR recorder shall have Wi-Fi capabilities for ease of downloading in the case of accident or incidents when the DVR cannot be safely accessed in the rolling stock. The DVR recorder shall have crash and fire protections for any in-cab image recordings that are stored in the locomotive operating compartment per 49 U.S.C 20168(b)(2). Frame rates and resolutions shall be customizable for each camera and be made accessible by Metra. The recorder shall feature video motion detection. Video motion detection sensitivity shall be adjustable, customizable, and shall be capable of being enabled or disabled by Metra. The DVR system shall have the ability to utilize GPS data for location data and time synchronization. The DVR shall interface, access and download existing event recorder data. The recorder shall have a power input for all voltage ranges experienced by its power connection to the locomotive and shall feature overvoltage and transient protection. The DVR recorder shall be capable of normal recording operations during momentary power losses, defined as 1 second or less, without: sustaining data loss, causing the DVR to reset due to momentary power loss, recording failure due to momentary power loss, or the DVR recorder entering a fault state requiring maintenance due to momentary power loss. The DVR recorder shall have a "self-test" and visual indicator system that indicates the system is properly functioning and recording. The visual indicator system shall alert personnel upon failure of any camera, hard drive, or other type of fault.

7.8.4 The forward facing camera shall be capable of clearly recording railroad signal aspects in all types of weather, day, or nighttime conditions. The forward facing camera shall be used to record the right of way, incidents, and railroad signal aspects of wayside signals. The cameras shall be aimed parallel to the centerline of tangent track within the gauge. The railroad signal aspects (colors) shall be clearly discernible during video playback. The camera shall be a high definition digital IP type camera. The camera shall be powered by Power over Ethernet (PoE). The forward facing camera shall feature a dual lens, one for wide view, and one for narrow view. The focal length of the wide lens shall be 6mm. The focal length of the narrow lens shall be 16mm. Alternative focal lengths may be considered. The camera shall be mounted inside the cab, on the engineer's side dash-board in a Metra-approved enclosure. The camera shall be adjustable to allow for camera positioning.

7.8.5 The rear-facing camera shall be a high definition digital IP type camera. The camera shall be powered by PoE. The focal length shall be determined during the design review. The camera shall be mounted outside the cab near the wind deflector on the observer's side in a weather-proof enclosure. There shall be 3 rear facing cameras. The rear facing cameras shall include left and right-side rear facing. And a third camera, "backup camera", mounted at the back of the locomotive that records in the direction of reverse travel aimed parallel to the centerline of tangent track within the gauge.

7.8.6 Two cameras shall be "inward facing" and used to record the cabin compartment of a locomotive. Each inward facing camera shall be adjustable to allow for camera positioning. Each inward facing camera shall be a high definition digital IP type camera. Each inward facing camera shall be powered by PoE. The inward facing cameras shall be capable of recording black and white, as well as color. The settings shall be made accessible and adjustable to Metra. Each inward facing camera shall have 1 lens. Each inward facing camera shall have an adjustable lens. The camera lens focal length shall be set at 2.5mm or Metra-approved alternative. Each inward facing camera shall be housed in a compact vandal resistant enclosure. The inward facing cameras shall be suitable for indoor and outdoor installations. The

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inward facing cameras shall be capable of recording in any weather, day, or nighttime conditions. Each inward facing camera shall include an Infrared illumination (IR) feature for night vision video capture capability which can be enabled or disabled by Metra.

7.8.7 The dedicated microphones will have a “quick-disconnect” threaded, environmental-rated circular connector. The contractor will use the appropriate mating connector as well as non-metallic flexible ½” conduit, ½” NPT connectors and UNEF circular connector adaptor for the final two (2) feet of conduit connection to each microphone. Each dedicated microphone shall be rated for exterior outdoor use. One dedicated microphone will be mounted within three (3) feet of the bell. A new rigid metal ½” conduit will be run from the recorder location to the location of the microphone. The second dedicated microphone will be mounted on the roof within three (3) feet of the air-horn. A new rigid metal ½” conduit will run from the recorder location to the location of the microphone. The roof microphone and associated conduit will not interfere with any removable roof panels. A third microphone will be mounted in the cab and shall be capable of recording cab compartment audio. This microphone shall be capable of being enabled or disabled by Metra.

7.8.8 In addition to the solid state hard drive storage media, a separate crash hardened memory module shall be priced for use with the DVR system. The crash hardened memory module may be internal or external. The crash hardened memory shall be sized to archive 12 hours of video. The DVR shall be already configured to accept crash hardened memory with “plug and play” functionality. The crash hardened memory module shall be a field replaceable component by Metra personnel without requiring the assistance of the contractor. The crash hardened memory module shall be upgradeable in the future to higher capacities.

7.8.9 Crash hardened memory module supplied shall be DOT certified to FRA 49 CFR Part 229.

7.8.10 The solid state hard drive shall be mechanically and functionally uniform and interchangeable across all cab compartment DVR systems defined in this specification. The hard drive shall be upgradeable in the future to higher capacities.

7.8.11 The crash hardened memory module shall be mechanically and functionally uniform and interchangeable across all cab compartment DVR systems defined in this specification.

7.8.12 On the video playback, The DVR system shall display a time and date stamp on all downloaded data. The time shall be synchronized with the time clock used by the event recorder. On the playback software, the system shall display event recorder data concurrent with video downloads. A minimum number of 6 event recorder channels shall be recorded: speed (SPD), Brake Pipe Pressure (BPP), Brake Cylinder Pressure (BCP), Throttle (THR) Bell (BEL), and Horn (HRN). The DVR system shall include computer software that allows for downloading and onboard viewing of video directly from the DVR recorder without removing the hard drive. The software shall allow the user to specify specific dates and times in order to control the length of the video clips downloaded. When downloading a video/audio clip, the user shall have the ability to select or deselect which video and audio channels are to be downloaded. The software shall have the capability to export all video and audio channels (including dedicated audio channels) into 1 file with all video and audio channels synchronized. Each audio/video clip shall contain at minimum a time stamp with date, time, name of DVR system, and associated video channel names that are overlaid onto the image and synchronized with video and audio. Upon starting the software, the main screen shall automatically (and without user interaction) display in real time live video viewports of all the cameras simultaneously. The viewports of all the video channels shall be visible simultaneously and without obstructions to the user on the main screen. The user shall not be required to make

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any clicks, minimize or maximize windows to cycle through to view video camera channels. The DVR system shall include computer software and cables/ docking port/ hardware allowing for video downloads for a hard drive removed from the DVR recorder that is connected to a laptop or desktop computer. All computer software supplied to Metra by the Contractor shall include an unlimited use license agreement for unlimited installations and use. The ability for Metra personnel to install and configure all supplied software without contractor assistance or interaction shall be required. The software interface design shall be subject to Metra approval.

## 7.9 TRAIN MANAGEMENT SYSTEM

Metra shall require locomotive system equipment including Positive Train Control (PTC) and Interactive Electronic Train Management System (IETMS) consistent with 49CFR Part 236, Subpart I – Positive Train Control Systems. Provisions shall be made in the design of the locomotive for a logical integration to facilitate access to, and service of, the PTC equipment, including but not limited to conduits, switches, antenna, hardware, and other system components. The builder shall furnish and install a Wabtec Interactive Electronic Train Management System (IETMS) (on-board equipment only). **[CDRL C-7-06]**

### 7.9.1 Wabtec I-ETMS Equipment (WPN 24-11-16541) consisting of:

- 7.9.1.1 TMC-4 – Train Control computer
- 7.9.1.2 Communications Management computer
- 7.9.1.3 CDU- Cab Display Unit
- 7.9.1.4 GPS Receiver with WAAS correction
- 7.9.1.5 74 VDC to 13.6 VDC 15A power converter
- 7.9.1.6 802.11 Antenna Assembly
- 7.9.1.7 Sonalert Assembly
- 7.9.1.8 System Interface Cables
- 7.9.1.9 Mounting Brackets
- 7.9.1.10 Metra I-ETMS Locomotive Software

### 7.9.2 74 volt VHF Comm. Locomotive equipment consisting of:

- 7.9.2.1 MCC 545C VHF Data Radio
- 7.9.2.2 Locomotive Enclosure Kit
- 7.9.2.3 Power supply
- 7.9.2.4 Antenna
- 7.9.2.5 Interconnect Cables & Mounting Equipment

### 7.9.3 Wabtec Crash Hardened Event Recorder consisting of:

- 7.9.3.1 TTX-CMM-ETMS Recorder
- 7.9.3.2 Power Cable & Ethernet Cable
- 7.9.3.3 Mounting Bracket

## 7.10 CONTRACT DELIVERABLES REQUIREMENT LIST

CDRL	Title
C-7-01	Locomotive Cab Controls General Arrangement
C-7-02	Event Recorder
C-7-03	Alerter
C-7-04	Communication System
C-7-05	Cab Digital Video Recorder System
C-7-06	IETMS PTC System

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## **8 AIR BRAKE SYSTEM**

### **8.1 AIR BRAKES**

8.1.1 The locomotive is to be equipped with single station, service-proven microprocessor controlled brake system subject to Metra design review and approval. **[CDRL C-8-01]** The brake valve shall be of fail safe design by allowing direct venting of brake pipe. The locomotive must provide full interoperability with existing locomotives equipped with 26L pneumatic brakes, Wabco Epic II brake equipment, and coaches equipped with 26C pneumatic brakes. Brake pipe pressure is to be 90 psi. The system shall incorporate the features and equipment listed below or provided with the equivalent electronic function. The brake system shall include interface capability for Electronically Controlled Pneumatic (ECP) brake system with appropriate functionality with overspeed protection, vigilance/alterer control and the event recorder. The ECP system and its interface with these ancillary devices shall have no single point failures. The ECP control logic and hardware platform shall be compatible with AAR standards. Locomotives shall be equipped with hard conduit ready to accept ECP wire trainline as defined by AAR Standards. Conduit shall be terminated with protective caps adjacent to the brake pipe train line hose connection.

A Failure Mode Effects and Criticality Analysis (FMECA) shall be conducted by the Contractor. The specific systems, including software and interfaces for the FMECA shall be approved by the Metra during design review.

8.1.2 The contractor shall submit as part of the proposal, a general description of the air system, including specifics of the air brake system and air supply unit. Details on the reliability and maintenance of the system shall be included. **[PDRL P-8-01]**

8.1.3 Full service brake application from foot pedal with warning whistle, eight second time delay, PC knockdown and permanent suppression shall be provided. Foot pedal size and location are subject to approval by Metra. **[CDRL C-8-02]**

8.1.4 Overspeed limit is to be provided with warning whistle, eight second time delay, PC knockdown and suppression feature.

8.1.5 One emergency brake valve shall be located at the observer's station and one at the no. 2 end of the locomotive. The valves shall be painted red. A decal with the words "EMERGENCY BRAKE VALVE" shall be affixed in an adjacent location.

8.1.6 A provision for "power braking" within reasonable limits is desirable if this may be accommodated by the proposed braking system and control system.

### **8.2 AIR END CONNECTIONS**

8.2.1 Brake pipe, main reservoir and MU hoses shall be of sufficient length to be compatible with all Metra equipment, AAR approved and dated. These hoses when coupled to a Metra coach or locomotive must negotiate the applicable curves described in Section 3 without hoses parting or distorting.

8.2.2 MU hoses shall be provided at both ends on both sides of the coupler and marked accordingly. The MU lines shall consist of:

8.2.2.1 Independent brake application and release line.

8.2.2.2 Main reservoir equalizing line

8.2.2.3 Actuating line.

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- 8.2.3 Brake pipe angle cocks and vented main reservoir cutout cocks shall be ball - type.
- 8.2.4 The builder's standard dummy couplings shall be provided for the front and rear brake pipe, main reservoir equalizing and MU hoses. All dummy couplings shall be vented.

### 8.3 AIR COMPRESSOR

- 8.3.1 An air compressor (electric motor-driven) with a minimum output capacity of 120 cfm displacement (per AAR S-5529) at 145 psi shall be provided. The air compressor system shall be subject to Metra review and approval. **[CDRL C-8-03]**
- 8.3.2 Air quality must comply with APTA standard PR-M-S-011-99.
- 8.3.3 Main reservoir pressure shall be maintained at 130-150 psi operating range.
- 8.3.4 Alarm for air compressor low oil shall be provided (unless an oil-less compressor is provided).
- 8.3.5 The after cooler shall be equipped with a separate automatic drain dump valve and shall be designed to avoid condensate traps and dump valve shall be heated as required to avoid freezing.
- 8.3.6 If electric motor-driven, the compressor shall be able to operate when the locomotive is on wayside power.

### 8.4 GAUGES AND FITTINGS

- 8.4.1 GENERAL Three (3) Salem 4 inch duplex air gauges, 0 - 160 psi with green dials shall be provided as follows:
- 8.4.1.1 Main Reservoir and Equalizing Reservoir
  - 8.4.1.2 Brake Pipe and Brake Cylinder
  - 8.4.1.3 Train Control Application and Suppression
- 8.4.2 Salem test fittings shall be provided at all gauges plus at the air compressor control switch.
- 8.4.3 Air compressor gauge, 0 - 200 psi shall be provided.
- 8.4.4 The above indications can be included in the Builder's integrated electronic display (if provided) in lieu of the above.

### 8.5 MAIN RESERVOIR

The main reservoir and air dryer system shall be subject to Metra design review and approval.  
**[CDRL C-8-04]**

- 8.5.1 Two main reservoirs shall be provided. Reservoirs shall have tell-tale drill holes provided per the requirements of 49CFR Section 229.31(b). Reservoirs shall be sloped to facilitate draining of condensate.
- 8.5.2 The number 2 main reservoir shall supply air for air brake devices only.
- 8.5.3 The no. 1 and no. 2 main reservoirs shall be equipped with combination automatic/manual drain valves Salem part no. 880-081 and valve heater Salem part no. 2155-

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100. Drain valve timer, Salem part no. 872 shall be provided and shall be set for a 3 minute cycle. (Approved equivalents acceptable) Drain valves shall be located at lowest point of the reservoir slope. Suitable protection against debris damage for #1 main, #1 and #2 drain valves and piping shall be provided.

8.5.4 An aftercooler shall be provided in the system between the air compressor outlet and the no. 1 reservoir.

8.5.5 An air filter/dryer system meeting requirements as specified in APTA Standard SS-M-011-99 shall be applied between the no. 1 and no. 2 reservoirs. A heater shall be included. Bypass piping and cutout cock shall also be provided.

8.5.6 A J-1 safety valve set for 150 psi shall be provided after the first main reservoir.

8.5.7 All check valves in the reservoir system shall be flange mounted.

## 8.6 AIR PIPING

8.6.1 Air piping shall be extra-heavy wrought steel using 300 lb AAR rated fittings (under car-body). Brake pressure and car supply trainline piping shall be 1.25 I.P.S. Contractor's standard piping and tubing shall be approved by Metra. **[CDRL C-8-05]**

## 8.7 PROPOSAL DELIVERABLES REQUIREMENT LIST

PDRL	Title
P-8-01	Air Brake and Air Supply System

## 8.8 CONTRACT DELIVERABLES REQUIREMENT LIST

CDRL	Title
C-8-01	Air Brake System
C-8-02	Deadman Pedal
C-8-03	Air Compressor
C-8-04	Main Reservoir and Air Dryer
C-8-05	Air Piping

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## **9 WARNING DEVICES**

### **9.1 BELL**

9.1.1 A bell (electric or pneumatic) shall be provided. The bell shall be mounted in a position to minimize snow and ice intrusion while still maintaining audible requirements. The location and design of the bell and bell controls shall be subject to Metra review and approval. **[CDRL C-9-01]**

9.1.2 A manual bell control shall be located on both sides of the cab.

9.1.2.1 Controls shall be arranged so that the bell may be operated manually at any time or actuated by air horn operation (with manual shutoff).

9.1.2.2 If the horn is blown from the engineer's side, manual shutoff of the bell must be from the engineer's side. If the horn is blown from the observer's side, manual shutoff of the bell must be from the observer's side.

### **9.2 HORN**

9.2.1 Horn sound levels must satisfy the requirements of FRA regulations 49 CFR 222 and 229.

9.2.2 A five-chime low profile horn, Nathan no. K5LA, or approved equivalent, shall be provided. The horn(s) shall be located in a Metra approved location. The location and design of the horn and horn controls shall be subject to Metra review and approval. **[CDRL C-9-02]**

9.2.3 The horn shall be activated by two (2) controls, one located on the engineer's console and the other on the observer's desk.

9.2.4 Horn assemblies with internal heating feature to prevent failure from ice or snow accumulations shall be provided.

### **9.3 CONTRACT DELIVERABLES REQUIREMENT LIST**

<b>CDRL</b>	<b>Title</b>
C-9-01	Bell and Bell Controls
C-9-02	Horn and Horn Controls

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## 10 TRUCKS

### 10.1 GENERAL REQUIREMENTS

Trucks shall be the builder's standard and service proven design and may be either 4-wheel or 6-wheel design. Details of the design, arrangement, installation, and testing of the truck components and assembly shall be submitted to Metra for review and approval. [CDRL C-10-01]

Truck system proposal shall include a basic general arrangement drawing, service history, and basic description of system function. [PDRP P-10-01]

Only trucks manufactured by a supplier with successful experience in railway passenger truck design and manufacture shall be acceptable. Final assembly needs not be done at an AAR certified shop, however, manufacture of wheels and axles and their mounting shall be performed at AAR certified facilities. Trucks and components shall be only of a service proven design, which has operated in similar service in the United States. The Contractor shall submit the service history of the truck, noting any deviation for this application to Metra for review and approval, prior to selection of truck. [CDRL C-10-02]

The trucks shall provide a safe and secure support and guidance system, transmitting accelerating and braking forces to the car-body, and must provide comfortable riding quality at all speeds up to 90 miles per hour on track appropriately certified by FRA. The design, arrangement and equipment of the trucks shall be such as to prevent "hunting" or "nosing" at all speeds, and to minimize rocking of truck frame on equalizer springs at critical speeds.

The design stresses in truck parts shall be chosen to provide a conservative factor of safety, consistent with proven truck design practice for heavy duty railway passenger service. In the design of all truck parts, all forces and combinations of forces, including braking forces, must be taken into account. Multiplication of forces due to accelerations and shocks, and non-uniform distribution of vertical loading due to track irregularities and super elevation, must be considered. The design center bearing load for both trucks shall be determined from the heaviest end of the locomotive, using AW3 load, plus train supplies, less truck weight. To this dead weight must be added all dynamic loads and multiplying factors.

### 10.2 TRUCK FRAME AND COMPONENTS

#### 10.2.1 Design Requirements

10.2.1.1 The truck frame shall be of a cast or a fabricated construction.

10.2.1.2 The truck frame shall be analyzed for static and dynamic loads and will be tested for static stresses and fatigue stresses.

10.2.1.3 The truck frame shall provide a minimum life of 40 years based on proper performance of scheduled maintenance.

10.2.1.4 Removal of wheel sets with traction motors using drop tables.

10.2.1.5 Axle-drive, end of-axle wheel-truing access provision, to allow wheel truing while the wheel set is attached to the locomotive.

10.2.1.6 Either axle-hung or fully suspended drives will be considered.

#### 10.2.2 Reliability and Maintainability

Design shall be such that failure of a component shall not cause the locomotive to become unsafe for normal operation. All truck working elements and adjustment points shall be conveniently accessible for inspection, adjustment and repair without requiring the removal of trucks or any other unrelated equipment.

### 10.3 BRAKE RIGGING AND HANDBRAKE

#### 10.3.1 Brake system shall be the builder's standard and service proven design to include tread or disc brakes, or a combination thereof.

10.3.1.1 Pneumatic application will apply brakes at all wheels

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- 10.3.1.2 A suitable combination (as required) of disc or tread brakes shall be installed.
- 10.3.1.3 Self-aligning and adjusting brake rigging or approved equal to correct clearances resulting from wear of brake pads, brake discs and wheel surface shall be provided.
- 10.3.1.4 Composition brake shoes/pads shall be used.
- 10.3.2 Performance of a hand brake mechanism shall ensure a 3% grade holding capacity, assuming a 25% brake shoe friction coefficient. The hand brake shall have the capability to be both manually and electrically operated, both at the unit and in the cab, with indicator lamps near the brake unit and also in the locomotive cab. The design and placement of the handbrake and handbrake controls shall be subject to Metra design review and approval. **[CDRL C-10-03]**

#### 10.4 WHEELS/AXLES/GEAR

- 10.4.1 Gear ratio shall provide for operation up to 90 mph minimum.
- 10.4.2 Axles shall be supplied to the latest revision of AAR Specification M-101, grade "F" material. End-of-axle access shall be provided for wheel truing operations.
- 10.4.3 Wheels shall be E-42 type, grade B per AAR M-107/M-208, with 1:20 contour, 5.5 inch width, AAR-2A profile, witness groove hub stamped, and standard AAR wheel identification. Wheels should have sufficient material to allow multiple wheel truing operations

#### 10.5 JOURNAL BEARINGS

- 10.5.1 Grease lubricated Timken Class GG roller bearings shall be provided.
- 10.5.2 For trucks designed with pedestals the following shall apply:
- 10.5.2.1 Journal box housings shall be equipped with 1060 steel liners.
- 10.5.2.2 Truck frame pedestal liners shall be Nylatron or approved equivalent.

#### 10.6 SUSPENSION SYSTEM

- 10.6.1 The suspension system shall be consistent with the overall performance requirements of the locomotive. The Contractor shall demonstrate through test results or simulations that the interfaces and integration of the system has been fully and successfully accomplished and that its dynamic performance under all operating conditions and speeds is in accordance with the requirements of this Specification and the intended services. If simulation is to be used, the Contractor must demonstrate that the model provides correlation with actual test data under a variety of circumstances to justify its use.
- 10.6.2 Wheel Load Equalization  
The suspension system shall meet Class G load equalization requirements per APTA Standard SS-M-014-06.
- 10.6.3 Static Lean Response  
The locomotive and suspension system shall meet static lean requirements as follows:
- 10.6.3.1 For maximum cant deficiency a worst-case wheel load no less than 60% of the static wheel load (see 49CFR Section 213.57 and 49CFR Section 213.329).
- 10.6.3.2 For maximum cant deficiency of 6 in. as per Chapter 1 of this Specification, a worst- case wheel load of no less than 50% of the static wheel load.
- 10.6.4 Track Dynamic Forces  
Track dynamic (P2) forces shall not exceed 82,000 lbs for a 0.5 degree dip angle and all

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speeds up to the locomotive operating speed limit. The calculation is to consider nominally stiff concrete tie track and to use the British Rail Equation (as defined in British Railways Board Group Standard GM/TT0088 Issue 1, Rev. A).  
The specific equation to be used is as follows

$$P_2 = P_0 + 2\alpha v \sqrt{\frac{m_u}{m_u + m_t}} \left( 1 - \frac{\pi c_t}{4\sqrt{k_t(m_u + m_t)}} \right) \sqrt{k_t m_u}$$

Where:

- $P_0$       Static wheel load in pounds
- $\alpha$       Dip angle in radians
- $v$       Vehicle speed in inches/ second
- $m_u$       Unsprung mass per wheel in lbf/in/ sec<sup>2</sup>
- $m_t$       Track mass per wheel in lbf/in/ sec<sup>2</sup>
- $c_t$       Track damping per wheel in lbf/in/sec
- $k_t$       Track stiffness per wheel in lbf/ in

Track parameter values are as follows:

- $\alpha$       0.0085 Total dip angle in radians based on '2 degree on both sides of the dip
- $m_t$       1.1335 Track mass per wheel in lbf/ in/ sec<sup>2</sup> for nominally stiff concrete tie track
- $c_t$       671 Track damping per wheel in lbf/in/ sec for nominal track conditions (from literature)
- $k_t$       392,900 Track stiffness per wheel in lbf/in for nominally stiff concrete tie track (corresponds to track modulus of 5,100 lb/in/in, assuming a track deflection of 0.084 inches under a 33,000 pound wheel load)

Calculation of  $P_2$  forces using builder proposed alternative values in the British Rail Equation and resulting change in the value of  $P_2$  forces may be considered by the Customer upon approval of justification for such changes by the Customer and that such calculations are also approved by the owner of the right-of-way or his designated representative.

#### 10.6.5 Dynamic Response on FRA Class 1 through Class 5 Track

Track-worthiness of the locomotive and suspension system shall be verified through test results or simulations over the track inputs defined in Chapter XI of AAR Standard M-1001. This includes the following conditions:

- 10.6.5.1      Constant Curving (M-1001 Section 11.7.3)
- 10.6.5.2      Spiral Negotiation (M-1001 Section 11.7.4)
- 10.6.5.3      Twist and Roll (M-1001 Section 11.8.2)
- 10.6.5.4      Pitch and Bounce (M-1001 Section 11.8.3)
- 10.6.5.5      Yaw and Sway (M-1001 Section 11.8.4)
- 10.6.5.6      Dynamic Curving (M-1001 Section 11.8.5)

Test or analysis is to consider speeds up to 90 mph (where appropriate). Limit values are to be based on criteria defined in Table 11.1 (AAR Standard M-1001).

#### 10.7 TRUCK GROUNDS

A Metra approved flexible ground strap system shall be provided between the car-body and each truck frame. The design and placement of truck ground strap shall be subject to Metra review and approval. **[CDRL C-10-04]**

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#### 10.8 PROPOSAL DELIVERABLES REQUIREMENT LIST

<b>PDR</b>	<b>Title</b>
P-10-01	Truck System

#### 10.9 CONTRACT DELIVERABLES REQUIREMENT LIST

<b>CDRL</b>	<b>Title</b>
C-10-01	Truck Design Review
C-10-02	Service History of Truck
C-10-03	Handbrake
C-10-04	Truck Ground

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## 11 SANDING

### 11.1 CONTROL

- 11.1.1 Electro-pneumatic sanding and suitable trainline controls shall be provided to sand ahead of the leading wheels of the locomotive in either direction. The location and design of the sand boxes and sand controls shall be subject to Metra review and approval. **[CDRL C-11-01]**
- 11.1.2 Automatic sanding under conditions of wheel slip, both motoring and blended braking shall be provided, as appropriate.
- 11.1.3 The braking system shall be arranged to provide automatic sanding at all nozzles when an emergency brake application is initiated, from either locomotive or the train consist. Sanding shall be to zero speed. There shall be no sanding with a zero speed emergency brake application.

### 11.2 SWITCHES AND LIGHTS

- 11.2.1 The builders standard momentary contact sand push button switch shall be mounted on the operator's lower console.
- 11.2.2 An indicating light, or an indication on the builder's integrated electronic display (if applicable) shall be provided to show whenever a sand valve is energized.

### 11.3 SAND TRAPS AND RELATED DEVICES

- 11.3.1 A total of four (4) sand traps shall be provided.
- 11.3.2 Four (4) control valves (or approved equivalent) shall be provided.
- 11.3.3 Sand trap compartments shall have clean out openings located at either the bottom or side of the sand boxes.

### 11.4 SAND BOXES

- 11.4.1 Sand boxes, having a minimum total capacity of 18 cu. ft., shall be provided.
- 11.4.2 Covers on the sand box filler openings shall be equipped with seals to minimize moisture entry and shall have latching mechanisms.
- 11.4.3 The inside surfaces of the boxes shall receive a treatment of polyamide-epoxy enamel or other approved anti-corrosion coating.
- 11.4.4 Screens, or other suitable provision, shall be provided for all sand boxes to prevent foreign items from being dropped into the sand.

### 11.5 CONTRACT DELIVERABLES REQUIREMENT LIST

CDRL	Title
C-11-01	Sand System

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## 12 ELECTRICAL SYSTEMS

### 12.1 ELECTRICAL CONTROL

12.1.1 An AC traction system with individual axle control is required. Filters shall be included to prevent track signaling circuit and communication system interference. The use of insulated gate bipolar transistors (IGBTs) in the power control circuits is required with AC traction systems. A proposal shall be submitted of the traction system. [PDRL P-12-01]

12.1.2 Electrical control functions shall be microprocessor controlled. The controller shall provide an operating status indication. An external communication port for the purpose of programming and diagnostic communication shall be provided.

#### 12.1.3 Control Features

12.1.3.1 Traction motor cut-outs are to be provided as part of the microprocessor control to permit locking out any one motor. When a motor is locked out the remaining motors shall not be overloaded.

12.1.3.2 Microprocessor-based ground relay protection shall be provided. Repeated ground relay pick-ups within a time period shall automatically cut out individual traction motors in an attempt to identify and isolate a grounded motor. If the first motor cut out by the locomotive control system does not prevent a recurrence of the ground relay, that motor will be cut back in and the next motor will be cut out. This sequence shall be repeated for the remaining motors until the ground relay no longer activates. If no grounded motors are identified by the automatic traction motor cutout system and the ground relay continues to operate during power mode of operation, the ground relay and power mode will be locked out on the affected unit. The microprocessor will display a message, "NO POWER - GROUND RELAY LOCK OUT" (or similar fault message). In the event of a ground relay lock-out, a manual means of resetting the system is desirable.

12.1.3.3 An interlock shall be provided to interlock propulsion capability with passenger car door open or wheelchair lift deployed detection circuitry. The locomotive shall contain a zero speed detection system. An indication on or adjacent to the Engineer's console shall illuminate when the detection system is in operation, and also when all doors are closed. A door(s) open condition shall inhibit the propulsion system, thus preventing movement. A brake release inhibit shall be furnished to prevent brakes on the train from being released when a wheelchair ramp is deployed. Manual isolation (override) for each feature must also be included. It shall be the builder's responsibility to provide a solution in full compliance with applicable FRA regulations (§238.131 & 238.133) "Exterior side door safety systems", and also in compliance with all related APTA standards such as PR-M-S-18-10.

12.1.3.4 Traction motor anti-plugging software to be provided, to prevent traction motors from being powered in the direction opposite the direction of travel.

12.1.3.5 A pressure switch, or other similar device in the brake pipe shall provide a minimum brake pipe maintaining feature which will drop out the generator field contactor if pressure drops below 39 psi. Contactor will pick-up when pressure exceeds 45 psi.

12.1.3.6 A pressure switch, or similar device in the independent brake application/release line shall drop out the generator field contactor if the pressure exceeds 40 psi. Contactor will pick-up when the pressure drops below 20 psi.

12.1.4 An Inverter Backup Mode feature (AC Traction configurations) shall be incorporated to allow for system reconfiguration to provide HEP in the event of an HEP inverter failure. In such cases, appropriate controls for this transfer and corresponding fault indicators shall be provided on the control panel. In such cases, locomotive propulsion shall remain functional at a reduced power level as necessary. Design details, software documentation and

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electrical schematics for the traction system shall be submitted to Metra for design review and approval. **[CDRL C-12-01]**

## 12.2 GENERATORS/TRACTION MOTORS

- 12.2.1 The builder's standard auxiliary power source shall be provided for the supply of 74 Volt DC battery loads, including primary source for battery charging.
- 12.2.2 The builder shall furnish his proven standard main generator/alternator. The traction generator design shall be submitted to Metra for review and acceptance. **[CDRL C-12-02]**
- 12.2.2.1 Shall have rectification by solid state devices.
- 12.2.2.2 Shall have Class H or other approved insulation.
- 12.2.3 The AC traction motors shall be the builder's current production, proven motor, with roller support bearings (if applicable). Adequate traction motor cooling air shall be provided for repetitive high-load start, quick stop operation. The traction motor design shall be submitted to Metra for review and acceptance. **[CDRL C-12-03]** AC type traction motors shall be designed for North American Passenger Service.
- 12.2.3.1 If the traction motor is axle hung, sealed-grease lubricated insulated bearings, tapered roller or equivalent shall be incorporated.
- 12.2.3.2 Class H or better insulation with vacuum/ pressure impregnation of all coils, armature, field or stator.
- 12.2.3.3 Fitted with disconnect cable leads or approved equal.
- 12.2.3.4 Properly baffled to prevent blowing of sand and debris from rails, and to prevent motors from inhaling non-filtered cooling air, rain or snow.
- 12.2.3.5 One motor shall be given all commercial tests for Institute of Electrical and Electronic Engineers (IEEE) standards and a complete heat run prior to use in first locomotive.
- 12.2.3.6 Motors shall be cooled with clean air supply (if required) using inertial air filters or filter grids as approved by the Customer.

## 12.3 WHEEL SLIP-SLIDE DETECTION

- 12.3.1 A state-of-the-art slip-slide protection system shall be provided by use of speed sensors on the traction motors and protect against both synchronous and differential slips and slides. Salient features shall include the following:
- 12.3.1.1 A wheel slip control system that shall make full use of advantages provided by microprocessor techniques.
- 12.3.1.2 Shall make use of available adhesion and provide protection against all rail conditions and be optimized for use on a lightweight passenger locomotive.
- 12.3.1.3 A positive traction control type system or approved equal shall be provided.
- 12.3.1.4 The slip-slide protection shall function in all operating conditions including dead-in- consist and isolated traction motor. For all in-train acceleration, service braking and slip/ slide correction, jerk rate shall not exceed 1.50 miles per hour per second per second (mphpsps).

## 12.4 PROTECTION

- 12.4.1 The propulsion system shall incorporate protection functions that prevent damage or incorrect operation resulting from the following causes, at a minimum:
- 12.4.1.1 Main alternator over current or over temperature
- 12.4.1.2 Inverter/ converter over current
- 12.4.1.3 Inverter/ converter semiconductor and /or heat sink over temperature

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- 12.4.1.4 Traction motor overload
- 12.4.1.5 Traction motor over temperature
- 12.4.1.6 Traction motor over speed
- 12.4.1.7 Incorrect connection of traction motor leads (i.e., phase reversal or incorrect phase sequence)
- 12.4.1.8 Wheel diameter differences, up to and including the greatest wheel diameter difference that is physically possible
- 12.4.1.9 Ground fault, sensed as an imbalance of supply and return current, the threshold of which shall be set as necessary to avoid nuisance trips
- 12.4.1.10 Open traction motor phase
- 12.4.1.11 Charging resistor open circuit (if applicable)
- 12.4.1.12 Line or DC link over voltage
- 12.4.1.13 Failure of line contactor(s) to open when commanded
- 12.4.1.14 Actuation of any protective function shall be annunciated to the diagnostic system

12.4.2 Transient abnormal or fault conditions shall be reset automatically. Automatic resets shall be counted and limited; repeated occurrences of the same malfunction over short time intervals may be treated differently to optimize the protection.

12.4.3 Propulsion controls shall be designed and programmed to provide protection of propulsion system power components. The control logic shall not command a power device to interrupt more current than it is rated for, less margin, nor to operate when its applied voltage is in excess of its rating, less margin. Reception of both forward and reverse commands, or detection of any other invalid command, shall inhibit propulsion or result in some other approved action. Upon detection of an abnormal condition which might result in damage, the controls shall actuate capable circuit interrupter(s) provided in the power equipment. Manual reset of fault condition shall be controlled to prevent equipment damage to any propulsion system component or sub-system.

#### 12.4.4 Equipment Isolation for Failure Modes

In case of equipment failure, the failed equipment shall be completely isolated (Both + and - sides) from the remaining good equipment. The idea is to provide maximum redundancy for increased mission reliability. The isolation method shall be automatic and annunciated via suitable display at Engineer's console. The arrangement adopted shall reflect accepted design practices in the rail industry. Axle control propulsion architectures shall satisfy the following criteria:

- 12.4.4.1 No single functional failure of a Traction Motor or Inverter:
- 12.4.4.1.1 Shall disable electric traction on more than one axle
- 12.4.4.1.2 Shall deprive the locomotive of any of its electric braking power beyond that which can be continuously made up by friction braking within the thermal constraints of the friction braking equipment
- 12.4.4.1.3 Shall deprive the locomotive of normal control of service friction braking on any truck
- 12.4.4.1.4 Shall deprive the locomotive of adhesion management on any truck
- 12.4.4.2 No two independent functional failures of a Traction Motor or Inverter:
- 12.4.4.2.1 Shall deprive the locomotive of normal control of service friction braking on more than 50% of its axles
- 12.4.4.2.2 Shall deprive the locomotive of adhesion management on more than 50% of its axles
- 12.4.4.3 No functional failure of any VWF inverter or traction motor shall disable electric traction on any axle beyond that directly affected

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12.4.4.4 Metra does not intend to prohibit brief operational interruptions at the locomotive level during which the equipment protects itself against a failure in progress or reconfigures itself following a failure

12.4.4.5 A vehicle architecture, wherein the propulsion system shares one or more line converters with the auxiliary power system, may be proposed

12.4.4.6 Alternative propulsion architectures shall demonstrate equivalent functional performance.

## 12.5 DYNAMIC BRAKES

12.5.1 Single-handle blended brake control shall be provided and controlled by the automatic brake handle position. The locomotive shall be equipped with the builder's dynamic brakes, which shall be automatically blended with the friction braking. The dynamic brake system design shall be submitted to Metra for review and acceptance. **[CDRL C-12-04]**

12.5.2 Normal blended braking effort shall be equivalent to the normal friction braking rate of the locomotive.

12.5.3 Normal blended braking shall be "dynamic priority" where friction braking is used to supplement dynamically braking to produce the braking effort called for. Emergency braking shall be "friction priority", where a small fixed amount of dynamic braking shall be used only to supplement the braking effort called for.

12.5.4 To the extent that either the train or locomotive auxiliaries are demanding power, dynamic braking energy recovered and used to supply those power demands is a desirable feature. If the total energy exceeds the auxiliary power and HEP demands, the surplus energy is dissipated as heat by the dynamic brake grid resistors.

12.5.5 The locomotive shall be equipped for load testing on its own dynamic brake grids. Cooling for dynamic brake grids shall be provided.

12.5.6 Protection shall be provided to nullify dynamic brake in response to a grid blower motor failure

12.5.7 Dynamic brake ground relay protection with indication display shall be provided.

12.5.8 A sealed cutout switch to nullify dynamic brake shall be provided.

12.5.9 Blended brake shall be nullified at speeds below 4-5 mph. The locomotive shall not transfer into blended or dynamic brake when the locomotive is at a standstill.

12.5.10 Wheel slide detection and correction shall be employed in conjunction with dynamic and pneumatic brake.

## 12.6 LAYOVER PROTECTION SYSTEM

12.6.1 A 480 volt, 3 phase, AC layover protection system from an external wayside power source shall be provided. The layover system design shall be submitted to Metra for review and acceptance. **[CDRL C-12-05]** It shall include the following:

12.6.2 The coolant for equipment requiring coolant shall be circulated through an electric immersion heater by an electric motor and pump. The coolant heater shall maintain adequate temperature levels.

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- 12.6.3 Locomotive batteries shall be charged by a layover charger, equipped with an ammeter,
- 12.6.4 Connection to power the locomotive air compressor (if motor-driven).
- 12.6.5 An adequate cab heater, with thermostatic control shall be provided.
- 12.6.6 Wayside power is to be trainlined, through the HEP cables/receptacles to the entire consist. The wayside power source will be plugged into the HEP power receptacles at the front end of the locomotive or at any location in the train consist.
- 12.6.7 Manual (on, off) control switch for activating layover protection circuitry shall be provided on a control panel within the cab. (As applicable)
- 12.6.7.1 An indicating light shall be provided on the control panel. The light is on whenever the layover switch is activated.
- 12.6.7.2 The layover switch shall be interlocked such that when the switch is on, it is not possible to start traction. If during traction the switch is placed in the on position, the circuit to the layover system will not be activated. In such instances, the circuit will automatically activate the layover system upon propulsion system shut down. The layover scheme is subject to Metra review and approval.
- 12.6.8 All heaters, pump motors and the battery charger shall be protected with thermal overload protection. When an overload trips or when the coolant temperature drops below safe levels, the alarm circuit shall be activated to illuminate the external beacon.

## 12.7 PROPOSAL DELIVERABLES REQUIREMENT LIST

<b>PDRL</b>	<b>Title</b>
P-12-01	Traction System

## 12.8 CONTRACT DELIVERABLES REQUIREMENT LIST

<b>CDRL</b>	<b>Title</b>
C-12-01	Traction System
C-12-02	Traction Generator
C-12-03	Traction Motors
C-12-04	Dynamic Brakes
C-12-05	Layover System

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## 13 HEAD END POWER SYSTEM

### 13.1 GENERAL REQUIREMENTS

A proposal shall be submitted for the head end power system. **[PDRL P-13-01]**

13.1.1 The locomotive shall be equipped with an inverter-type Head End Power system to provide 480 Volt, three phase, 60Hz. head end power to the train consist. The HEP system shall be sufficiently sized to power up to an 11-car train, minimum of 500kW @ .8 Power Factor. A "split bus" HEP system configuration is not required. Design details, software documentation and electrical schematics for the head end power system shall be submitted to Metra for design review and approval. **[CDRL C-13-01]**

13.1.2 The control system shall incorporate fault monitoring, diagnostics and control of the inverter. An external communication port for the purpose of programming and diagnostic communication shall be provided. The HEP system shall include a Trainline Complete (TLC) function to determine circuit continuity and shall determine when the HEP generator can energize the 480V trainlines. The TLC function shall prevent having an energized empty HEP receptacle.

13.1.3 Controls shall be provided in the cab. The below indicators and/or controls may be replaced with indications on the builder's integrated electronic display (if provided). Design of the Head End Power controls shall be submitted to Metra for design review and approval.

**[CDRL C-13-02]** The following features shall be included:

13.1.3.1 Controls for Start, Stop, TLC override, and fault resets. The stop push button shall function under any condition of plant operation to immediately open breakers, reduce alternator excitation and remove all power from the distribution trainlines. The emergency shut off shall also operate the shutdown sequence.

13.1.3.2 Status indicator lamps or display.

13.1.3.3 Switches identified as "H.E.P. ON", and "H.E.P. OFF".

13.1.3.4 A selector switch or control for consist configuration relative to desired energized receptacles. (Coupled to B-end, etc)

13.1.4 Displays or meters indicating: voltage and amperage for all three phase legs and frequency.

13.1.5 HEP ground fault detection system to identify an electrical ground in the 480 VAC HEP output circuit. A ground occurring in the HEP circuit shall result in an indicator light as notification of the condition. An audible alarm is not required. A ground occurring in one phase of the HEP trainline circuit shall not affect operation of the HEP system.

13.1.6 A wayside layover interlock is required to prevent connecting to wayside power while the locomotive is generating HEP or vice versa. The control system shall be designed to prevent application of power to trainlines if the trainlines are already energized from another source of 3-phase power, such as another locomotive or shore power.

13.1.7 An Inverter Backup Mode feature is desirable to allow for system reconfiguration to provide HEP in the event of a HEP inverter failure. In such cases, appropriate controls for this transfer and corresponding fault indicators shall be provided.

13.1.8 The system shall be capable of remote control of ON and OFF functions from a controlling cab car on the opposite end of the consist.

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### 13.2 PROPOSAL DELIVERABLES REQUIREMENT LIST

PDRL	Title
P-13-01	Head End Power System

### 13.3 CONTRACT DELIVERABLES REQUIREMENT LIST

CDRL	Title
C-13-01	Head End Power System
C-13-02	Head End Power Controls

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## 14 MULTIPLE UNIT AND TRAINLINE CONTROLS

### 14.1 GENERAL REQUIREMENTS

Electrical trainline connections for MU control, as well as car control (including public address and intercom) shall be provided. Three phase power, including ground and control interlock circuits shall also be provided. Design details and placement of all multiple unit, HEP, and trainline cables and receptacles shall be submitted to Metra for design review and approval.  
[CDRL C-14-01]

### 14.2 CABLES

- 14.2.1 One 27-point locomotive control jumper cable of sufficient length (~61") to connect between the rear end low MU receptacle and a commuter car MU receptacle shall be provided for each locomotive.
- 14.2.2 One 27-point locomotive control jumper cable (~108") shall be provided for each locomotive.
- 14.2.3 Two (2) female 3/3 pole HEP molded type cables, Clements National MPA-1 or approved equivalent, are to be provided at the rear end. The cables are to be permanently wired into the locomotive. Location of the cables shall be similar to existing Metra locomotives.
- 14.2.3.1 The rear end cables shall terminate at clasp connections located directly behind the locomotive rear end plate. The clasp connections are provided with rubber boots.
- 14.2.3.2 Rear end cables shall be of sufficient length so that when connected to the receptacles on a coupled commuter car, the curves described earlier in this Specification can be negotiated without distress to the jumpers.
- 14.2.4 Jumper cables shall be furnished for completing the HEP control trainline on the no. 1 end of the locomotive (as required). The cable shall be of sufficient length to complete the loop, if such jumpers are necessary.

### 14.3 RECEPTACLES

- 14.3.1 Three (3) functional 27-point MU control receptacles, Clements CRA-27-MU with CRA-H-2L-XX cover or approved equivalent provided at the no. 1 end.
- 14.3.2 Three (3) functional 27-point MU control receptacles, Clements CRA-27-MU with CRA-H-2L-XX cover or approved equivalent provided at the no. 2 end.
- 14.3.3 One (1) dummy 27-point MU control receptacle shall be provided at the no. 2 end. Pin and grommet shall be Clements CRA-425-V01 and Contact Band shall be Clements CRA-42BS or approved equivalent.
- 14.3.4 Pin assignments for all functional 27-point MU receptacles shall be in accordance with Metra specification or as follows:

14.3.4.1	#1	Spare	SP1
14.3.4.2	#2	Low Coolant/Hot Battery (If Applicable)	SG
14.3.4.3	#3	Engine Stop, Throttle 5-6 (D Valve)	DV
14.3.4.4	#4	Negative	N1
14.3.4.5	#5	Emergency Sanding	ES
14.3.4.6	#6	Generator Field	GF
14.3.4.7	#7	Throttle 3-8 (C Valve)	CV

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14.3.4.8	#8	Forward	FO
14.3.4.9	#9	Reverse	RE
14.3.4.10	#10	Wheel Slip Indication	WS
14.3.4.11	#11	Negative	N2
14.3.4.12	#12	Throttle 5-8 (B Valve)	BV
14.3.4.13	#13	Positive Control	PC
14.3.4.14	#14	Communicating Signal	TS
14.3.4.15	#15	Throttle 2-4-6-8 (A Valve)	AV
14.3.4.16	#16	Engine Run	ER
14.3.4.17	#17	Positive	P1
14.3.4.18	#18	Door Closed Indication	DP
14.3.4.19	#19	Negative	N3
14.3.4.20	#20	Door Closed Indication Positive	PD
14.3.4.21	#21	Positive	P2
14.3.4.22	#22	Ground Relay Tripped Indication	GR
14.3.4.23	#23	Manual Sanding	SA
14.3.4.24	#24	HEP Re-Start	SP2
14.3.4.25	#25	Lift Deploy Indication	LD
14.3.4.26	#26	Spare Wire	SP3
14.3.4.27	#27	Spare Wire	SP4

14.3.5 Dual 16-point receptacles, Clements National CX316-1POC-A or approved equivalent, for communications trainline shall be provided at both the no. 1 and no. 2 ends. Wiring is to be such that communication functions can be trainlined between the no.1 and no. 2 end receptacles.

14.3.6 Pin assignments for the communications trainline receptacles are as follows:

14.3.6.1	Symbol	Pin No.	Function
14.3.6.2	PA1*	1	70.7V Speaker line
14.3.6.3	PA2*	2	70.7V Speaker line
14.3.6.4	+74V	3	Power Positive
14.3.6.5	COM	4	Power Negative
14.3.6.6	COM	5	Power Negative
14.3.6.7	PA5	6	70VDC Control line from main amp.
14.3.6.8	+74V	7	Power Positive
14.3.6.9	PA6	8	70VDC Control line from main amp.
14.3.6.10	9	9	Spare
14.3.6.11	10	10	Spare
14.3.6.12	11*	11	Spare
14.3.6.13	12*	12	Spare
14.3.6.14	PA3*	13	Intercom and amp. input line
14.3.6.15	PA4*	14	Intercom and amp. input line
14.3.6.16	--	15	Shield of 13 &14
14.3.6.17	--	16	Shield of 11 &12

\* indicates twisted shielded pairs: 1&2, 11&12, and 13&14.

14.3.7 Four (4) 3/3 pole HEP molded receptacles, Clements National MRA-1 or approved equivalent compatible with existing Metra equipment shall be provided at the no.1 end (if jumper cables for completing the HEP trainline on the no. 1 end are required). Two (2) receptacles shall be provided at the no. 2 end. The receptacles shall include a cover to retain the jumper in the receptacle.

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14.3.8 Phase rotation of main power pins shall be 1-2-3 for HEP receptacles and jumpers. The small control pins shall be connected as follows:

- 14.3.8.1 #1 Trainline control
- 14.3.8.2 #2 Grounded
- 14.3.8.3 #3 Trainline control

14.3.9 Receptacle covers shall be painted as follows:

- 14.3.9.1 Head end power - Red
- 14.3.9.2 27-point MU - Orange
- 14.3.9.3 Communication System – Brown

14.3.10 Identification tags shall be provided over each receptacle as follows:

- 14.3.10.1 Head end power - "480 VAC"
- 14.3.10.2 27-point MU - "27 MU TRAINLINE"
- 14.3.10.3 Communication system - "PA SYSTEM"

14.3.11 The location of receptacles on both ends of the locomotive shall be compatible with Metra's existing locomotives.

#### 14.4 CONTRACT DELIVERABLES REQUIREMENT LIST

CDRL	Title
C-14-01	MU, HEP, and Trainline Cables and Receptacles

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## 15 BATTERY AND BATTERY FEATURES

### 15.1 BATTERY PRIME MOVER

The batteries shall be of a reliable, rail service proven design, with adequate power to meet or exceed established performance standards on the Metra system as described elsewhere in this Specification. Prior applications, other than rail service, may be considered but are subject to approval by Metra's Mechanical Department. Battery design shall be optimized to allow for the lowest possible life-cycle costs and ease of maintenance. A proposal shall be submitted for the battery system. **[PDRL P-15-01]** Details of the design of the battery system shall be submitted to Metra for design review and approval. **[CDRL C-15-01]**

#### 15.1.1 MAIN LOCOMOTIVE BATTERY

15.1.1.1 A 64 volt battery system shall be provided. Design of the main battery system shall be subject to Metra design review and approval. **[CDRL C-15-02]**

15.1.1.2 Battery charging shall primarily be accomplished through the auxiliary power supply system. Battery charging shall also be handled from the 480 VAC system through the layover charger provision.

15.1.1.3 A provision to control the battery charge rate based on ambient temperature conditions is required to prevent over or under charging situations.

15.1.1.4 Battery box(es) shall be provided in the builder's standard location, sized to accept unitized batteries and shall have vented access doors with quick release handles. Battery box(es) interior shall be coated in corrosion-inhibiting paint and be equipped with stainless steel drip pans.

15.1.1.5 Batteries shall be equipped with a single-point refill irrigation system with connections compatible with existing Metra refilling equipment.

15.1.1.6 An LVPS (Low Voltage Power Supply) shall be provided for the supply of 74 Volt DC battery loads, Including primary source for battery charging."

15.1.1.7

#### 15.1.2 PROPULSION/AUXILIARY BATTERY **[CDRL C-15-03]**

15.1.2.1 A Li-Ion Battery propulsion/auxiliary battery shall be provided with the capability of producing continuous 500kW @ .8 Power Factor of head end power. Design of the propulsion/auxiliary battery system shall be subject to Metra design review and approval.

15.1.2.2 A Li-Ion Battery propulsion battery shall be provided with minimum initial rated 5280 kWh energy. Useable energy will vary based on duty cycle, 65% of initial rated.

15.1.2.2.1 Maximum Battery discharge power shall exceed 2.38 MW

15.1.2.2.2 Battery and support structure to be designed for shock and vibration per IEC 61373

15.1.2.2.3 Battery assembly shall be protected by a hood structure with access for inspection.

15.1.2.2.4 Carbody battery assembly shall be removable by crane.

15.1.2.2.5 Below-Deck Battery subassembly shall be removable via forklift

15.1.2.2.6 General (typical) battery duty cycle assumed to be 6 days/week operation, 2 charge/discharge cycles per day.

#### 15.1.3 PROPULSION/AUXILIARY BATTERY CONTROL **[CDRL C-15-04]**

15.1.3.1 A Battery Management System (BMS) shall be included for each battery pack.

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- 15.1.3.2 A master BMS shall be responsible for interfacing with Locomotive Control System.
- 15.1.3.3 Battery Voltage, Current and Temperature Monitoring shall be provided
- 15.1.3.4 The BMS shall protect the battery in the event of over/under voltage, over temperature, and over current.
- 15.1.3.5 Diagnostic data shall be made available from the BMS to be used for remote monitoring of the battery.
- 15.1.3.6 Each battery rack shall be equipped with a fire suppression system that shall be monitored by the BMS.

#### **15.1.4 PROPULSION/AUXILIARY BATTERY CHARGING [CDRL C-15-05]**

- 15.1.4.1 Battery charging may be performed by an overhead 1500 VDC source (FAST CHARGE) to connect by way of locomotive pantograph
- 15.1.4.2 Typical Battery charge duration dependent on charge power available.

#### **15.1.5 DC FAST CHARGE PANTOGRAPH [CDRL C-15-06]**

- 15.1.5.1 DC Fast Charging via DC Catenary source.
- 15.1.5.2 Pantograph and High Speed Circuit Breaker Mounting Provisions shall be roof mounted
- 15.1.5.3 Electric or air operated pantograph operation to be provided.

#### **15.1.6 BATTERY THERMAL CONDITIONING [CDRL C-15-07]**

- 15.1.6.1 A thermal conditioning unit shall be provided for each battery subassembly
- 15.1.6.2 Coolant shall be 50/50 mixture of propylene glycol and water, or equivalent
- 15.1.6.3 The cooling system is linked to the Battery Management System (BMS) with sensors to monitor coolant temperature and pressure.
- 15.1.6.4 Coolant drain and refilling apparatus are located on the engineer's side of locomotive.

### **15.2 PROPOSAL DELIVERABLES REQUIREMENT LIST**

<b>PDRL</b>	<b>Title</b>
P-15-01	Battery System

### **15.3 CONTRACT DELIVERABLES REQUIREMENT LIST**

<b>CDRL</b>	<b>Title</b>
C-15-01	Battery System
C-15-02	Main Locomotive Battery
C-15-03	Propulsion/Auxiliary Battery
C-15-04	Propulsion/Auxiliary Battery Control
C-15-05	Propulsion/Auxiliary Battery Charging
C-15-06	DC Fast Charge Pantograph
C-15-07	Battery Thermal Conditioning

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## **16 PAINTING, SIGNAGE, AND EXTERIOR**

The exterior decorative treatment of locomotives shall be agreed upon between Contractor and Metra. The builder shall prepare styling drawings for Metra's approval. All coatings shall be lead free. The styling drawings shall be submitted to Metra for review and approval. [CDRL C-16-01] Edge sealer shall be used on all exterior vinyl decals.

### **16.1 PAINTING**

- 16.1.1 All exterior car-body surfaces shall be painted with a polyurethane paint system, DuPont Imron or approved equivalent, in a scheme in accordance with current Metra styling & painting concept. (Refer to example drawing M-1897).
- 16.1.2 A clear coat DuPont Imron #VF-610 or equivalent shall be applied over the finish colors.
- 16.1.3 Fuel tank, trucks, air reservoirs and other undercarriage surfaces shall be painted with the builder's standard black paint.
- 16.1.4 Handrails at each side of the exterior doors shall be painted reflective white. All exterior hand holds to be painted gloss white.
- 16.1.5 Black anti-skid material shall be applied on the rear (no. 2) walkway surface. The surface shall be outlined in reflective white paint.
- 16.1.6 Cab interior, vestibule, short hood interior, long hood interior and components shall be painted suede gray, DuPont Tuffcote #917-43094 or equivalent. Alternate color will be considered, subject the Metra approval.

### **16.2 PRESSURE SENSITIVE MARKINGS**

- 16.2.1 The nose of the locomotive shall receive alternate red and white reflective striping arranged in a "vee" pattern. The red material shall be 3M Scotchlite Diamond Grade #3972 and the white material 3M Scotchlite Diamond Grade #3970.
- 16.2.2 A four inch (nominal) wide white reflective strip, 3M Scotchlite Diamond Grade #983-10 shall be applied to the perimeter of the locomotive at side sill level.
- 16.2.3 The following decals and numerals are to be provided in reflective material, 3M Scotchlite 680 series and applied to the locomotive prior to clear coating, in accordance with Metra styling & paint drawings:
  - 16.2.3.1 RTA logo, 8" diameter one on each side of the locomotive, color and location to be determined.
  - 16.2.3.2 Locomotive road numbers, 8" high Helvetica medium style applied on each side of the cab. Color to be determined.
  - 16.2.3.3 Metra logo, one on each side of the locomotive, size and color to be determined.
  - 16.2.3.4 Locomotive road numbers, 6" high Helvetica medium style applied to the no. 2 end in each upper corner. Color to be determined.
  - 16.2.3.5 Locomotive names, 4" high capital and lower case Helvetica medium style applied one on each side of the locomotive. Color and location to be determined.

### **16.3 IDENTIFICATION**

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- 16.3.1 The letter "F" shall be located on the side sill near the end of each side to identify the cab end as the front of the locomotive.
- 16.3.2 Illuminated number panels provided in an approved location on the no. 1 end shall be white Helvetica medium characters on a black background.
- 16.3.3 Road numbers shall be determined by Metra and shall be continuous through the number of locomotives ordered.
- 16.3.4 Locomotive road numbers shall be stenciled in a prominent location in the cab, visible to both the operator and the observer sides.
- 16.3.5 A stainless steel owner's plate per Metra drawing M-327, is to be applied to the locomotive on both sides near the rear (no. 2) end.
- 16.3.6 AEI tags, two per locomotive shall be provided with;
- 16.3.6.1 Owner's code - METX
  - 16.3.6.2 Locomotive road number
  - 16.3.6.3 Length of locomotive
  - 16.3.6.4 No. of axles
  - 16.3.6.5 Bearing code - 01
  - 16.3.6.6 Side indicators (right/left sides)

#### 16.4 CONTRACT DELIVERABLES REQUIREMENT LIST

<b>CDRL</b>	<b>Title</b>
C-16-01	Exterior Styling

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## **17 MATERIALS AND WORKMANSHIP**

### **17.1 GENERAL REQUIREMENTS**

- 17.1.1 Workmanship and Quality shall conform to the best manufacturing practices in all respects. All work shall be performed by qualified personnel, using correct tooling and procedures, and be properly trained and skilled in the tasks they will be performing.
- 17.1.2 Surfaces exposed to passengers, crew, or maintainers shall be smooth and free of burrs, sharp edges or corners, and dangerous protrusions. The vehicle design shall avoid pinch points, tripping hazards, snagging points, water traps, and debris accumulation points.
- 17.1.3 Car-body structural parts that are permanently covered and concealed after assembly shall not be made of copper, copper bearing aluminum alloys, brass, bronze, silver, or nickel.
- 17.1.4 Foreign matter, such as shavings, chips, etc., shall be completely removed from all parts of the vehicle, its components, assemblies and subassemblies, whether hidden or exposed.
- 17.1.5 Materials for the construction of the vehicle shall be in accord with the stated specification or cited standard, unless the Contractor obtains Metra's approval for a substitution in writing. Alternate standards may be proposed, but must be supplied in English, with a narrative comparing both standards, and citing justification why the substitution is equivalent.
- 17.1.6 All materials shall perform safely and satisfactorily within their operating environment and in accordance with their intended function.
- 17.1.7 Whenever a commercial material is not covered by a specification or standard, the Contractor shall identify the material by the commercial trademark, name, and address of the supplier. The Contractor shall submit a description, and the technical data specifications, of the material composition for approval. The Contractor shall maintain records that trace all materials to their manufacturers, and shall verify compliance with quality standards specified or cited in these Provisions.
- 17.1.8 Single-source materials shall not be permitted unless approved by Metra. Approval shall be determined on a case-by-case basis. Specification equivalency and benefit data for any substitution to a cited standard shall be submitted to Metra for review and approval.
- 17.1.9 The following materials shall not be used in the construction of the vehicle:
- 17.1.9.1 PVC
  - 17.1.9.2 Asbestos
  - 17.1.9.3 Cadmium (except for battery)
  - 17.1.9.4 Lead (except for lead solder on the printed circuit boards)
  - 17.1.9.5 PCBs
  - 17.1.9.6 Carcinogenic materials as listed by current Publication of American Conference of Governmental Industrial Hygienists (ACGIH)
  - 17.1.9.7 Materials listed in 29 CFR 1910.19
  - 17.1.9.8 All CFC and HCFC compounds except R-22 and R134a
  - 17.1.9.9 Urethane Foam
  - 17.1.9.10 Chlorinated fluorocarbons that may cause environmental problems or handling hazards

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- 17.1.9.11 Materials that, in their normal installed state, emit products that are known to be toxic or irritants
- 17.1.9.12 Materials that, in their normal installed state, emit products that are known to be toxic or irritative
- 17.1.9.13 Beryllium
- 17.1.9.14 In addition, Metra does not accept other restricted materials (restricted due to safety, environmental, and/or regulatory reasons) as well as materials that require stringent Personal protective equipment (PPE) such as face protection, special cloths during handling, removal and/or application by Metra. On a limited and case by case basis, Metra may approve the use of such material and in these cases the Contractor shall be required to submit a waiver in writing to Metra for approval prior to any use of such material. The Contractor's waiver request shall include the justification(s) for using the material, total weight of the material, location(s) and distribution on the vehicles, material safety and data sheets, and current test reports. In addition, the Contractor shall submit a letter from an independent material safety professional indicating their review of the Contractor's waiver request and their professional conclusions regarding the request and the safety, environmental and regulatory implications involved for Metra throughout the life of the vehicles.
- 17.1.10 The Contractor shall keep on file Safety Data Sheets (SDS) for all chemical materials (paints, solvents, adhesives, caulking, etc) used in the manufacture of the vehicle, and provide SDS information as requested by Metra for any additional material in question. A copy of each SDS shall be submitted to Metra for review and approval.
- 17.1.11 All materials utilized in the construction of the vehicle shall be subject to the approval of Metra. The Contractor shall keep a running list of all materials used in the vehicle in matrix format (matrix shall contain; material name, specification or material ID number, application, approval status, correspondence number, etc.). The Contractor shall submit this matrix along with material certifications and material property test reports to Metra for review. **[CDRL C-17-01]**
- 17.1.12 The Contractor shall submit for approval joining and fastening data, specifications, and standards for all types and methods of fastening and joining used.
- 17.1.13 All name and rating plates shall be permanently attached using mechanical fasteners. Exceptions may be made for small components and circuit boards.
- 17.1.14 All materials shall be new and of recent manufacture. Material, which is found to be defective and subsequently repaired, cannot be used unless specific approval is granted by Metra.
- 17.1.15 All materials used shall be inherently corrosion resistant, or be suitably finished with a corrosion resistant finish to minimize corrosion and degradation of appearance or function.
- 17.1.16 Materials that require overhaul/reconditioning periodically shall be available in the United States and overhaul/reconditioning shall be performed in the United States. All repair for major electric/electronic equipment shall be completed within one (1) months.

## 17.2 STORAGE OF MATERIAL

- 17.2.1 All stored material subject to corrosion shall be adequately protected by waterproof covers, coatings, or packaging to prevent damage.

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- 17.2.2 Equipment covers, cable entrances, and openings shall be suitably closed to prevent ingress of water or dirt.
- 17.2.3 All dated material shall have the expiration date clearly marked. Expired material shall not be used.
- 17.2.4 Material or components, which require maintenance during storage, shall be properly maintained per the component(s) manufacturer's instructions. The Contractor shall document such maintenance, and provide these records as requested by Metra. **[CDRL C-17-02]**
- 17.2.5 Rejected or damaged material shall be clearly marked, dispositioned, and stored separately from all other material.

### 17.3 STAINLESS STEEL

When used, types and grades of stainless steel shall be stated in all drawings. Material certifications and test reports including chemical analysis, physical properties shall be submitted to Metra. **[CDRL C-17-03]**

- 17.3.1 Certified copies of test reports covering each coil of steel to be used shall be submitted to Metra by the Contractor. Each test report shall list chemical analysis, physical properties, weight, mill coil number, invoice number, date and mill order number of each coil. For sheet stock, a ladle analysis and single physical property test on each heat and each size shall be made and shall be submitted. **[CDRL C-17-04]** All austenitic stainless steel shall be free from precipitated carbides, and all stainless steel shall be free from scale.
- 17.3.2 General requirements for stainless steel are:
- 17.3.2.1 Gauge tolerance (standard for industry);
  - 17.3.2.2 Color and finish (must match samples);
  - 17.3.2.3 Flatness - coil stock (standard mill flatness);
  - 17.3.2.4 Flatness - sheet stock (stretcher level quality);
  - 17.3.2.5 Camber (standard for industry).
- 17.3.3 Buffing and polishing of stainless steel, if required, shall be done without any use of composition containing iron or iron oxide.

### 17.4 LOW ALLOY HIGH TENSILE STEEL

Low alloy, high tensile steel sheet shall be of the Cr-Si-Cu-Ni-P composition, corrosion resistant types, conforming to SMA570WQ per JIS G 3114 (Japanese Industrial Standard), ASTM Specification A656 Grade 80 or equivalent specification approved by Metra.

Types and grades of steel shall be stated in each drawings.  
Material certifications and test reports including chemical analysis, physical properties shall be submitted to Metra. **[CDRL C-17-05]**

### 17.5 STEEL/STAINLESS STEEL CASTINGS (if used)

The contractor shall provide casting specifications/procedures, requirements, test requirements/methods and acceptable criteria including cast surface and machining surface if steel or stainless castings are used. **[CDRL C-17-06]** Metra may add extra requirements.

- 17.5.1 Weld repairs of castings shall be allowed, provided that repairs are performed in accordance with an approved written procedure, and by welders qualified to ASTM A488. For stainless steel casting, provide written procedure and its justification.

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## 17.6 ALUMINUM (if used)

When used types and grades of aluminum shall be stated in each drawing. Metra may request the material certification and test report including chemical analysis, physical properties.

Aluminum forgings shall comply with ASTM B247 or Aluminum Association Standards for Aluminum Mill Products, alloy, and temper 6061-T6.

Aluminum castings shall comply with ASTM B26, ASTM B85, ASTM B108, or Aluminum Association Standards for Aluminum Mill Products alloy and temper 356-T6, 364-T5, or 356-T6 respectively, and shall be free from blowholes, cracks, shrinkage, and other defects.

Dissimilar materials such as aluminum and stainless steel may not contact directly. Bolts and nuts, screws or other fasteners used with aluminum alloys shall be aluminum alloy (not containing copper) or shall be well galvanized, unless otherwise approved

## 17.7 ELASTOMERS

The Contractor shall submit test reports for all elastomers proposed.

Glazing strips for side and end windows shall be molded or extruded Neoprene conforming to ASTM C-542, with ends vulcanized together to form one continuous piece.

Elastomers must comply with applicable flammability and smoke emission requirements of FRA Regulation 49 CFR Part 238 as well as Section 17.16 of this specification. **[CDRL C-17-07]**

## 17.8 GLAZING MATERIALS

Glazing materials shall be proposed and approved by Metra. Window glazing facing to outside of the locomotive shall meet 49 CFR 238 Part 223. The end door under/next to the cab control room if any, the end door shall meet 49 CFR 238 Part 223 large impact test with retention.

All material must comply with applicable flammability and smoke emission requirements of FRA Regulation 49 CFR Part 238 as well as Section 17.16 of this specification. **[CDRL C-17-08]**

## 17.9 WOOD, PLYWOOD, PLYMETAL, COMPOSITE MATERIALS (if used)

### 17.9.1 Wood

Any pieces of wood entering into construction of locomotives shall be select grade, shall be thoroughly seasoned by air or kiln drying, and shall be dressed on all surfaces to dimensions.

### 17.9.2 Plywood

All plywood must be exterior "BB" grade, DFPA marked, 100% waterproof bond, formed from Group II wood species for inside finish panels, as described in the American Plywood Association, Specification PS 1-83 (or later revision).

Except where used in the construction of plymetal panels, all plywood must be treated to resist decay and mold. Treatment materials must be nontoxic to man and non-corrosive to car-body materials.

### 17.9.3 Metal Faced Plywood - Plymetal

The term plymetal refers to metal faced plywood (described above) which conforms to the last published revision of Bombardier Plymetal Specification SMP 209-D. Whenever the metal surface of a plymetal panel is faced Melamine, it shall be applied in accordance with Section 17.10 of these specifications.

Plymetal panels shall also meet the test criteria listed in Table 17-2 below:

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**Table 17-2**

<b>Minimum Metal to Wood Test</b>	<b>Minimum Value</b>
Dry Shear	250 lbf/in <sup>2</sup> (1.72N/mm <sup>2</sup> ) to 80% wood failure
Boil shear, 3 hrs boil, tested at 68°F	150 lbf/ in <sup>2</sup> (1.03N/mm <sup>2</sup> ) to 80% wood failure
Wet shear, 48 hrs. soak, 68°F	150 lbf/ in <sup>2</sup> (1.03N/mm <sup>2</sup> ) to 80% wood failure
Creep, under static load for 48 hrs, 68°F	250 lbf/in <sup>2</sup> (1.72N/mm <sup>2</sup> ) to 80% wood failure

All exposed edges of the panels, drilled holes, fastener heads, openings, or cutouts within the panels shall be waterproofed and sealed with an approved epoxy paint/coating as soon as possible after fabrication, and prior to installation.

The overall flatness shall not exceed a maximum deviation of 0.015" per lineal foot, with a maximum of 0.125" deviation of any point on the panel measured from a reference plane taken from any three corners. The overall deviation of the panel thickness shall not exceed 0.031" (1/32").

All material must comply with applicable flammability and smoke emission requirements of FRA Regulation 49 CFR Part 238 as well as Section 17.16 of this specification.

#### 17.9.4 Metal Faced Composite Materials

Metal faced composite materials shall perform ASTM C297 testing for bonding strength to avoid delamination. A minimum of 6 samples shall be tested each category. The metal faced panels shall meet the test criteria listed in Table 17-3 below:

**Table 17-3**

<b>Minimum Metal to Composite Test</b>	<b>Minimum Value</b>
Dry	250 lbf/in <sup>2</sup> (1.72N/mm <sup>2</sup> )
Wet, 48 hrs. soak, 68°F	150 lbf/ in <sup>2</sup> (1.03N/mm <sup>2</sup> )
Creep, under static load for 48 hrs, 68°F	250 lbf/in <sup>2</sup> (1.72N/mm <sup>2</sup> )

#### 17.10 PLASTICS (if used)

##### 17.10.1 Thermoplastics

Thermoplastic sheet shall be homogeneous and extruded from virgin stock which does not include any regrinding of vacuum formed parts. Color pigments shall be UV stabilized. The color and surface finish of parts, manufactured from this material, shall be approved by Metra prior to a production run of parts. **[CDRL C-17-09]** Finished parts shall be free of waves and quilting. Voids, lumps and contamination shall be no larger than 0.01 in with a maximum of one defect in a 4.0 ft<sup>2</sup> area.

Thermoplastic materials shall comply with applicable flammability and smoke emission requirements of FRA Regulation 49 CFR Part 238 as well as Section 17.16 of this specification, and with the requirements listed in Table 17-3 below:

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**Table 17-4**

<b>Physical Property</b>	<b>Test Method</b>	<b>Performance Requirement Value</b>
Specific Gravity	ASTM D792	1.20 to 1.36
Hardness, Rockwell	ASTM D785	90 to 100, R-Scale
Tensile Strength	ASTM D638	5,500 psi (38 MN/m <sup>2</sup> ) minimum at 73°F (23°C)
Flexural Modulus	ASTM D790	320,000 psi (2206 MN/m <sup>2</sup> ) minimum elasticity at 73°F (23°C)
Flexural Strength	ASTM D790	10,000 psi (68,947.6 kPa) minimum @ 73°F (23°C)
Impact Strength (@ 73°F notched IZOD)	ASTM D256	6.6 foot pounds per inch of notch minimum.
Heat Shrinkage	None	15% maximum, 10 minutes @ 380°F (193°C)
Thickness	None	3/32 inch (2.38 mm) minimum

Independent laboratory test certificates shall be provided stating that the thermoplastic sheet complies with the requirements of the following standards. **[CDRL C-17-10]**

#### 17.10.2 Fiberglass Reinforced Plastics

This material shall be laminated polymeric reinforced material. Resins shall be thermosetting, fire-resistant polyester. Fiberglass content by weight shall be 25% minimum unless otherwise specified. Parts may be produced by resin transfer molding or compression molding.

Exposed fiberglass surfaces shall have a smooth matte finish. Embossed surface will be permitted in order to assure that finished surfaces are resin rich to obtain uniform color without visible glass fibers.

All material must comply with applicable flammability and smoke emission requirements of FRA Regulation 49 CFR Part 238 as well as Section 17.16 of this specification.

The Contractor shall submit for approval certificates verifying that reinforced plastic materials comply with the minimum requirements specified in Table 17-4 below. **[CDRL C-17-11]**

Pre-test conditioning of test specimens shall conform to ASTM D618.

**Table 17-5**

<b>Mechanical Property</b>	<b>Test Method</b>	<b>Method #1</b>	<b>Method #2</b>
Tensile Strength	ASTM D638	13,000 psi	18,000 psi
Compressive Strength	ASTM D695	22,000 psi	32,000 psi
Flexural Strength	ASTM D790	21,000 psi	28,000 psi
Impact	ASTM D256	10 ft-lbs/in of notch	13 ft-lbs/in of notch
Hardness	ASTM D2583	45 Barcol	45 Barcol
Heat	None	175°F Continuous	-
Thickness	None	0.125 in, minimum	0.125 in, minimum
Gelcoat Thickness	None	0.014" or 14 mils, ± 2 mils.	N/A

#### 17.10.3 Melamine

Melamine shall be laminated to aluminum sheets. The melamine impregnated, colored papers shall be directly molded to aluminum sheets at a temperature not less than 270 degrees F and at a pressure not less than 1,000 psi. The characteristics shall not be less than that required of general purpose type in NEMA Standard LD-3-2005 (or latest revision). Gloss finish melamine shall not be used unless otherwise approved, and melamine with a rough textured finish is likewise restricted.

All material must comply with applicable flammability and smoke emission requirements of FRA Regulation 49 CFR Part 238 as well as Section 17.16 of this specification. The Contractor shall submit for approval certificates verifying that bond between the melamine

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and the aluminum complies with the minimum requirements specified in Table 17-5 below.  
**[CDRL C-17-12]**

**Table 17-6**

Mechanical Property	Test Method	Performance Requirement Value
Tensile Strength	ASTM D638	with grain: 22,300 psi minimum cross grain: 20,300 psi minimum
Modulus of Elasticity	ASTM D790	with grain: $2.8 \times 10^6$ psi minimum cross grain: $3.1 \times 10^6$ psi minimum
Flexural Strength	ASTM D790	with grain: 15,000 psi minimum cross grain: 25,300 psi minimum
Internal Bond	ASTM D952	2,600 psi

Un-backed balanced melamine panels may be used in the locomotive interior. The characteristics shall not be less than that required of general purpose type in NEMA Standard LD-3-2005 (or latest revision).

The bond between the melamine and the aluminum shall meet the following:

Test Category	Test	Min. Requirements
Internal Bond	ASTM Test D952	2,600 pounds per square inch
Tensile Strength	ASTM Test Properties D638	22,300 lbs per square inch, with the grain
Flexural Properties	ASTM Test D790-71	Flexural modulus of elasticity, $2.8 \times 10^6$ pounds per square inch, with grain

#### 17.11 UPHOLSTERY MATERIAL

Upholstery material for vehicle seats shall be approved transportation grade material and shall be able to be cleaned by at least three widely available commercial industrial cleaning agents that are known to be chemically compatible. The contractor shall propose the material with technical information including physical properties. All material must comply with applicable flammability and smoke emission requirements of FRA Regulation 49 CFR Part 238 as well as Section 17.16 of this specification.

#### 17.12 PIPING, TUBING AND PRESSURE VESSELS

Air or hydraulic hose applications shall not be permitted in locations where adequate visual inspections cannot be made. Hose installations shall be located/arranged in such a manner as to prevent accidental cross connections to other hoses located in the same general area.

Hose installations shall be such that kinking, rubbing, straining, and unnecessary swinging are precluded. Routing that requires other piping, or cables, as the sole means of support shall not be accepted.

The Contractor shall perform a leak test on the final air or hydraulic piping system, with all components installed, on each vehicle in accordance with IEC 61133. The Contractor shall submit a copy of the test procedure for approval. **[CDRL C-17-13]** A copy of the test report for each vehicle, including retest reports if appropriate, shall be included with each Vehicle History Book.

Loss of main reservoir air pressure due to cumulative leakage in the entire pneumatic system, not including that required for system functioning, per vehicle, shall not exceed 10 psig in 15 minutes,

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following a 5-minute settlement period from the point at which the system was fully charged and the air compressor was shut off.

The Contractor shall submit piping, tubing, and pressure vessel specifications and data for approval. **[CDRL C-17-14]**

#### 17.12.1 Piping and Tubing

Piping and tubing shall be adequately supported at least every 24 inches [610 mm] throughout its length and at connections, and must not interfere with the removal of or access to other components. A minimum clearance of 3 mm [0.125 in] shall be maintained on all piping and tubing used in the vehicle.

Attachment shall be by securely fastening with elastomeric or polymeric lined, steel clamps, or an approved equivalent, between the pipe and clamp to prevent chafing and vibration.

All piping shall be seamless stainless steel or precision steel as determined by the application.

All brake piping shall be seamless stainless steel pipe.

Stainless steel fittings must be used with stainless steel piping and tubing. Forged steel fittings, zinc plated to ASTM B633, Type II, Yellow, SC3 / SC4, may be substituted upon Metra approval.

All piping, tubing, valves, fittings, installation and testing methods, shall comply with ASME B31.1.

Joints that serve the sole purpose of connecting straight runs of pipe shall not be used.

Unavoidable joints in piping shall be made in an approved manner. All inaccessible runs of tubing or piping shall be without joints.

Piping segments shall be deburred and blown out after cutting, and thoroughly cleaned and capped after fabrication. Metra reserve the right to verify piping cleanliness is to its satisfaction at any time during the production process.

After full installation on the vehicle, and before connection or installation of system components, the piping system shall be completely flushed with a suitable liquid solution, using appropriate pressure and velocity to fully dissolve all contaminants from manufacture and installation. The piping systems shall be cleaned a second time, following completion of component installation, using approved procedures. The Contractor shall submit for approval by Metra the proposed flushing and cleaning procedures for the piping and piping system.

#### **[CDRL C-17-15]**

Following installation, piping systems shall be pressure tested in accordance with ASME B31.1 or other approved method.

All leaks, which appear during pressure testing, shall be repaired to the Metra's approval and re-tested until acceptable under the approved test criteria.

All hoses used shall comply with AAR M-618. All hose fittings shall be of an approved reusable type. Iron pipe fittings used with steel piping shall be AAR approved, with additional corrosion resistance as approved by Metra.

All piping shall be installed in accordance with AAR S-400, Air Brake Specification No. 2518 and in such a manner as to provide drainage to prevent freezing.

#### 17.12.2 Air Filters

The filter element shall be a common production type, commonly available through various sources.

Access to the filter element for replacement purposes shall be possible without requiring the opening of any pipe fittings. Filters shall not be located in inaccessible locations for routine maintenance access.

#### 17.12.3 Pressure Vessels

Unfired pressure vessels shall comply with Section VIII and IX of the ASME Boiler and Pressure Vessel Code for Unfired Pressure Vessels.

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A test report shall accompany each pressure vessel received by the Contractor, and a copy of the test report shall be included in the appropriate Vehicle History Book. Each pressure vessel shall be stamped by the testing facility, whether it is the manufacturer or a third party, as verification of unit testing. Any data plates mounted to a pressure vessel must be sealed to prevent corrosion between the pressure vessel and the data plate mounted to it.

17.12.4 Drain cocks shall be provided at the low points of all reservoirs.

## 17.13 BEARINGS AND LUBRICATION

17.13.1 All bearings and lubricants shall be readily available in the United States. US Standard grease fittings or plugs shall be provided for all bearings not internally splash- or bath-lubricated.

17.13.2 All rotary shafts shall be supported by cylindrical or tapered roller bearings where practicable. Ball bearings may be used, subject to approval. Rotary / Motor shafts shall be suitably protected against corrosion to allow unencumbered removal of bearings.

17.13.3 Bearings subject to atmospheric or liquid contamination shall be sealed by labyrinth, lip, or face seals. Bearings installed in a vertical application shall have suitable protection to prevent moisture or contaminants from accumulating on, or entering, bearing.

17.13.4 Bearings that are not splash- or bath-lubricated shall be provided with standard grease fittings and drain plugs or pressure-release devices for re-lubrication. Ball bearings of 25 mm [1-in] shaft size and smaller may be factory lubricated-for-life, subject to approval.

17.13.5 Bearings shall be installed and removed without major disassembly of related components. Thrust style bearings shall be used whenever there is an axial load on the rotating shaft carried across rolling elements.

17.13.6 Sleeve bearings shall be used for shafts with rotary motion of less than one full revolution. Sleeve bearings shall be adequately lubricated. Sleeve bearings supporting ferrous shafts shall be composed of bronze, brass, or aluminum alloys as approved. Sleeve bearings may be used to support rotary shafts if space limitations preclude the use of anti-friction bearings.

17.13.7 Self-lubricated bushings (sintered metal) shall be used in accordance with the manufacturer's recommendations, but shall not be used for shafts with speeds greater than 500 rpm.

17.13.8 The Contractor shall submit bearing specifications and data for approval. **[CDRL C-17-16]**

17.13.9 All lubricants shall be products approved by the supplier of the parts on which the lubricant is to be used. All lubricants shall, as a minimum, conform to applicable ANSI and ASTM specifications. Multi-purpose lubricants shall be used where possible. The Contractor shall submit for approval data on lubricants recommended for bearings and bushings.

## 17.14 CURED MATERIALS

All materials that are applied prior to curing shall be applied according to the OEMs full recommendations, including surface preparation, mixing criteria, application temperature, shelf life limits, pot life limits, curing temperature, curing exposure (before handling, or loading), etc. All uncured material shall be stored and applied according to the OEM's full recommendations.

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All materials shall be used within the specified shelf life limits; material that has exceeded the shelf life shall not be used.

Preparation prior to bonding or painting the surface shall be prepared according to ASTM D2651.

#### 17.14.1 Paint & Primer

All paint with the exception of powder coat must be compatible with the Authorities' present paint application apparatus and system, and must be fully repairable within the parameters of restrictive air quality zones and the local, governing air quality management authority. The Contractor shall submit for approval data on all paints, primers, and application processes or procedures to be used for the Authorities vehicle. The undercoating material shall be applied according to the manufacturer's instructions.

All dents, roughness, or other surface imperfections shall be corrected prior to the application of the priming coat.

Primer, finish paint, and related components shall be supplied as a complete system, manufactured by a single manufacturer. All mixed paint materials shall be used within the first 70% of the mixed pot-life time. Paint shall be applied within the manufacturer's recommended temperature range, but at a temperature no less than 55° F.

Preparation for paint application shall follow the paint manufacturer's recommendations. As a minimum, prior to paint application, surfaces shall be cleaned to remove all traces of contamination, and properly treated to promote paint adhesion.

Paint shall be applied evenly, and the finished surface shall be free of dirt, runs, "orange peel", or other imperfections. Paint inspection and acceptance criteria subject to Metra approval.

**[CDRL C-17-17]** Paint quality control samples may be proposed to establish Cosmetic coatings of paint shall have specified gloss levels for the appearance desired. The gloss levels shown in Table 17-7 are defined according to common terminology, with the following criteria based upon the ASTM D 523 – 60° axis angle with equivalents shown for 80° and 20°.visual acceptance criteria, subject to Metra approval.

**Table 17-7**

Gloss Level Definition	Glossmeter Setting and Gloss Value		
	20 degree	60 degree	85 degree
- High Gloss	85-90%	90-95%	95-100%
- Semi Gloss	0-10%	20-30%	50-60%
- Flat Gloss	0%	0-10%	10-20%

At least two coats of finish paint shall be applied, with appropriate surface preparation between coats.

Touch-up paint shall be identical in all respects to the original paint. Color chips for color match may be provided by the contractor for Metra approval, to establish acceptable color match tolerances. It is the Contractor's responsibility to ensure that the color match is acceptable. It may be required that the color match be made according to ASTM D 2244. In no case shall color mismatch detract from the overall appearance of the equipment.

Prior to assembly, all low-alloy steel areas shall be painted with one coat of an approved etching primer followed by one coat of an approved sealer to prevent rusting.

All coatings used are to be EPA compliant.

Painted surfaces shall develop full adhesion to the substrate to which they are applied. Testing for adhesion between the paint and the substrate surface will be done on a random basis and shall conform to ASTM D 3359, 3a Classification, using Permacell® #99 adhesion test tape.

#### 17.14.2 Powder Coating

Powder coating if used, shall be epoxy based for interior surfaces and polyester based for exterior surfaces. Finished film thickness shall be 3.5 mil (0.089mm) □ 1.0 mil (0.025mm). The surface preparation and pre-treatment shall be according to the powder manufacturer's recommendations.

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Powder coating finish gloss level for cosmetic surfaces shall be according to Powder Coating Institute, Gloss Level Standard(s) – 7 to 10.

#### 17.14.3 Adhesives

Adhesives to be used for installation of floor covering, panels, insulation, and vibration isolation materials shall have a satisfactory history of performance in a rail transit environment. A list of all adhesives to be used, including location, material safety data sheets, technical data & specification sheets, and flammability properties, shall be submitted for approval. **[CDRL C-17-18]** Adhesives used in small quantities may not require flammability data, subject to Authorities approval.

Joining of components by adhesives shall be completed within the maximum working times as follows; the application and aligning of bonded components shall be completed within 70% of the adhesives maximum working time, considering application conditions. When two-part compounds are being used, only the amount of adhesive that can be used within 70% of the maximum recommended pot life shall be mixed.

Adhesives that use atmospheric or humidity cure shall be installed such that the air circulation to fully cure the adhesive is possible.

Adhesive selection and bonded joint design shall consider MIL-HDBK-691B.

#### 17.14.4 Sealants and Caulking

The use of caulking and sealing compounds shall be minimized.

Caulking and sealing compounds shall be applied in accordance with the manufacturer's instructions and recommendations, shall be non-staining, and shall be supplied in colors closely matching those of adjacent materials and surfaces. Caulking used in exterior applications shall be ultraviolet light (UV) resistant. If butyl-type is used, it shall be extruded polyisobutylene sealer compound of 100 percent solids.

Caulking primers shall be quick-drying, colorless, non-staining sealers of a type and consistency recommended by manufacturers of caulking materials for the particular surface involved.

Packing (backstop) shall be non-staining, resilient material, such as fiberglass roving, neoprene, butyl, closed-cell foams, or other compressible materials compatible with the caulking compound used. Joints, spaces, and junctures to be packed and caulked or sealed shall be completely cleaned of dirt, dust, oil, and other foreign materials that would adversely affect caulking quality. Suitable primer shall be used to achieve full adhesive bond.

Surfaces shall be thoroughly dry before caulking compounds are applied. Caulking compound application shall be compatible with prior or subsequent paint application. When so stipulated by the sealant manufacturer, paint and other protective coatings shall be removed from surfaces to be caulked prior to priming and application of sealants.

Compounds shall be applied with pneumatic guns. Where the use of a caulking gun is impracticable, suitable hand tools shall be used.

Unless otherwise indicated, the entire perimeter of each opening shall be caulked. The finish of caulking joints on flush surfaces and in internal corners shall be neatly pointed; excess material shall be removed; and, where exposed, the caulking shall be free of wrinkles and uniformly smooth.

Application of polysulfide or silicone compounds shall be in accordance with the OEM's instructions and recommendations.

Compounds shall not be used when they become too gelled to be discharged in a continuous flow or exceed their stated shelf life, and they shall not be modified by addition of liquids, solids, or powders. Compounds shall be installed within the manufacturer's defined temperature range. Installation and working of compounds shall be completed within the maximum working times as follows; the application and working of caulking material shall be completed within 70% of the minimum "skin" time, considering application conditions. When two-part compounds are

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being used, only the amount of caulking that can be installed within 70% of the maximum recommended pot life shall be mixed.

Adjoining surfaces, finishes, and fixtures shall be carefully protected throughout caulking operations. Stains, marks, or damage as a result of caulking and sealing work shall be removed.

## 17.15 INSULATION

Insulating materials shall be fire-retardant, non-carcinogenic, non-hygroscopic, resistant to fungus, and provided with a vapor barrier as required to prevent the entry of moisture, oil, gases, and dust. The materials shall not absorb fluids and gases and shall possess the required properties to meet the noise and vibration requirements of this specification.

The method of insulation retention in the car-shell, for all insulating materials, shall be subject to Metra approval.

The Contractor shall submit for approval data on thermal and acoustic insulation materials and application processes. **[CDRL C-17-19]**

### 17.15.1 Acoustic Insulation

Sound damping material used in the fabrication of the vehicle shall be resistant to diluted acids, greases, gasolines, fuel oils, aliphatic oils, and vermin; and must be resistant to fungus; and must not support combustion. The material shall not be affected by sunlight or ozone, and shall not become brittle with age

### 17.15.2 Thermal Insulation

Thermal insulation materials shall be transportation grade of the rigid, non-rigid, or spray-on type. Insulation shall be installed with a vapor barrier to preclude moisture accumulation. The type of thermal insulation to be used shall not be susceptible to mold or rot and shall not absorb water. Metals, which are attached to the insulation, shall be corrosion resistant, and not settle under vehicle vibration. The vehicle thermal insulation shall not have an odor or be capable of absorbing odors, and shall not sustain vermin. Urethane foam insulation is expressly prohibited.

Thermal insulation material shall have a thermal conductivity of not greater than 13,000 J/hr-m<sup>2</sup>-Co/cm (0.25 Btu/hr-ft<sup>2</sup>-Fo/in) when tested in accordance with ASTM C177.

## 17.16 FIRE SAFETY

17.16.1 All materials used in the vehicles shall be selected to minimize combustion and propagation of fire both inside and outside vehicles. The Contractor shall ensure that all materials which are subject to specific fire safety requirements and guidelines in 49 CFR Part 238.103[c] and NFPA 130 have been properly tested and certified by a recognized independent laboratory. All test reports shall be submitted to Metra for approval and shall include Pass/Fail conclusions per the applicable performance criteria and shall include certification from the recognized independent laboratory that the test results were obtained after testing in accordance with the procedures and equipment specified in the test methods.

17.16.2 All test reports shall also be accompanied by a certification from the Contractor that representative samples of combustible materials has been tested by a recognized independent testing laboratory and that the results show the representative samples comply with the 49 CFR Part 238.103[c] and NFPA 130 requirements as well as the Toxicity requirements of this specification.

17.16.3 The name, address, qualifications, and contacts of all laboratories used shall be provided to Metra in advance of testing and the laboratory selected shall be subject to Metra's approval.

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17.16.4 Additional testing would be required if the test reports submitted by the Contractor are not accepted by Metra. Reasons for Metra not accepting test reports may include, testing of representative material was not performed, compliance criteria and conclusions are not provided in the test reports, certifications not provided, test reports are over 5 years old, regulations/requirements have changes since testing was conducted etc. Metra has the sole right to determine if test reports are acceptable or if additional testing is required.

17.16.5 All materials used in the subject vehicles shall be in compliance and be tested in accordance with FRA Regulation 49 CFR Part 238, Section 238.103 and NFPA 130. The fire safety and flammability tests shall also be performed for sealants, caulking, and adhesive materials. In case materials are not listed in these standards, the Contractor shall contact Metra for approval with the proposed performance criteria they plan to use. In addition the Contractor shall conduct the fire safety analysis as required by Section 238.103[c].

17.16.6 All test results should be completed and submitted to Metra prior to delivery of the first vehicle in the order. No vehicle will be utilized in revenue service until all test results have been submitted, reviewed and approved by Metra and a complete fire safety analysis per 238.103[c] and NFPA 130 has been submitted, reviewed and approved by Metra. **[CDRL C-17-20]**

17.16.7 All materials used in vehicle construction shall be tested for the emission of toxic gases during combustion using the NBS Smoke Chamber, bellows pump, and the appropriate Draeger tubes for the gases involved. Bombardier SMP 800-C maximum values shall be used to determine the acceptability of products.

17.16.8 The tests are to be run in the flaming mode, with sampling done after 240 seconds. The test report shall show the maximum concentration (ppm) for each of the following gases:

- 17.16.8.1 Carbon Monoxide (CO)
- 17.16.8.2 Sulfur Dioxide (SO<sub>2</sub>)
- 17.16.8.3 Hydrogen Cyanide (HCN)
- 17.16.8.4 Carbon Dioxide (CO<sub>2</sub>)
- 17.16.8.5 Hydrogen Chloride (HCl)
- 17.16.8.6 Oxides of Nitrogen (NO<sub>X</sub>)
- 17.16.8.7 Hydrogen Fluorine (HF)
- 17.16.8.8 Hydrogen Bromide (HBr)

17.16.9 On a limited and case by case basis, Metra may approve the use of material that have been verified as not having alternatives and have not passed the specified performance requirements. In these cases the Contractor shall be required to submit a waiver in writing to Metra for approval prior to any use of such material. The Contractor's waiver request shall include the justification(s) for using the material, total weight of the material, location(s) and distribution on the vehicles, material safety and data sheets, and current test reports. In addition, the Contractor shall submit a letter from an independent material fire safety professional indicating their review of the Contractor's waiver request and their professional safety analysis and conclusions regarding the request and the safety, environmental and regulatory implications involved for Metra throughout the life of the vehicles.

## 17.17 JOINING AND FASTENING

No protruding screws, rivets, mounting bolts, or similar items shall be permitted on the exterior of the vehicle, except where approved by Metra. The use of exposed fasteners on the vehicle interior shall be minimized. Interior fasteners shall be countersunk where possible or low profile heads where countersink is not possible. Interior fasteners shall not protrude enough to become a tripping or snagging hazard.

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#### 17.17.1 Fastening to Structural Members

Fastening to structural members shall be done only on the low stress portion of the member and shall not be located within 3/4" (17mm) from the open edge of the structural member.

The Contractor shall ensure that any fastening or joining to structural members does not result in moisture accumulation within any structural member. To this end, fastenings to hollow, closed section structural members shall not be accomplished using drilled holes in the structural member.

#### 17.17.2 Threaded Fasteners

The number of different sizes and styles of fasteners used shall be minimized. A single standard, US (ANSI/SAE/IFI), shall be adopted for the fasteners used. Fasteners shall be properly marked per the system adopted. All threaded fasteners shall comply with ANSI B1.1 class 2 requirements, unless otherwise specified or approved. All structural threaded fasteners shall have rolled threads.

Self-tapping or thread forming screws may be used with Metra approval only, on a case-by-case basis.

Use of threaded inserts or special or non-standard fasteners shall require Metra approval.

At least 1 1/2 threads shall be visible beyond all nuts. Bolts smaller than 6 mm [0.25 in] shall not project more than 1 1/2 thread plus 6 mm [0.25 in]. Bolts 6 mm [0.25 in] or larger shall not project by more than 8 threads.

Fasteners exposed to public view shall be treated as follows:

17.17.2.1 On the vehicle interior, all exposed fasteners shall be stainless steel with flat or oval heads, properly countersunk.

17.17.2.2 On the vehicle exterior, all exposed fasteners shall be stainless steel, unless otherwise specified.

17.17.2.3 Fasteners and fastener components used on the vehicle underfloor or roof areas shall be stainless steel except in cases where high strength fasteners such as SAE grade 8 are required. The contractor shall provide a list of all threaded fasteners, fastener classification, material, finish, and location used, for Metra approval. **[CDRL C-17-21]**

#### 17.17.3 Fastener Materials

Fastener component materials (screws, nuts, washers, etc.) shall be properly selected for the application and shall not be mixed within an assembly unless approved by Metra. All fasteners shall be stainless steel, or steel finished with protective coating such as passivation, dichromate, or zinc plating, depending on the specific application.

Threaded aluminum fasteners shall not be used except in tapped holes in solid aluminum structures, subject to approval.

Stainless steel nuts and bolts shall be used for stainless-to-stainless joints. Anti-seize compounds shall be used on all stainless steel fasteners threaded into stainless steel, or using stainless steel nuts.

#### 17.17.4 US Standard

Threaded fasteners shall conform to current SAE J429 standards for externally threaded fasteners and SAE J995 standards for internally threaded fasteners. Steel fasteners 1/4" diameter and above shall be SAE grade 5 minimum.

Stainless steel fasteners shall be manufactured from austenitic stainless steel alloys, according to ASTM F 593, with a nominal tensile strength of 100 ksi. All fasteners shall be clean and free of manufacturing scale.

Non-structural screws, such as Phillips or slotted head screws smaller than 1/4" diameter may be SAE grade 2 minimum.

#### 17.17.5 Locking Requirements

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All threaded fasteners shall be self-locking or provided with locking devices. Locking devices shall be lockwire, lock washers, torque patch, or prevailing torque type locknuts as appropriate for the application or service. Lockwire, if used, shall be stainless steel.

Pervailing torque locknuts shall be of the nylon collar insert type. Previously installed and removed locknuts shall not be re-used. High temperature applications may use metallic distorted thread locknuts upon Metra approval.

Bolts for use with locknuts shall not be drilled for cotter pins or in heat related applications.

All locknuts shall comply with the Industrial Fasteners Institute requirements regarding to locking ability.

When oversized or slotted holes are provided for installation tolerance allowance, flat washers, of suitable size to cover oversized holes, or slots shall be used in all locations adjacent to the hole. In this case, at least one hole shall be of close tolerance to ensure accurate positioning of component. If slotted holes are provided as a means of adjusting a piece of equipment, a secure method of fixing the adjustment shall be provided, such as adjustment screws, ribbed or toothed adjustment washers, Drilled holes and pins, etc.

#### 17.17.6 Plating & Treatment of Fasteners

All steel fasteners shall be zinc plated with the highest protective service condition available per thread configuration. Stainless steel fasteners shall be passivated. If stripping and re plating of fasteners is required to meet the aforementioned criteria, documentation must be made available to verify that all applicable post plating treatments and standards have been met.

Metra may require batch testing of stripped and re-plated fasteners to ensure there is no hydrogen embrittlement.

After manufacturing, steel fasteners shall be electroplated, zinc with a yellow chromate conversion per ASTM B633, Type II - Yellow (please refer to table for thickness).

After manufacturing, steel fasteners shall be electroplated, zinc with a yellow chromate conversion per ISO 4042, (refer to Table 18-8 for plating thickness).

Table 17-8

Plating Thickness for Steel Fasteners, Zinc, Yellow Chromate Conversion			
Bolt size	Metric DIN 267	US ASTM B633	Thickness (Micro meter / inch)
Dia, up to #8 (M3)	A1L	-	3µm / .00012"
Dia. >#8 (M3) to 5/16" (M8)	A2C or A2L	SC1	5µm / .00020"
Dia. >5/16" (M8) to 7/8" (M22)	A3C	SC2	8µm / .00031"
Dia. >7/8" (M22) to 1-1/8" (M33)	A4C	SC3	13µm / .00051"
Dia. >1-1/8" (M33) and greater	A5C	-	15µm / .00059"

#### 17.17.7 Hydrogen Embrittlement

Fasteners or fastener components with hardness greater than or equal to 320 HV (32 HRC) are susceptible to hydrogen embrittlement when these parts are pickled and/or electroplated. This may cause these fasteners to fail at relatively low loads even if stress relief annealing (baking) is performed after plating. Examples of hardened fasteners are steel bolts - US Grade 8, hardened steel washers, spring washers, etc. These types of fasteners shall be mechanically plated to avoid hydrogen embrittlement.

#### 17.17.8 Torque Marking/Indexing

The Contractor shall ensure the proper application of all threaded fasteners. Torque marks or stripes extending from the secured hardware to the surrounding surface shall be applied to all safety related hardware, including truck, door, and brake equipment bolts. Tightening indication may be required on other non-safety related hardware upon the Authorities' request.

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#### 17.17.9 Bolts and Nuts

All threaded fasteners falling into this category used in this project shall require a submittal of Certifications of Compliance (C of C) with each shipment of hardware to the end user. The C of C shall be traceable to a manufacturer.

High strength fasteners such as SAE grade 8 hardware shall be used for mounting the traction motors to the trucks, and for all truck mounted appurtenances, unless specifically allowed otherwise by Metra.

#### 17.17.10 Electrical and High Temperature Connections

Plated steel screws or bolts, nuts, flat washers, and lock-washers used in mounting and in making connections to resistors and other heat-producing apparatus shall be suitable for high temperatures without degradation of the strength of the hardware or its corrosion resistance. Flat washers shall be used on both sides of all electrical connections (under bolt head and under nut).

#### 17.17.11 Riveting

Rivet holes shall be accurately sized, located, and aligned for the intended rivet. Rivet holes that have been repaired, or the rivet removed shall be reamed to the next larger rivet size, and the next larger rivet installed. Rivets exposed to passengers on the outside of the vehicle shall be stainless steel.

Hand-driven steel rivets shall be driven hot and shall completely fill the holes.

Two part rivets consisting of a pin and collar (such as Huck-Bolt types) shall be installed such that the pin breaks flush with the end of the collar.

Blind rivets may be used subject to Metra approval. Blind rivet materials may be stainless steel, or plated carbon steel with plated steel or stainless steel mandrels compliant with SAE J1200. The mandrel shall break flush or slightly below the surface of the rivet head, but shall remain locked in place as a structural part of the rivet assembly. All rivets shall be installed according to the rivet manufacturer's instructions, using equipment approved by the rivet manufacturer.

Rivet nuts shall be of the positive locking variety, with either exterior serrations or hex cross sections to preclude spinning once installed. The rivet nut hole shall be made per the rivet nut manufacturer's recommendations.

Aluminum alloy rivets shall comply with Aluminum Association Standards for Aluminum Mill Products alloys and tempers 6061-T6 or 6053-T61.

### 17.18 WELDING, BRAZING AND SOLDERING

All welding practice not specifically covered in this Section shall be in accordance with the applicable requirements and recommendations of the American Welding Society (AWS), as contained in the latest revisions of the "Structural Welding Code" (AWS D1.1), "Aluminum Welding Code" (AWS D1.2), "Structural Welding Code - Sheet Steel" (AWS D1.3), Structural Welding Code – Stainless Steel (AWS D1.6), "Sheet Metal Welding Code" (D9.1), "Recommended Practices for Resistance Welding" (AWS C1.1), "Railroad Welding Specification" (AWS D15.1) and the AWS "Welding Handbook" (AWS WHB). Where non-AWS welding is used, the supplier shall demonstrate equivalence. The contractor shall demonstrate compliance with AWS welding requirements and standards.

The Contractor shall be responsible for the quality of all welding and brazing, including the welding and brazing of its suppliers and subcontractors.

Prior to welding, all surfaces shall be thoroughly cleaned to remove corrosion, rust, scale, slag, grease, oil, water, paint, and other foreign materials in accordance with applicable parts of D1.1, Section 8.5 on Workmanship and Technique.

Parts to be joined by welding shall be supported and held in position by tables, jigs, or fixtures to prevent warping. Weld joint design and welding method shall be selected to include

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provisions for shrinkage and warping due to the welding process. Welding shall be applied in a manner to minimize distortion. Acceptable distortion levels shall be submitted for Metra approval.

All Weld quality shall be in accord with acceptable weld criteria as defined in AWS welding Codes.

The Contractor shall submit welding procedures specifications (WPS) and Procedure Qualification Records (PQR) to Metra for review and approval. **[CDRL C-17-22]**

#### 17.18.1 Welder Qualification

Welders shall be tested and certified to verify their proficiency for producing sound welds, for each weld type performed by the welder to each applicable Welding Procedure Specification (WPS). Welder qualification tests shall be performed in accordance with the applicable requirements of AWS standards, or other approved equivalent standards. Welder qualification tests for pressure vessel welding shall be in accord with applicable requirements of ASME Section IX, or other approved specifications.

Welders shall be certified to AWS or equivalent welding societies and an identification number from the society shall be provided.

The Contractor and all suppliers and subcontractors shall retain records of welder qualifications and shall make these records available to Metra upon request.

Metra shall have the right to require the making of test welds by any welder, whether under the direct control of the Contractor or a supplier or subcontractor, to ascertain his/her competence and to determine the suitability of the welding procedure used.

#### 17.18.2 Welding Procedures

All welding practices not specifically covered in other sections shall comply with AWS-D1.1, AWS-D1.2, or AWS-D1.3 and the AWS Welding Codes as appropriate to the applicable AWS welding standard(s). Requirements for dynamically loaded structures shall be applied.

Resistance welding shall be in accordance with SAE-AMS-W-6858. Resistance welding operations shall be undertaken using only equipment fitted with meters or readouts and adjustments for time, current, and pressure.

The method used in depositing weld metal shall be one that reduces warping and residual stresses. To achieve this, tack welding, offset welding, skip welding, and other devices and sequences well known to the craft shall be used where appropriate.

Machine welds of any thickness may be made with one or more passes as per the Procedure Qualifications Record (PQR) for the weld joint.

The Contractor shall submit a procedure qualification record (PQR) for all weld joints to be used or pre-qualified per AWS codes and all Weld Procedure Specifications (WPS) for the project. Procedures used for the welding of metal combinations not specifically covered by the AWS standards (i.e. stainless steel to steel) shall be approved by Metra. Stainless steel to steel welds shall use austenitic stainless steel filler metal.

#### 17.18.3 Welding Electrodes

The choice of welding rod or wire filler metal shall be made with consideration of the make, type, size, composition, and suitability to the application and shall be in accordance with "Specification for Filler Metal" AWS A5.0. Welding electrodes shall be stored in a dry, closed environment to prevent contamination in accordance with AWS recommended practices for filler material storage. Welding electrodes shall be clearly marked. All low-hydrogen electrodes shall be kept in a dry-rod oven to keep moisture from the electrodes. The electrodes shall now be exposed to the atmosphere for longer than a period of four hours. Low-hydrogen electrodes soak atmospheric moisture and stays in the flux. When welding with an electrode with moisture in the flux can cause excessive surface and/or subsurface porosity and can cause slag entrapment.

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#### 17.18.4 Weld Repairs

Weld repairs shall be performed in accordance with approved procedures, which comply with AWS D1.1 or the AWS Code applicable to the welded material. When a production weld has been determined to be substandard, all production since the previous acceptable production quality control test shall be segregated, and disposition shall be recommended to Metra for approval. All parts with substandard welds shall be rejected or repaired by weld removal, re-weld, and inspection. Re-weld, inspection, and any Non-Destructive Examinations (NDE) required by the applicable AWS welding standard regarding repairs.

#### 17.18.5 Welding Inspection and Examination

The Contractor shall inspect all welds. Welds shall be inspected to verify compliance with these provisions and specifications.

Welding inspection procedures and welding inspector qualification tests shall be performed in accordance with the applicable requirements of the AWS standards for weld inspection.

The Contractor shall use and demonstrate the use of personnel qualified to perform weld inspection. An AWS Certified Senior CWI shall lead all welding matters. An AWS Certified Welding Inspector (CWI) shall be utilized for inspection and oversight of welding inspection. All welding must be inspected by a CWI and the CWI stamped inspection reports shall be provided. This requirement applies to all welding work performed under the contract.

Non-destructive examination and testing of welds and welder qualification tests shall be performed in accordance with the applicable requirements of the AWS Welding and Brazing Handbook and the requirements of the applicable AWS standard the Welding Procedure Specification (WPS) is written to.

Personnel performing NDT shall have documented qualifications in accordance with American Society of Non-destructive Testing (ASNT), TC-1A.

In addition to visual inspection requirements specified by the AWS welding codes, non-destructive surface inspection (dye penetrant or magnetic particle methods, as appropriate) shall be used to inspect all first-production welds.

The Contractor shall specify additional non-destructive inspection requirements for subsequent welds. If the Contractor elects to inspect less than 100 percent, then the Contractor shall submit a random sampling inspection plan for approval by Metra. In no case shall the length of weld non-destructively inspected be less than one percent of the total weld length.

All welds designed to carry primary stresses in members such as side sills, end frames, bolsters and other important truck and frame members, shall be inspected by the Contractor for defective welding.

Critical areas of all such welds shall be magnetic particle or dye penetrant or ultrasonic tested and radiographic tests shall be used on a random sample basis.

The following defects in excess of limits indicated or established in the approved procedures shall be cause for rejection of the work affected: cracks, regardless of length, magnitude or location; overlaps; lack of penetration; incomplete fusion; inclusions except if they do not materially affect the strength of the welded joint and do not indicate improper technique or an unsatisfactory procedure; undercuts; poor surface appearance; or improper size of weld. On the first structure or component, all full-penetration welds shall be non-destructively, volumetrically inspected (ultrasonic or radiographic methods). The Contractor shall specify a random sampling plan for volumetric inspection of subsequent full-penetration welds for approval by Metra. **[CDRL C-17-23]**

With the approval of Metra, destructive sectioning and metallurgical examination may be substituted for some or all of the required volumetric inspection requirements.

#### 17.18.6 Heat Treatment

Where required by specifications or drawings, welded assemblies shall be stress-relieved by heat-treating in accordance with AWS D1.1. Chapter 4, Part A. Heat treatment procedures shall

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be documented and submitted for review for first piece/part processing. All heat treatment documentation (results) shall be retained by the Contractor.

#### 17.18.7 Brazing

The Contractor shall maintain a brazing program similar to the welding program specified in the welding portion of this specification.

All brazing, qualification of braziers, and repair of brazing defects shall be in accordance with the requirements and recommendations specified in the AWS Welding and Brazing Handbook. The Contractor shall maintain quality control procedures necessary to ensure high-quality brazing. The Contractor shall submit brazing specifications, procedures, and certifications to Metra for review and approval. **[CDRL C-17-24]**

#### 17.18.8 Soldering

Soldering of electronic equipment shall comply with the requirements of ANSI J-STD-001B. The Contractor shall submit soldering specifications, procedures, and certifications for approval.

### 17.19 CORROSION CONTROL

17.19.1 All materials used shall be either inherently corrosion resistant, or suitably treated, or coated to resist corrosion. Equipment located in areas highly susceptible to corrosion shall be made from inherently corrosion resistant materials. Areas exposed to corrosive fluids or cleaning solutions shall be protected with coatings resistant to those fluids. The Contractor shall be responsible for verifying that all such areas are protected through communications with Metra.

17.19.2 Except as otherwise indicated, all aluminum exposed to view in finished work in the interior of the vehicle shall have a protective anodized coating.

17.19.3 The recommendations contained in "a Corrosion Control Manual for Rail Rapid Transit", UMTA-DC-06-0152-83-1, shall be used, except as otherwise directed by Metra.

17.19.4 The Contractor shall prepare a Corrosion Control Plan, which shall locate all materials that require treatment to prevent corrosion due to atmospheric exposure, and areas of dissimilar metal or other material joining which could result in galvanic action and material deterioration. This plan shall document the methods used to preclude failure due to corrosion for any of the above conditions. The Contractor shall update this document as materials and treatments change. The Corrosion Control Plan shall be submitted to Metra for review and comment.  
**[CDRL C-17-25]**

### 17.20 DISSIMILAR METAL TREATMENT

17.20.1 Direct contact between electrically dissimilar metals is prohibited except as approved by Metra for electrical connections between copper and aluminum where appropriate joint compounds are used as specified herein. Isolating and moisture-proofing materials, appropriate to the materials being joined, shall be used at all times.

17.20.2 All metals used in the fabrication process shall be surface treated with corrosion-resistant materials prior to assembly, with consideration being given to the severity of exposure to which the surface shall be subjected.

17.20.3 The joining of incompatible metals and materials shall be minimized as much as possible. When such metals must be joined, provision shall be made in accordance with MIL-STD-889 to prevent chemical reactions between the metals.

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17.20.4 Surfaces of aluminum alloy parts secured to ferrous parts shall be protected with one-part polysulfide or silicone sealant used as joint compound, or with joint material that is non-hygroscopic and is free from chlorides and heavy metal ions.

17.20.5 Fibrous joint material shall be impregnated with bitumen or other water-repellant substance, which shall completely cover interfacing surfaces.

17.20.6 All ferrous metal surfaces, other than stainless steel, shall be protected by painting or zinc plating as defined in this specification, unless otherwise specified. Steel surfaces not requiring protection shall be galvanized by the methods and requirements described in ASTM A123. Minor damage to galvanized coatings shall be repaired with an approved zinc rich paint.

## 17.21 WIRING REQUIREMENTS

Wire sizes, insulation requirements, materials, shielding methods, and identification of wire and cable used for primary, auxiliary, control, and communications applications shall be based on the current carrying capacity, voltage drop, mechanical strength, temperature, and flexibility requirements of AAR, ASTM, ICEA, NFPA, MIL, or NFPA 70 specifications. Wire, cable, and bus bars shall be copper. All wiring not explicitly referenced in other parts of this specification shall meet at a minimum the latest revision of APTA specification PR-E-RP-009-98, Recommended Practice for Wire Used on Passenger Equipment.

All wire and cable insulation shall meet the flame and smoke test requirements of the Flammability, Smoke Emission & Toxicity section of this specification, and shall be substantially free of halogens. The wire and cable selected shall be rated by the manufacturer to last the life of the vehicle.

The Contractor shall mark each wire, by wire type, at an interval of 12 inches, and mark each wire end with a function code using a scheme subject to approval by Metra.

Metra shall approve all electrical wire and cable used in the vehicle. The Contractor shall submit samples and specifications of each size and type of wire and cable proposed for use in the vehicle for Metra approval. **[CDRL C-17-26]**

Braided copper wire, or wire rope, shall be used in all ground strap applications. Flexible stranded copper wire is acceptable in other applications.

All conductors of multi-conductor cables shall be terminated.

### 17.21.1 Conductors

Maximum current capacities shall conform to National Electric Code, NFPA 70, ampacity table 310-16.

Except as otherwise specified, conductors shall be of soft, annealed, tinned copper stranded in accordance with ASTM B33.

Stranding and conductor construction for all wires and cables No. 18 AWG and larger shall comply with NEMA WC 70, NEMA WC 71, and AAR RP-585, as is appropriate for the application. Stranding shall be per ASTM B174; Class I or equivalent - 10 to 7 AWG, and Class K or equivalent - 18 to 12 AWG.

Stranding and conductor construction for wires and cables No. 20 and No. 22 AWG shall be of 19-strand construction as appropriate for the usage requirements.

### 17.21.2 Wire & Cable Insulation

Each conductor shall be separately covered with insulation. Flat cables are prohibited, except for specific data/communications applications where other arrangements are impractical.

Wire and cable insulation used for car-body wiring shall be flexible, crosslinked polyolefin, or equivalent. Wire and cable shall comply with the requirements of NFPA 130. Wire and cable shall comply with applicable sections of NEMA WC 70, NEMA WC 71, and AAR RP-585 as is appropriate for the application and subject to Metra review.

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Wires within enclosed equipment or suitably protected locations shall comply with MIL-W-81044, or as otherwise approved.

For general-purpose wire and cable, the insulation shall be of heat and moisture proof material suitable for a continuous temperature rating of 167° F (75° C) minimum in dry and wet locations. For high-temperature applications, such as connecting to heaters and resistors, the insulation shall be suitable for a maximum conductor temperature of 230° F (110° C).

Asbestos, urethane, and polyvinylchloride (PVC) based insulations or jacket materials shall not be used.

Outer jacket material of multi-conductor cable shall be the same as that used to insulate individual conductors, unless physical considerations indicate a different material with superior characteristics.

Multi-conductor cables shall provide at least 10 percent spare wires and at least one spare of each wire type and size.

Shielding shall be used over multi-conductor cable for safety-critical circuits. Shielding material shall be woven wire providing not less than 60 percent coverage and shall be soft, annealed, tinned copper of an area equal to or greater than the largest conductor.

Non-conducting separators and fillers may be applied between conductor and insulation on conductor sizes greater than No. 5 AWG.

Leakage between primary wiring and vehicle body shall be measured in accordance with IEEE 11. The leakage shall be at least 10 megOhms when measured with 1,000-volt megOhmeter. Hi-Pot shall be accomplished on all primary power wiring at 2,500 VAC for 1 minute per IEEE 11.

General car-body wiring insulation shall be flame-retardant, extra-flexible, cross-linked polyolefin material. General car-body wiring insulation and/or jacketing shall be free of halogens, phosphorus, sulphur, and nitrogen (combined to less than 1% by weights), or otherwise be subject to Bombardier SMP 800-C test criteria.

#### 17.21.3 High-Temperature Wire & Cable

Insulation for all wires in high-temperature applications, including but not limited to those connecting with heaters, resistors, or lights shall conform to the following:

For wire sizes No. 16 AWG and larger, the insulation shall be silicone rubber in accordance with AAR RP-587, RP-588 and RP-589., 110° C irradiated cross-linked polyolefin, or abrasion-resistant extruded PTFE (polytetrafluoroethylene) Teflon meeting MIL-W-22759/6B

For wire sizes No. 18 AWG and smaller, the insulation shall be abrasion-resistant extruded TFE Teflon meeting MIL-W-22759/6B. When used for interconnecting pieces of apparatus, this type of wire shall be bundled and shall have a protective covering.

#### 17.21.4 Communications Wire & Cable

The communications system manufacturer shall approve all car-body wire and cable applicable to the communications equipment.

All communications wire and cable shall be installed in raceways, conduits or as otherwise approved.

The jacket shall be waterproof and abrasion-resistant, and shall provide insulation resistance greater than 1 M $\Omega$ /ft between shield and water.

#### 17.21.5 Conduit & Wire Channel

All conduits and wire ways shall be free of burrs, sharp edges, and square corners. Conduit welded into the car-body shall not have any burn-through of weld, or any other penetration into the interior of the conduit. The ends of the conduits and wireways shall be suitably rounded to prevent edge contact with the wire. Conduit radius shall be sufficiently large enough to allow easy pulling of the wire.

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Wires and cables installed in flexing applications shall be housed in abrasion resistant, flexible conduit or sheathing designed for the application, and installed such that there is no pinching, stretching, or kinking under all ranges of motion.

The Contractor shall ensure that wireways, conduits, and piping, that is susceptible to corrosion shall be suitably protected from corrosion such as zinc plating per ASTM B633 Type II yellow, SC4, or receive a minimum of two coats of primer and two coats of an approved paint. This priming and painting can be accomplished either before or after installation of the item on the car-body.

#### 17.21.6 Application & Installation

All wiring shall be performed and directed by experienced personnel using appropriate tools for stripping insulation, cutting, soldering, and attaching mechanical crimp-type terminals with correct dies.

All locomotive wiring connected to a given piece of electrical apparatus shall be insulated for the highest voltage supplied to that apparatus. Wires operating with potential differences of 50 volts or more shall not be cabled or routed together. Signaling, LVDC, AC, and HVDC wiring shall be separated.

Wiring for any communications system equipment shall be done in an approved manner to conform to the requirements established by the supplier of that equipment.

All circuits shall be adequately protected and insulated from ground. All circuits and branches must be separable by a switch or terminal board to isolate their grounds when trouble-shooting is required.

Wiring shall be fabricated into standard harnesses, and installed in prefabricated groupings, and standardized locations in the vehicles.

Locomotive wiring shall comply with NEC Code, Chapter 3 (NFPA 70), and with the AAR Manual of Standards, Section F, S-538, Wiring Practice, and Rolling Stock Standard, except where otherwise specified.

Circuit protection shall comply with NEC Code, Chapter 2.

Electrical circuits and associated cabling shall be designed with clearance and creepage distance between voltage potentials and car-body ground in accordance with the environmental conditions to which the circuits and cabling will be subjected, and in accordance with NFPA 130, Chapter 4 or equivalent IEC standards.

Electric apparatus shall be housed in sealed enclosures to remain clean and dry. Cooling air shall be filtered to remove all conductive and non-conductive dust.

The layout of wiring shall be designed in advance of its installation and in cooperation with those furnishing the related equipment.

#### 17.21.7 Undercar and Roof Wiring Installation

All wiring shall be run in insulated metal raceways and wire ducts with securely fastened but easily removable metal covers.

Wire and cable shall be securely anchored in an approved manner in the ducts to prevent chafing from relative motion.

Minimum wire size for under locomotive wiring shall be 14 AWG for power and 16 AWG for control circuits. Within equipment enclosures, minimum wire size shall be 22 AWG.

When physical strength is required, No. 6 AWG or larger wires may be used and supported in place without any type of enclosure by using molded rubber cable support blocks. This method is also acceptable in protected areas that may be subject to damage or vandalism.

The wire ducts and conduits shall be of waterproof construction. Watertight strain-relief bushings with insulated throat liners shall be provided at duct entrance and exit points.

Bushings shall be sized such that the wire and lug may be removed through the bushing.

Wires or cables shall not pass over or through the battery compartment.

Floor wiring shall be run in conduits or ducts and may be run through partitions, but only if suitable bushings are provided at such points of passage.

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Sufficient slack and wire length shall be provided to prevent breaking or pulling out of bushings or terminals, and to allow for a serviceability loop long enough for three re-terminations. Drip loops shall be provided where appropriate.

#### 17.21.8 Power Cables

HVDC power cables (with the exception of cables passing through or above the floor) that are No. 6 or larger shall be cleated in place.

The cleats shall be positioned at intervals no greater than 257 mm (1.5 ft), and adequate clearance shall be maintained between cables and any structural members, components, or items of equipment.

Where mechanical protection is required, short lengths of conduit may be employed, one conduit per wire, subject to approval.

#### 17.21.9 Cable Connectors

All cable connectors shall be of watertight design, unless enclosed in interior watertight cabinets and approved by Metra, with removable / replaceable crimp contacts of the correct size for the wire being terminated.

Cable connectors shall be equipped with sealing gaskets. Extension bodies shall be used if necessary to ensure that there is sufficient room to terminate the cable wires within the connector body.

The cable jacket shall extend within the body, shall be held by a clamp, and shall have a gasket seal at the entrance.

Unused connector pin positions shall be sealed with either connector contacts or plastic sealing plugs designed for that purpose.

Adjacent connectors shall either use different inserts or different insert orientations to prevent erroneous connections.

Connectors installed in exterior locations shall comply with MIL-DTL-5015. All other connectors shall comply with an equivalent standard, as approved by Metra.

#### 17.21.10 Terminals

Terminations and connections throughout the vehicle shall be with insulated ring tongue connectors of the compression (crimp) type.

Quick-disconnect (fast-on) terminals with locking features may be used, subject to approval, provided that the type of fast-on has demonstrated a satisfactory service in a similar fashion.

Materials such as phosphor bronze shall be shown to be suitable for repeated use.

Terminals shall not utilize PVC insulation.

Terminals shall be attached to the wiring with the crimping tools and dies recommended by the connector manufacturer.

The terminal used shall be of the type that securely grips and holds the insulation of No. 10 AWG wire or smaller. The crimp terminal shall be rated to match the wire conductor diameter and the insulation diameter.

Conductors that will be subjected to motion shall utilize the proper strain relief mechanism recommended by the manufacturer.

Spare terminals shall be provided for each terminal assembly in an amount equal to at least 10 percent of all terminals, with at least one spare terminal provided for each terminal size. Spare conductors in a multi-core cable need not be terminated at spare terminal strip locations.

#### 17.21.11 Conduit and Raceway Requirements

All locomotive wiring shall be housed in metal raceways. Open metal raceways and their elbows, couplings, nipples, bushings, locknuts, universal joints, expansion joints, and other conduit fittings shall be so designed that the sections can be mechanically and electrically coupled, while the wires are protected from abrasion.

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High voltage wiring, (i.e., wiring in excess of 120 volts) shall not be run in the same cable ducts, conduits, or raceways as low voltage wiring.

All conduits shall be arranged to prevent moisture traps and shall drain toward control boxes, and shall be supported to the car-body at least every 610 mm (24 in).

Wires in conduits, ducts, and raceways shall be free of kinks, insulation abrasions, and insulation skinning.

If a conduit is designed to come through the flooring of the vehicle and into equipment boxes located at the passenger compartment level, the conduit must extend 25 mm (1 in) above floor level to prevent water or cleaning chemicals from draining onto the below-floor cables.

#### 17.21.12 Wire Harness

The layout of wiring, for both vehicles and equipment, shall be designed in advance of its installation and in cooperation with the suppliers of the related equipment. Wiring shall be pre-fabricated into standard harnesses, wrapped and tied with nylon wire ties or a high strength, waxed lacing cord designed not to invade the wire insulation. Harnesses shall be installed with identical arrangement and location in each vehicle having similar equipment. Separate harnesses shall be provided for major circuit groups or types, or as required for specified circuit separation. All circuits and branches shall be separable by means of terminal boards to isolate portions from others for troubleshooting. All circuits subject to periodic high potential tests shall be arranged so that they can be conveniently isolated for the tests.

Alternative methods for fabricating and installing wiring, which are standard locomotive builder practice, will be submitted for consideration at the appropriate design review.

Harnessed wires shall not be installed in conduit. Wires from different conduits or other openings shall not be harnessed together with wires running within the box or entering the box through another entrance point. Each harness or group of wires between equipment enclosures shall contain a minimum of 10% spares, but no fewer than 2 spares for each wire size.

#### 17.21.13 Cleating

Split block cleats of molded neoprene rubber or an approved equivalent shall cleat all cable and wiring not installed in conduits. A nonflammable insulating material with a durometer reading of 50 to 60 Shore A hardness, shall be used for cleating.

The holes in the cleat shall be sized for the individual wires and cables. Hole edges shall be radiused to prevent square edge contact with cable insulation.

Each cleat shall have a stiffener on the side away from the mounting bracket that will act to spread the bolt clamping force over the entire length of the cleat.

Bolts shall have lock nuts of approved design.

Cable and wiring, other than HVDC, using cleating shall be supported to the car-body at least every 610 mm (24 in).

#### 17.21.14 Equipment Enclosures & Junction Boxes & Fittings

Boxes, covers, and fittings of ferrous metal shall be galvanized inside and outside after fabrication. All box covers shall be marked with the vehicle number, all like covers shall be interchangeable. The box covers shall be held in place with latches or blunt end screws. Self-tapping screws shall not be used for box covers.

Screws and other hardware shall be made of stainless steel.

All undercar and roof-mounted junction boxes shall be waterproofed and vented, and shall protect enclosed equipment and connected conduits from water seepage.

The interiors of all equipment enclosures and junction boxes shall be protected with an electrically insulating; white, or light color paint.

#### 17.21.15 Wire Identification & Terminal Markings

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Wire terminal designations shall be assigned to all electrical conductors, whether individual wires or cables, within the entire locomotive.  
All wires and cable shall be marked within 305 mm (12 in) of the end of the wire and every 305 mm (12 in) along the entire length of the wire.  
Wires shall be identified according to circuit function, wire number, wire segment, and gauge.  
Wire identification shall be subject to approval by Metra.

#### 17.21.16 Splicing and Taping

Splicing and taping shall not be allowed unless expressively approved by Metra on a case by case basis.

### 17.22 CIRCUIT PROTECTION

17.22.1 Handles shall indicate ON, OFF, and TRIPPED positions. Circuit breakers shall be molded-case type multi-pole, with frame size suitable for continuous current and interrupting duty. Circuit breakers shall be applied such that the worst-case fault currents shall not exceed the manufacturer's guaranteed operating ranges KAIC rating.

17.22.2 Each pole shall be equipped with a trip mechanism consisting of an inverse time element for overload protection and an instantaneous magnetic element for short circuit protection.

17.22.3 Each pole shall be equipped with adequate means of arc extinction to prevent flashover.

17.22.4 Multi-pole breakers shall operate contacts simultaneously.

17.22.5 Breaker current rating shall be clearly visible after installation and shall comply with NEMA AB1, ANSI C37.13, C37.14, or C37.16.

17.22.6 Continuous current rating shall be selected in accordance with NFPA 70 for load and type of service indicated.

17.22.7 Electrically controlled breakers shall be equipped for operation from the LVPS

17.22.8 Circuit breakers shall be properly coordinated with protective devices.

17.22.9 Other than high speed circuit breakers (HSCBs) used for HVDC circuits, circuit breakers shall not be used for protection on HVDC circuits.

17.22.10 Fuses shall not be used except for indicator type fuses within electronic assemblies, high voltage circuit protection, and special applications with approval.

### 17.23 GROUNDING

17.23.1 Grounding connections shall be made through copper or bronze pads, tinned, and silver soldered to the car-body.

17.23.2 The copper pads shall be tinned or silver electroplated after attachment. Stainless steel ground pads may also be used, subject to Metra approval.

17.23.3 Low voltage and high voltage circuits shall not be grounded to the same grounding pad, if such grounding is permitted by this specification.

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17.23.4 All ground pads shall be visible and accessible for inspection and troubleshooting. The ground connections shall be attached by an approved bolt, washer, and nut designed for the purpose.

17.23.5 Resiliently-mounted equipment shall be grounded with flexible strap-type grounding leads bolted between a car-body grounding pad and the equipment's grounding pad. Strap flexibility and length shall be sufficient to prevent failure from fatigue. Fixed equipment maybe grounded by flexible straps or properly terminated wire of the same type used for locomotive wiring.

17.23.6 The ground strap termination method shall form a gas-tight, uniformly distributed connection with the conductive surface. Current density shall not exceed bonding requirements below.

17.23.7 All grounding and bonding jumpers and straps shall be sized to handle fault current and lightning discharge current, for which the voltage drop shall not exceed 50 volts. The bonding method employed shall not produce a DC resistance in excess of 0.0025 ohms, or more than 0.025 ohms at 150 kilohertz for any applied AC voltage.

17.23.8 All ground pads shall be readily visible and accessible for inspection and troubleshooting.

17.23.9 All equipment enclosures and shock-mounted equipment shall be grounded with tinned, braided copper, flexible strap grounding leads bolted to a car-body grounding pad.

17.23.10 Ground cables and shunts shall be extra-flexible, tinned, non-insulated, stranded copper cable meeting the additional requirements of TP19.11.2, and shall be terminated by approved crimped ring terminals on both ends.

17.23.11 Ground cables and shunts shall be sized to withstand, without failure, the maximum failure current that could be anticipated should the return wiring totally fail.

17.23.12 In no case shall the size of a ground cable or shunt be less than No. 10 AWG.

17.23.13 The Contractor shall ensure that all metal parts inside and outside the vehicle that could be touched by passengers or operating personnel, including equipment boxes, panels, and test receptacles in the passenger or operator areas, shall never exceed car-body potential.

## 17.24 ELECTRICAL COMPONENTS

Electrical components, which are singly replaceable, shall be connected to locomotive wiring through individual, removable connections, or "pigtails" with connectors. Replaceable components shall not be connected to locomotive wiring using soldered connections. Electrical components installed on the vehicle without protective enclosures, including, but not limited to inductors, transformers, resistors and capacitors, shall be designed, selected and installed to make them impervious to the effects of Metra's railroad environment and operations. This shall include, as a minimum, the effects of extreme weather, water, snow and ice, extreme temperature swings and possible impact by debris. Exceptions to this requirement may be granted on a case-by-case basis, upon approval by Metra.

### 17.24.1 Relays and Contactors

Contactors and relays shall meet or exceed IEC 60077.

Low-current relays (less than 10 Amp per pole) shall have silver-alloy contacts.

Very low current relays (1 Amp and less) shall have gold-plated, silver-alloy contacts.

Relays and contactors that have not been proven in rail service shall comply with MIL-PRF-6106.

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Relays shall be capable of at least one million electrical operations at rated contact capacity with the exception of those operating on the order of 1000 times per day being capable of at least ten million electrical operations at rated capacity.

Plug-in relays shall be secured in their sockets by mechanical restraint.

Relay and contactor coils shall be suppressed to mitigate transient voltage spikes, with the suppressing network mounted as close to the coil as possible.

Relays and contactors, except low-power miniature relays mounted on printed-circuit boards, shall incorporate means of visually determining whether contacts are picked up or dropped out. Relays used in safety-critical circuits with single point failures shall comply with the AAR Signal Manual, Volume 2, Section 6, unless otherwise approved.

Contactors used to interrupt HVDC circuits shall be equipped with blowout coils or other means of arc suppression in accordance with TP 12.

#### 17.24.2 Pushbutton Switches and Indicators

Switches shall be heavy-duty, with electrical characteristics, ratings, and accessories as required for circuit application.

Pushbutton (including illuminated) switches shall have silver-plated or silver-alloy terminals. Indicators and pushbutton switches shall have insulation resistance of at least 1 M $\Omega$  to case at 500 VDC. Re-lamping of indicators shall be from front.

Contacts shall have maximum resistance of 0.10 ohm at 3 VDC and 10mA load. Minimum open contact resistance shall be 50 M $\Omega$ .

Contact shall be rated for inductive loads. The contacts shall normally operate at not more than 20 percent of the manufacturer's inductive rating for 25,000 cycles of operation at 250 C. The electrical-contact material shall be silver or silver with a gold flash or gold plate, and be normally a break-before-make type.

Indicators shall be LED type where possible.

#### 17.24.3 Inductors

Power inductors shall have vacuum-impregnated windings and be rated to withstand at least twice the maximum peak-to-peak voltage expected in normal operation.

#### 17.24.4 Transformers

Transformers shall have vacuum-impregnated windings and have a minimum inter-winding breakdown voltage of 1,500 VDC. Exceptions to this requirement may be granted on a case by case basis, upon approval by Metra.

#### 17.24.5 Resistors

Resistors other than power/braking resistors shall be derated 50 percent minimum.

#### 17.24.6 Capacitors

Capacitors shall be rated for transients of at least twice the maximum peak voltage expected in normal operation and be applied at continuous voltages not greater than 80 percent of rated working voltages. Exceptions to this requirement may be granted on a case-by-case basis, upon approval by Metra.

#### 17.24.7 Motor Starters

Starters shall be rated for continuous duty at service indicated, shall be equipped with magnetic holding coils, and shall be capable of resetting automatically upon loss of supply voltage.

Starters shall be equipped with sufficient auxiliary contacts to comply with requirements for annunciation circuits, as indicated. Thermal overload protection shall be provided. Three-phase starters shall be three-pole.

#### 17.24.8 Environmental Conditions for Electronic Systems

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When not in conflict with or specified otherwise in component portions of this specification, "normal railroad operating environment" for electronic systems shall be defined by referring to criteria in relevant sections of standard EN 50155 Railway applications – Electronic equipment used on rolling stock, including:

IEC/EN 61373 Railway applications – Rolling stock equipment – Shock and vibration tests  
EN 50121-3-2 Railway applications – Electromagnetic compatibility: Rolling stock – Apparatus  
Metra will not require test reports for the above standards unless stated at the component/system level.

APTA, AAR, and applicable North American standards take precedence where any conflicts arise.

#### 17.25 ELECTRONIC COMPONENTS

Electronic components shall be free of storage and handling damage. Where possible, components shall be clearly and permanently labeled with values or type identification. Semiconductor devices shall be available from two or more qualified manufacturers. Exceptions to this requirement may be granted on a case-by-case basis, upon approval by Metra. Carbon resistors shall not be used on printed circuit boards. Metra may grant the use of carbon resistors on printed circuit boards that have previously been approved by Metra and are currently being supplied to Metra. Components as applied in their circuits shall be derated by at least 25 percent from manufacturer's ratings. For power semiconductors, derating of current shall be such that manufacturer's maximum junction temperature is not exceeded with 25 percent increase in semiconductor current above that required for performance

##### 17.25.1 . Printed Circuit Boards

Printed circuit boards (PCBs) shall be of glass epoxy construction, complying with NEMA LI1, grade FR-4, or equivalent standard such as IEC 249. PCBs shall be uniformly coated. Conductor materials shall be determined on the basis of current carrying capacity and in accordance with IEC 326-3. Edge connectors and boards shall be keyed to prevent insertion of any board in wrong a position, and mounted for ease of board removal and replacement. To the greatest extent practicable, component labeling shall be provided on PCBs.

##### 17.25.2 Semiconductor/Integrated Circuits Requirements

The Contractor shall be responsible for ensuring that all electrical and electronic circuitry, including those of suppliers and subcontractors, as a minimum meet the criteria for the use of semiconductors and/or integrated circuits listed in this section, unless otherwise approved. Suppression devices shall be provided to protect the devices and limit the circuit voltage. Non-JEDEC registered devices which carry more than 100 Amps may be used with prior approval, based on submission of complete procurement specifications defining each such device and evidence of availability from two or more manufacturers. All semiconductor/integrated circuits shall be rated to properly perform in the range -40 to +85 C [-40 to +185 F]. Transistors and other solid-state power devices operated from nominal battery supply shall have minimum breakdown ratings of four times the maximum circuit voltage. Suppression devices shall be provided to protect the devices and limit the circuit voltage. All integrated circuits shall be screened for defects. The Contractor shall submit for approval screening methods based on a minimum of a 48-hour burn-in for the completed assembly. Alternate screening methods may be submitted to Metra for review and approval.

##### 17.25.3 Microprocessor-Based System Requirements

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Microprocessor-based components, assemblies, and power supplies shall be provided with voltage/current regulation and protection to ensure proper operation.

All interfacing wiring shall be protected against interference from other on-car or wayside electrical radiation.

The microprocessor shall be of a family shown to be suitable for the rugged environmental conditions encountered in rail applications, and shall be supported by software development language and diagnostic programs, which are acceptable to Metra.

The microprocessor assembly shall be housed in an enclosure, which shields the microprocessor assembly and the surrounding circuits from EMI radiation and interference. The microprocessor shall have external buffers provided, and shall be protected from external voltage and current transients and EMI.

#### 17.25.4 Software Requirements

Where the software is essentially a modification of an existing product to meet the Metra's requirements, the design process, and documentation, shall be submitted for review and approval by Metra.

For newly developed software, the Contractor and/or supplier shall submit a Software Quality Assurance Plan [**CDRL C-17-27**] for approval complying with IEEE 730 or equivalent, and containing, as a minimum, the following documentation requirements:

17.25.4.1 Software Requirements Specification

17.25.4.2 Software Design Description

17.25.4.3 Software Verification and Validation Plan

17.25.4.4 Software Verification and Validation Report

17.25.4.5 User Documentation

Source code shall be written in a high-level language such as C. All source code, properly documented, shall be placed in Agency approved third-party escrow when the last vehicle exits its warranty period.

The Software Design Description, in (b) above, shall comply with IEEE 1016 or equivalent.

The requirements of this section shall be presented to Metra at the Design Reviews. Metra shall be properly notified of meetings and reviews scheduled to determine progress with respect to the software requirements and the software design description by the Contractor. It is recommended that the Contractor establish a Software Management Plan.

The contractor shall support a software compatibility on future operating system on laptop.

### 17.26 CONTRACT DELIVERABLES REQUIREMENT LIST

CDRL	Title
C-17-01	Material Certifications
C-17-02	Material Maintenance
C-17-03	Interior and Exterior Stainless Steel Samples
C-17-04	Stainless Steel Coil Test Reports
C-17-05	LAHT Tension and Bend Test Reports
C-17-06	Casting Qualification Report
C-17-07	Elastomer Certification
C-17-08	Visual Inspection Criteria for Glazing
C-17-09	Thermoplastic Sheet Color and Surface Finish Samples
C-17-10	Thermoplastic Test Certifications
C-17-11	Fiberglass Reinforced Plastic Test Certifications
C-17-12	Melamine Test Certifications
C-17-13	Leak Test for Air and Hydraulic Piping System
C-17-14	Piping, Tubing, and Pressure Vessel Specifications

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C-17-15	Proposed Flushing and Cleaning Procedure for Pipe
C-17-16	Bearing Specification and Data
C-17-17	Paint Inspection and Acceptance Criteria
C-17-18	Adhesives Utilized
C-17-19	Insulation Application, Retention, and Data
C-17-20	Fire Safety Analysis
C-17-21	Threaded Fastener Data
C-17-22	Welding Documentation
C-17-23	Welding Inspection Plan
C-17-24	Brazing Documentation
C-17-25	Corrosion Control Plan
C-17-26	Wire and Cable Data and Specifications
C-17-27	Software Quality Assurance Plan

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## **18 INSPECTION AND TESTS**

### **18.1 INSPECTION**

18.1.1 It is the intent of these Specifications that inspection of the locomotive and its components be the responsibility of the Contractor and the Manufacturers, and that inspections be performed at the plants of the Contractor and the Manufacturers, so that corrections can be made under factory conditions.

18.1.2 Metra shall have the option to have one or more duly authorized inspectors in the Contractor's plant or any sub-contractor's plant to check on and review all details involved in the construction of the locomotives and to be responsible for engineering liaison between Contractor and Metra and for approval of designated changes as necessary.

The Contractor shall provide adequate work space and provide copies of all designs and drawings (minimum two sets of 11" X 17" prints in three ring binders), and testing facilities, as necessary for execution of representative's inspection.

The scheduling of Metra personnel for station inspection and in-process testing shall be done in a timely fashion, with not less than 24 hours notice (written or oral) being given by the Contractor. Requests for weekend coverage shall be made only when absolutely necessary. Such requests must be made in writing by 3:00 PM of the preceding Thursday, and must contain eight (8) hours of inspection and/or test work for Metra personnel.

The Contractor's gauges and other measuring and testing devices shall be made available for use by Metra to verify that the locomotives conform to all specification requirements. If necessary, the Contractor's personnel shall be made available to operate the devices and to verify their condition and accuracy.

18.1.3 Inspection stations shall be at the best locations to provide for the work contents and characteristics to be inspected. Stations shall provide the facilities and equipment to inspect structural, electrical, pneumatic, and other components and assemblies for compliance with the design requirements. Stations shall also be at the best locations to inspect or test characteristics before they are concealed by subsequent fabrication or assembly operations. Metra reserves the right to establish as many inspection stations it deems necessary. Metra also reserves the right to conduct such inspections independent of the manufacturer's representative or with a restricted number of the Contractor's personnel.

18.1.4 The presence of Metra's representative in the plants of the Contractor shall not in any way supplant the Contractor's own inspection nor lessen the responsibility of said Contractor in respect to meeting all requirements of these Specifications.

18.1.5 Metra shall have the right to reject any design, workmanship or material which does not conform to accepted practice, to the design of the Contractor or any subcontractor supplying materials or components to the Contractor, or to these Specifications. Any such rejection shall be corrected by the Contractor to the satisfaction of Metra. Repetitious rejections may be the cause for Metra to order discontinuance of all or a portion of the design and/or manufacturing work. Such discontinuance shall not relieve the Contractor from schedule compliance requirements, pending resolution satisfactory to Metra.

18.1.6 Inspections of the first article produced, of certain major components and assemblies shall be made at the Manufacturer or Subcontractor source or at the Contractor's shop. The Contractor shall notify Metra at least ten (10) working days in advance of the date on which

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inspection by representatives of Metra may be made, of the first article produced at the source plant or Contractor's shop, of the following components and assemblies:

- 18.1.6.1 Locomotive car-body shell
- 18.1.6.2 Control Cab layout
- 18.1.6.3 Battery Prime Mover (and associated auxiliaries)
- 18.1.6.4 Windows - fit and finish
- 18.1.6.5 Trucks-frame
- 18.1.6.6 Trucks-fully assembled
- 18.1.6.7 Wheel and axle assemblies with Traction Motors
- 18.1.6.8 Couplers and draft gear
- 18.1.6.9 Air brake system
- 18.1.6.10 Wheel slide control system
- 18.1.6.11 Cab seats
- 18.1.6.12 HVAC system, controls and temperature controls
- 18.1.6.13 All external and internal lighting systems
- 18.1.6.14 Communication system
- 18.1.6.15 Electrical lockers
- 18.1.6.16 All electrical panels
- 18.1.6.17 Batteries and charging system
- 18.1.6.18 Front pilot and snowplow
- 18.1.6.19 Cab seats
- 18.1.6.20 Exterior doors
- 18.1.6.21 Alerter/ speedometer/ overspeed
- 18.1.6.22 Event recorder system
- 18.1.6.23 Digital Video Recorder (DVR) System
- 18.1.6.24 Positive Train Control (PTC) system
- 18.1.6.25 Windshield wipers

18.1.7 The Contractor shall notify Metra at least twenty (20) working days prior to completion of the first locomotive at which time a sample locomotive inspection will be made at the plant of all parts and performance, including such running tests as can be made at the Contractor's plant. All clearances and dimensions shall also be checked.

Representatives of the manufacturers and subcontractors, and any others, Contractor or Metra feels are necessary, shall be present at the sample locomotive inspection at Contractor's shop.

18.1.8 Metra's Chief Mechanical Officer, Program Manager, Project Manager or their duly authorized representative shall be authorized to release the locomotives for delivery and shall be authorized to approve the pre-delivery acceptance tests. Upon request to the quality assurance supervisors, Metra inspectors shall have access to the Contractor's quality assurance files related to this procurement. These files shall include drawings, assembly procedures, material standards, parts lists, inspection processing and reports, and record of defects.

18.1.9 All requests from regulatory and other agencies to inspect any of the work shall be made through Metra rather than directly to Contractor.

18.1.10 Inspection costs incurred by Metra shall be borne by Metra, and no provision for such costs shall be made by Contractor in its bid price.

## 18.2 TESTS

18.2.1 The Contractor shall perform all tests specified herein unless the Contractor can furnish test reports acceptable to Metra which indicate that the equipment furnished under this contract

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is identical to equipment which has been tested for the same application and that these tests demonstrate compliance with the requirements of these specifications.

The Contractor shall prepare and submit a Master Test Plan to Metra for review and acceptance. **[CDRL C-18-01]** It shall be the Contractors responsibility to prepare a test plan, which includes all necessary testing to prove compliance with all requirements of this Specification.

The Contractor and his subcontractors may, at their option, conduct additional tests as part of their Quality Assurance program.

Unless indicated otherwise, all costs associated with any of the tests performed shall be borne by the Contractor. In the event of failure to meet the specification requirements in any test, the Contractor, at his expense shall make the necessary correction and rerun the test in its entirety (again at his expense). The Contractor shall give at least a twenty (20) working day notice to Metra prior to the start of any test.

The cost for train crews and alike used to perform qualification tests shall be borne by Metra for the first set of such tests. For any re-testing required, Metra shall invoice the Contractor for such services.

The Contractor shall prepare detailed procedures for all tests described herein. Each procedure shall be submitted to Metra for review and approval not less than sixty (60) calendar days prior to the first test. **[CDRL C-18-02]**

The Contractor shall provide a written report of each test, including all test data, to Metra. In the case of tests which are performed on all locomotives or all components, the report of tests shall be included in the appropriate locomotive history book. All testing shall be for this contract. (Previous test reports not accepted). Pass/Fail conclusions must be stated in each test report.

#### 18.2.2 QUALIFICATION TESTS (One Time Tests)

Metra may add additional qualification tests dependent upon final design of the locomotive.

18.2.2.1 The first truck frame and bolster shall be stress tested under load conditions to approximate the conditions to be encountered in service (including impact loads, curving forces and braking forces). A minimum of one hundred (100) strain gauges shall be used. Strain gauges shall be located based on stress calculations, stress-coat testing and previous experience. Measured stress exceeding 80% of the yield strength of the material used, permanent deformation, cracks and fractures shall be cause for rejection. Metra shall be advised at least twenty (20) days prior to this test.

18.2.2.2 Unless certification documentation from the manufacturer exists satisfying requirements of the Environmental Protection Agency (EPA), a test demonstrating compliance with EPA prevailing Emissions Tier requirements shall be conducted on a single Metra locomotive at a site capable of performing certified testing to satisfy EPA test requirements. Metra will not test any locomotive for acceptance until this has been completed and/or compliance demonstrated, with copies of Emissions Certification provided to Metra.

18.2.2.3 The sound levels shall be measured and verified to meet or exceed regulatory standards. Tests shall be conducted with all systems running. Tests shall be run both statically and as part of a running test and in accordance with FRA standards.

18.2.2.4 A test demonstrating positive train control system functionality on Metra's entire system must be satisfactorily completed.

18.2.2.5 In addition, an air brake system performance test of a six-car consist, shall be conducted on Metra property to demonstrate compliance with specified braking performance parameters and to verify system design and component interaction characteristics. Testing shall be scheduled at times convenient for Contractor and Metra jointly. If equipped, a wheel slide system test shall be performed. In order to provide a test of the operation of the wheel slide protection system under actual operation conditions, facilities shall be provided for a test of this system during the road brake tests. Wheel slides shall be induced by apparatus

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installed on the vehicle that will spray a water soap solution on the track ahead of the lead wheels on each truck.

18.2.2.6 A curve negotiating and clearance test shall be conducted on two coupled locomotives and the locomotives shall successfully pass this test to comply with the requirements as described in Section 3.2.

18.2.2.7 Metra shall request to verify conformance to the ride quality requirements, one of the first pilot locomotive shall be subjected to ride quality road tests. At a minimum, the ride quality tests shall consist of testing of one or more locomotives on minimally compliant track that conforms with all FRA track standards for the classes of track over which the locomotives are designed to operate. The locomotive or locomotives shall also be tested on a major segment of track over which the locomotives are intended to operate in revenue service, making all local stops while operating at normal scheduled speed. The Contractor shall submit a Ride Quality Testing Plan for submittal to Metra for review and approval, specifying the start and end points, speeds, test methodology, measurement parameters and criteria, and method of instrumentation for the ride quality tests. Results from previous ride quality tests that closely simulate Metra's revenue service environment may, at the sole discretion of Metra, be accepted in lieu of additional ride quality testing.

Instrumentation capable of measuring and charting the magnitude and frequency of the vertical and lateral shocks expected, up to 1.00 g (0.04 oz) and 0.5 to 50 Hertz, shall be provided and operated by the Contractor, who shall reduce the raw data for presentation to Metra. Sensing units shall be located on the locomotive floor above the intersection of the locomotive longitudinal center line and each truck transverse center line.

In the event, the dynamic behavior of the locomotive is non-compliant in any respect with requirements, the Contractor shall submit to Metra within 30 calendar days, a program containing mathematical analysis of the problem and a course of action for its correction. If Metra approves the analysis and corrective measures, those corrective measures shall be made effective on the pilot locomotives within 90 calendar days at the expense of the Contractor, the locomotive shall be retested, and if the measures are successful, they shall be applied to all locomotives. If not, the analysis and correction steps shall be repeated, resubmitted and retested until success is attained.

#### 18.2.2.8 EMI/EMC Test

Contractor shall develop and submit to Metra for review and approval an Electromagnetic Compatibility Control Plan (EMCCP) which describes the Contractor's organization to achieve EMC in accordance with APTA PR-E-S-010-98. **[CDRL C-18-03]** The Contractor shall conduct and document all plan requirements to the integrated vehicle, all subsystems, and suppliers. The Contractor shall ensure that all equipment, both individually and as part of the railcar assembly, complies with the EMC requirements.

The EMCCP shall address all requirements in the Specification and in 49 CFR 238 including scope, purpose, project organization, schedule deliverables, EMC design reports, EMI Safety Analysis, and emissions limit test procedures and plans and testing. The plan shall include requirements for system integration and cover all EMC critical components and electronic subsystems for each vehicle type.

#### 18.2.3 IN-PROCESS TESTS (All Locomotives)

Each locomotive shall successfully pass the following tests conducted in accordance with an approved test procedure:

18.2.3.1 Water tightness tests shall be conducted on the locomotive car-body and completed locomotive prior to delivery. Tests are intended to demonstrate water tightness of the locomotive body construction before application of thermal insulation and finish panels. Complete locomotive water test shall demonstrate water tightness of finished locomotive simulating passage through rainstorm at maximum speed.

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18.2.3.2 Air brakes shall be statically tested per FRA Regulations to verify all functions of the brake system under all conditions (service, emergency, release, and charging, function, conductor's valves, and all other combinations).

18.2.3.3 All electrical circuits, including control elements, are to be tested for continuity, grounds, voltage drop, and function. Tests shall be conducted individually as well as simultaneously. Megger and high potential tests will be conducted on all circuits and equipment as appropriate.

18.2.3.4 Functional tests of the following systems shall be conducted to demonstrate compliance with these specifications. Metra may add additional functional tests:

18.2.3.4.1 Communication System

18.2.3.4.2 Air Conditioning

18.2.3.4.3 Heating System

18.2.3.4.4 Emergency Lighting System

18.2.3.4.5 Door operation

18.2.3.4.6 Handbrake

18.2.3.4.7 Propulsion system, includes Battery Prime Mover

18.2.3.4.8 Head End Power System

18.2.3.4.9 Video System

18.2.3.4.10 Dimensional Testing

18.2.3.4.11 Alerter/Event Recorder

18.2.3.4.12 Locomotive Control

18.2.3.4.13 Headlights, Ditch lights, Oscillating light, Marker lights (includes aiming of headlight & ditch lights)

18.2.3.4.14 Horn Testing and Compliance per 49 CFR Part 229.129 using Metra Horn Sound Level Test Form and test reports shall be provided in each locomotive's history book.

18.2.3.4.15 Positive Train Control System

18.2.3.4.16 Wheel Slide System

18.2.3.4.17 Electrical Function

18.2.3.4.18 Trainline

18.2.3.4.19 Car-body Dimensional Measurement

18.2.3.4.20 Cab Noise and Compliance per 49 CFR Part 229.121

18.2.3.4.21 Exterior Noise Testing and Compliance per 49 CFR Part 210 Railroad Noise Emission Compliance Regulations

#### 18.2.4 POST-DELIVERY TESTS: CONDITIONAL ACCEPTANCE

Metra may add additional post-delivery qualification tests.

18.2.4.1 In accordance with 49 CFR Part 238.111 Metra will conduct acceptance tests on each delivered locomotive. Metra shall complete these tests completed within fifteen (15) calendar days after notice of fitness for testing is issued and shall be conducted in accordance with written test plans. These tests will also identify defects that have become apparent between the time of the locomotive's release and delivery to Metra. The post-delivery tests shall include visual inspection and operations. Generally, post-delivery test shall apply criteria that are similar to the criteria applied in an analogous IN-PROGRESS test (if any). However, Metra reserves the right to conduct any additional test to ensure that the completed locomotives have attained the desired quality and have met the requirements of these specifications.

Reports covering Conditional Acceptance testing shall be prepared by the Contractor.

18.2.4.2 Tests will include, but are not limited to the following:

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- 18.2.4.2.1 Communication Equipment (including Information Systems)
- 18.2.4.2.2 Trainline Compatibility
- 18.2.4.2.3 HVAC System Functions
- 18.2.4.2.4 ADA System Functions
- 18.2.4.2.5 Running Tests
- 18.2.4.2.5.1 Curve Clearance Verification Test
- 18.2.4.2.5.2 Brake Test
- 18.2.4.2.5.3 Riding Quality Test
- 18.2.4.2.5.4 Audible Noise Test
- 18.2.4.2.5.5 PTC Qualification Test
- 18.2.4.2.5.6 TMS Qualification Test

#### **18.3 LOCOMOTIVE PRE-SHIPMENT INSPECTION**

After all work, including testing is completed, the Contractor shall perform a locomotive pre-shipment inspection according to a Metra approved procedure. All manufacturing or testing non-conformance shall be rectified with no open issues pending before pre-shipment inspection occurs. The locomotive history book shall be complete and ready for review and approval by Metra or a designated representative. A "Fitness for Delivery" certificate will be issued by Metra upon satisfaction of these requirements.

#### **18.4 NOTICE OF ARRIVAL**

Upon delivery, each locomotive will be inspected for shipping damage, vandalism, etc. Upon satisfactory inspection, this certificate will be issued. The Contractor will be responsible for resolution of any abnormal conditions or discrepancies before the locomotive will be allowed to undergo Acceptance Testing.

#### **18.5 FITNESS FOR OPERATIONAL TESTING**

Following arrival, each locomotive will undergo Operational Performance Testing. Metra will subject the locomotive to a series of operational performance tests. Testing will consist of shop testing the locomotive's subsystems and track testing with all subsystems operating. If Metra determines, in its sole discretion, that the locomotive does not pass one, all, or any combination of tests, Metra shall issue the Contractor a 'Notice of Rejection' for the locomotive listing the items to be remedied or repaired.

#### **18.6 CONDITIONAL ACCEPTANCE**

Upon satisfactory completion of all Operational Testing, Metra will issue a "Notice of Acceptance," corresponding to the date of each locomotive's placement into revenue service. The time period of warranty coverage shall commence with issuance of this document.

#### **18.7 CONTRACT DELIVERABLES REQUIREMENTS LIST**

<b>CDRL</b>	<b>Title</b>
C-18-01	Master Test Plan
C-18-02	Test Procedures
C-18-03	EMI/EMC Test

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## **19 PRODUCT SUPPORT**

All manuals, drawings, photographs, and training material ("Material") shall include an irrevocable license to reproduce such Material for Metra's internal purposes. Metra has rights to use above documentation in the bid package for overhaul, parts procurement without notifying OEM.

Manuals, Drawings, etc. shall be shipped to:

Metra  
547 W. Jackson Boulevard  
Chicago, Illinois 60661  
Attention: Chief Mechanical Officer  
Mechanical Department 16th floor

### **19.1 DRAWINGS AND REPRODUCTIONS**

19.1.1 The Contractor shall furnish before the first locomotive is delivered a complete and correct electronic (pdf) set of drawings, covering all assemblies, subassemblies, and all detail parts, manufacturing/shop/parts drawings prepared by the Contractor and Subcontractors that are necessary for the construction of equipment. The inspection (visual/dimensional) criteria, casting/forging material criteria shall be provided. Electronic editable copies of the following drawings shall be provided (see PROJECT DRAWING DELIVERABLES for additional requirements):

- 19.1.1.1 Locomotive Schematics & Conduit Diagrams
- 19.1.1.2 Air Piping Diagrams
- 19.1.1.3 Locomotive General Arrangement
- 19.1.1.4 Clearance Diagram
- 19.1.1.5 Wire Running List
- 19.1.1.6 Structural Drawings including material information
- 19.1.1.7 Maintenance Parts Information (ex. Lubricant, coolant, consumables)

19.1.2 A formatted in Autodesk AutoCad (.dwg files) of the complete editable as-built version of the drawings above shall be provided thirty (30) days after the conditional acceptance of the last locomotive. **[CDRL C-19-01]**

19.1.3 Metra shall have unlimited rights to use these drawings and documentation specifically issued to Metra for this project.

### **19.2 PHOTOGRAPHS**

19.2.1 Electronic version (jpg) of the following color photographs shall be provided **[CDRL C-19-02]**:

- 19.2.1.1 Side elevation of the locomotive;
- 19.2.1.2 Combination front and side (three-quarter) view of the locomotive;
- 19.2.1.3 Head-on view of each end;
- 19.2.1.4 Cab, taken from three (3) different angles;
- 19.2.1.5 Both trucks in the ready to run condition, but not applied to locomotive;
- 19.2.1.6 Ten (10) miscellaneous photographs illustrating the construction of the locomotives;
- 19.2.1.7 Battery Prime Mover;
- 19.2.1.8 Interior of all lockers and control panels;
- 19.2.1.9 Undercar equipment;
- 19.2.1.10 Major underframe connections (bolster at side and center sill, etc.);
- 19.2.1.11 Underframe, inverted, before addition of superstructure (If New Locomotive);

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- 19.2.1.12      Roof panels, before addition to locomotive;
- 19.2.1.13      Details of side panels;
- 19.2.1.14      Details of all communications equipment;

### 19.3 DRAWING LISTS AND BILLS OF MATERIALS

- 19.3.1      Two (2) copies of a complete drawing list and bill of materials, which should include all Contractor's construction drawings and specialty manufacturers' drawings applicable to the locomotive shall be furnished. **[CDRL C-19-03]**
- 19.3.2      An electronic version, Microsoft Excel file, of each document shall be provided thirty (30) days after conditional acceptance of the last locomotive.

### 19.4 SPARE PARTS CATALOGS AND MAINTENANCE MANUALS

#### 19.4.1      Publication List

The following publications will be provided on Universal Serial Bus (USB) mass storage devices in a Metra-approved format.

- 19.4.1.1      Locomotive Operating Manual
- 19.4.1.2      Locomotive Service Manual
- 19.4.1.3      Parts Catalog (Order Specific)
- 19.4.1.4      Maintenance Instruction Set
- 19.4.1.5      Tool Catalog
- 19.4.1.6      Battery Prime Mover Maintenance Manual

- 19.4.2      There shall be two (2) comprehensive manuals: 1) Maintenance and 2) Parts. The Contractor shall deliver, in searchable, electronic form drafts of the Maintenance manual and of the Parts Manual to Metra prior to the shipment of the first production locomotive. As-built updates, including locomotive affectivity shall be provided through the life of the contract. The Contractor shall deliver to Metra the final, editable electronic version of each manual within thirty (30) days after conditional acceptance of the last locomotive. **[CDRL C-19-04] [CDRL C-19-05]**

All manuals shall be divided into component subsections as Vendor sees fit.

Each section shall have a table of contents.

The contractor shall provide the manufacture name and part number for drop replacement parts.

In all both manuals, Contractor developed and Vendor supplied information shall be integrated into a unified presentation for each system addressed. For clarity of presentation the same data may be presented twice but shall use the same views and diagrams with the same reference numbers in each manual.

- 19.4.3      The Maintenance Manual shall address components to the lowest level identified in the parts catalog. The manuals shall contain a detailed analysis of each component so that maintenance personnel can effectively service, inspect, maintain, adjust, troubleshoot, repair, replace and overhaul the equipment. Where interfaces occur, a cross reference shall be made to the appropriate location.

The manuals shall be divided into the following sections and address the following topics:

- 19.4.3.1      **Introduction** - This shall include the purpose of the manual, special tools, technical guidance including torque requirement, sealing requirement etc., and equipment and safety precautions.
- 19.4.3.2      **Theory of Operation** - This shall include the general theory and the specifics of this system and the relationship of assemblies, subassemblies and components with an explanation and analysis of their functions to the smallest replaceable components.

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- 19.4.3.3     **Operating Procedures** - This shall include the location and functional descriptions of all controls, monitors and indicators.
- 19.4.3.4     **Troubleshooting** - This shall include a list, in tabular format, of symptoms, causes of malfunction or improper operation, and probable remedies to the smallest line replaceable component or printed circuit board level. Logic/flow charts may be used to assist troubleshooting, but must reflect the most efficient and effective logic and not be simply tracing of schematics.
- 19.4.3.5     **Corrective Maintenance** - This shall include step-by-step removal, replacement, and adjustment procedures to the smallest line replaceable component or printed circuit board level. Detailed procedures shall be provided to adjust any unit that has been replaced.
- 19.4.3.6     **Preventive Maintenance** - This shall include a list, in tabular format, of all lubrication requirements, types of lubricants, frequency of application, inspection requirements and limits, component replacement and repair schedule, required adjustments, limits and tolerances, optimum test point readings, calibration charts and procedures in performing the preventive maintenance.
- 19.4.3.7     **Corrective Repair (Shop)** - This shall include detailed troubleshooting procedures for subassemblies as well as complete assemblies, step-by-step removal, overhaul, replacement and adjustment procedures to the smallest replaceable component. Detailed test and adjustment procedures shall be provided for all subassemblies and for the complete assemblies/units.  
As part of the overhaul procedure, details for rebuilding, reclaiming or replacing all wearing or moving parts with comprehensive information on the limits and tolerances sufficient to determine the best approach to follow must be included.
- 19.4.3.8     **Appendix** - This shall include a list of reference drawings, interface drawings, circuit diagrams, symbols, cross references and revisions.
- 19.4.4       The parts manuals shall enumerate and describe every part to the lowest level of replaceable component. They shall include component name, symbol, function, rating, tolerance, manufacturer name and address, manufacturer's part number, commercial equivalents and quantity per assembly or sub-assembly. The manuals shall contain exploded-view diagrams illustrating and indexing every removable/replaceable part.  
Each diagram shall be accompanied by a page listing every item indexed in the associated diagram and providing complete ordering data for every item. Diagrams and exploded views shall be provided to identify the appropriate location of parts within a sub-assembly and of the sub-assembly within the next larger assembly.

## 19.5 OPERATING INSTRUCTION BOOK

- 19.5.1       The Contractor shall furnish fifty (50) copies of instruction books, of a convenient size for handling and carrying, for train crew information on the operation of the locomotives. The book shall provide general information for the train crew duties, including troubleshooting information in case of breakdown or failure, and safety aspects related to train crew duties.  
Diagrams and photographs shall be used where applicable.

- 19.5.2       All copies of the book covering the Metra locomotives shall be delivered sixty (60) calendar days before delivery of the first production locomotive to Metra. The text of the operating instruction book shall be submitted to Metra for approval prior to printing. **[CDRL C-19-06]** In addition, an electronic version (format to be agreed upon) of this book shall be provided.

## 19.6 RECORD OF CONSTRUCTION/LOCOMOTIVE HISTORY BOOKS

Locomotive builder shall furnish in electronic form (pdf Files) to Metra a complete record of construction for each locomotive consisting of the following information **[CDRL C-19-07]**:

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- 19.6.1 All serial numbers on (and not limited to) trucks and related components (bolsters, equalizer beams etc.) and all heat numbers of truck forgings and castings; axles, wheels, bearings, journal boxes, brake components, cab components and related components, HVAC systems and related components, Positive Train Control (PTC) equipment and related components, , display units, battery chargers and power supplies, Communications systems and related components, engine systems and related components, pressurized components, yolk and coupler, and any other serialized parts, In addition, all software and firmware part numbers and revisions shall be provided. The list of components tracked shall be agreed upon between Metra and Contractor.
- 19.6.2 Serial numbers, software and firmware part numbers and revisions shall be provided with each locomotive history. In addition, an electronic version of a master list of serial numbers per vehicle shall be provide to Metra in Microsoft Excel format that can be uploaded into Metra's asset tracking database (Maximo).
- 19.6.3 Locomotive weight sheet including the total weight on the #1 and #2 trucks;
- 19.6.4 Wheel and axle mounting reports;
- 19.6.5 Heat numbers on truck forging and castings (if appropriate);
- 19.6.6 Contractor's standard test sheets;
- 19.6.7 Two copies of "Certificate of Reservoir Construction" specifying minimum tensile strength of the material used, thickness of the shell and heads, outside dimensions and serial number;
- 19.6.8 Copies of all inspection and test reports required in this document for each locomotive;
- 19.6.9 Written reports, tests, and approved contract changes made by the Contractor during locomotive construction;
- 19.6.10 Emissions Registration Card and/or Certificate (If Applicable);
- 19.6.11 Specification sheets as required by FRA shall be completed and delivered to Metra no later than delivery date of each locomotive.

#### 19.7 BLUE CARDS

Two (2) copies of FRA Form (F6180-49) shall be furnished with each locomotive, with all data entered and notarized.

#### 19.8 AS BUILT SPECIFICATION

Locomotive Builder shall furnish an electronic version of an as built specification showing all details of locomotive, all components used and naming supplier and model of all equipment on locomotives. These books shall be furnished to Metra no later than 30 calendar days after delivery of final locomotive. If any changes were made during construction, the as built specification shall detail the changes, and indicate to which locomotive changes were made or different equipment was applied during construction. **[CDRL C-19-08]**

#### 19.9 FIELD SERVICE

The Contractor shall provide for field support facilities and personnel during the periods of performance testing, warranty, and retrofit programs (if any). The details and plans for field service, to include a list of spare parts that the Contractor will have on property during the

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warranty period, shall be submitted to Metra for review and approval. [CDRL C-19-09] Where manufacturers' systems require specialist support, the Contractor shall arrange with the manufacturer for qualified personnel. Metra may require the Contractor to replace any field service personnel whom Metra deems in its discretion to be unsatisfactory.

Metra will accommodate field support personnel with a minimum of two parking spots at one of its main shops/yards, either Burlington Northern Santa Fe 14<sup>th</sup> St. Coach Yard, Rock Island District 47<sup>th</sup> St. yard or Milwaukee District Western Avenue Coach Yard. The specific location for field personnel will be decided at a later date depending on Metra's needs and distribution of the newly purchased locomotives. The Contractor will be required to provide its own office space (trailer or other temporary office space, not to exceed 60 foot length by 12 foot wide by 12 foot height and office supplies (desks, chairs, computers, etc.). The field support office, including all furnishings, shall be covered under the Contractor's Risk Insurance. The Contractor shall be responsible for its own security of the office space and space provided for material storage. Material storage space will also be provided for the contractor. Metra will provide a minimum of one hundred and fifty (150) square feet of space for the Contractor to store material. Metra will provide utilities (electrical) for the office and material storage space.

#### 19.10 TEST EQUIPMENT

The Contractor shall supply, sixty (60) calendar days prior to delivery of the first production locomotive, one (1) set of Specialty Tools, other than air brake test rack, and any test and diagnostic equipment necessary to support and maintain the locomotives and their subsystems. The contractor shall propose the type and quantity of Test and Diagnostic Equipment the contractor deems necessary and most cost-effective for their proposal. A Specialty Tool shall be considered any tool, gage, die, etc. called out for inspection, repair, maintenance or overhaul of the vehicles that is not readily, commercially available. Special Tools shall not include fixed shop equipment. Fixed shop equipment shall be defined as cranes, drop tables, car jacks, and maintenance pits. Test equipment will troubleshoot down to electronic board level (qualify boards for functionality). [CDRL C-19-10]

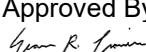
#### 19.11 TRAINING

##### 19.11.1 General

The Builder must provide a modular training program using methodologies and formats which follow Instructional Systems Design (ISD) standards or equivalent Metra-approved formats recognized by American Society for Training and Development (ASTD). Training programs will be provided for the specified number of Metra's designated Instructors, Supervisors, Operating, Maintenance, and Engineering personnel, and be of a quality and depth sufficient to permit such personnel to train others in the operation and maintenance of the locomotives and to safely and satisfactorily operate, service, and maintain the locomotives and all their ancillary equipment. The training shall be based on Metra's "Train the Trainer" philosophy to allow future training programs to benefit fully from the training materials provided. Safety and FRA inspection compliance are of the utmost importance.

The Contractor must provide modular training materials using Metra's Word-based template and style (active voice, present tense). The Contractor must be familiar with Information Mapping methods and techniques. An additional requirement is that all written materials (course guides, tests, practical exercises) must allow for immediate and invisible integration into Metra Workforce Education and Training's (WFET) current training materials. This will allow for comprehensive training with respect to all aspects of operation and maintenance of the new equipment.

If the Builder intends to use a subcontractor for training, the Builder should identify the subcontractor. If a subcontractor is used, Metra's issuance of the Notice to Proceed is conditioned upon Metra's receipt of an executed copy of the Builder's contract with the trainer identified. The Builder should also specifically designate by name the project manager who will

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oversee the entire training process, oversee the training subcontractor, and who will interface directly with Metra's Director of Training & Development.

The ultimate objective of all training materials is that the trainees will be able to safely, accurately, completely, and successfully perform their assigned job tasks. Assigned job tasks include operations, maintenance, and repairs. Safety and FRA inspection compliance are critical to the success of the project. The training must include thorough explanations, operating, and maintenance instruction for any and all new technology. Metra requires that the training define with sufficient detail, accuracy, and completeness the operating and maintenance practices, procedures, and requirements associated with the supplied rolling stock.

Specifically, the Contractor must develop materials and deliver training that includes:

- Comprehensive conceptual information
- Functional descriptions
- System descriptions
- Component descriptions
- Installation and removal instructions
- Scheduled maintenance instructions
- Running maintenance instructions
- Comprehensive diagnostics and testing information
- Explicitly defined terminology for new technologies
- Comprehensive information for all new technologies, including system interfaces

Developing and delivering training requires that the Contractor:

- Obtain broad and deep knowledge of Metra equipment and supporting components
- Understand Metra's operations and operational goals
- Obtain a thorough understanding of all regulations that govern Metra operations

The training shall be conducted in two phases. The first phase shall commence prior to the first production unit being available for revenue service. The second phase shall commence sixty (60) calendar days after the conditional acceptance of the last locomotive of the initial order, in order to provide adequate training of Metra's designated personnel to allow them to become proficient with the equipment. Phase one consists of vehicle orientation, operation and running repair. Phase two consists of vehicle heavy repair procedures and requirements.

Training shall include instructor led classroom and hands-on instruction through the use of actual equipment, mock-ups, models, manuals, diagrams, and parts catalogs.

The Builder shall conduct a task analysis that is craft and location specific and includes an assessment of Metra's designated employees' baseline skills (knowledge, skills, abilities) to determine the appropriate level of content assumed in the training materials. The Builder shall assume the attendees have no knowledge of the features of the new locomotives, and using results of the assessment, shall design the training program to bring the level of student knowledge to one fully adequate for the stated objectives. The Builder's approach to this effort shall be based on the assumption that the builder's own interests, immediate and future, are best served by a high quality program.

All courses of instruction shall be presented in the English language.

Prior to the initiation of classroom instruction, all instructors to be utilized by the Builder shall attend an orientation at a Metra-designated location to become familiar with Metra's safety regulations and facilities, and to be advised of student qualifications and expectations.

A complete training plan including manuals and other training materials to be used by the Builder during training shall be delivered to Metra sixty (60) calendar days before initial training is conducted. The manuals shall be accurate, complete, of professional quality, and shall have been approved by Metra. Drawings shall be the most recent version reviewed and approved by Metra.

In addition to the above requirements, the Builder shall submit as part of the BAFO, in detail a projected training plan clearly linking each individual activity and deliverable to the locomotive

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production schedule, providing clear project management documents (Gantt charts, etc.), which link the various time lines. Note: the clarity of the information and level of detail will be important factors in this evaluation.

The program shall be conducted in a Contractor provided facility, at or near Metra's facilities in the Chicago, Illinois metropolitan area and shall include classroom and hands-on instruction (including practical exercises on actual equipment). The Builder shall provide an adequate supply of high quality, professionally prepared material on paper and such other training aids as may be necessary to impart the essential information to the people involved and leave them with authoritative and up-to-date reference material. The program shall include pre and post tests and hands-on practical exercises to determine the proficiency of the students in meeting the course objectives.

The training shall provide in-depth instruction covering all subjects and systems and their location, removal, replacement, and interfaces with other systems and parts of the locomotive. Special emphasis shall be placed on job aids and instruction that compare and contrast the differences in new locomotive systems with Metra's existing locomotive systems. Metra will provide the Contractor with a set of maintenance manuals on typical existing equipment.

The Builder shall, within ninety (90) calendar days after the Notice to Proceed, submit an Overall Training Program Outline with clearly defined Terminal Learning Objectives and a schedule for Metra's approval that identifies milestones for submitting the course outlines, lesson plans, instructor and student guides, audiovisual and other training aids, simulators, written and practical skills evaluations, and conducting classes. The training outline shall identify each module of instruction and the general topics to be taught, and indicate the order in which modules will be presented. **[CDRL C-19-11]**

Training materials including manuals, audio/visual aids, reference documents, computer hardware and software, mock-ups, models, simulators, check lists, and related items shall be as described in Section 19.10.9.

Prior to training materials being developed for a given module, the Builder shall submit a set of clearly defined Module Enabling Learning Objectives being developed, and shall not proceed with development until the Module Enabling Learning Objectives are approved by Metra's Training and Development Division. As training materials are being developed, the builder shall work closely with Metra's staff to ensure Metra's standards with respect to the course organization, content, and overall quality of written documents and audio/visual aids are being met.

All training materials such as training aids and lesson plans shall become the property of Metra at the completion of the training program. The Builder shall be responsible for the condition of these materials for the duration of the training program and shall replace all damaged materials unless the damage results from Metra's negligence. Lesson plans shall be updated as required during the course of instruction. Metra shall be given full copyrights to reproduce and modify training materials for Metra's use.

#### 19.11.2 Instructor Qualifications

Prior to the development of any training materials, all contracting instructors must attend an orientation at a Metra-designated location. The objective of the orientation is to familiarize the contracting instructors with Metra's safety regulations and facilities. At the orientation, Metra will also advise the instructors about student qualifications and expectations. The orientation will be a one-day session. In the event that more than one session is necessary, Metra will host multiple sessions in order to accommodate all instructors.

All of the instructors provided by the Builder shall be fully capable of delivering in-depth technical information that can be understood by participants. A detailed resume for each instructor shall be provided to Metra for approval sixty (60) calendar days prior to commencement of scheduled course instruction. **[CDRL C-19-12]** Metra reserves the right to disqualify any of the builder's instructors for reasonable cause at any time.

Metra will recognize the instructor as qualified when the individual:

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- 19.11.2.1 Can communicate, in English, in a manner that allows the participants to understand;
- 19.11.2.2 Has been trained in adult teaching principles and methods and has had experience in conducting technical training courses;
- 19.11.2.3 Has an in-depth knowledge of the system under discussion, how it interfaces with other systems or subsystems, the procedures for isolating faults, if applicable, and troubleshooting, and is able to communicate that information to students in an effective manner.
- 19.11.2.4 Is able to design practical written tests, according to the approved course objectives, to determine the extent to which students understand and can apply the information that has been taught.

As part of the BAFO, the Builder should define and explain the specific person(s) for each subcontractor who will be designated as the contact to implement that portion of the training.

#### 19.11.3 Training Schedules, Class Size, and Program Plan

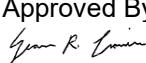
- 19.11.3.1 The Contractor must, within ninety (90) calendar days of receiving the Notice to Proceed, submit an overall initial Training Program Plan that contains a detailed outline and a project schedule for Metra's approval. The program plan must contain:

- 19.11.3.1.1 All assigned project team members including:
- 19.11.3.1.2 The tasks to which they are assigned
- 19.11.3.1.3 Company name
- 19.11.3.1.4 Location
- 19.11.3.1.5 Contact information
- 19.11.3.1.6 Project Objectives.
- 19.11.3.1.7 Detailed project phases, tasks, and deliverables (scope).
- 19.11.3.1.8 A detailed schedule of delivery dates, specifying milestones such as draft delivery dates, edited materials delivery dates, and final delivery dates.
- 19.11.3.1.9 The course modules and corresponding lessons.
- 19.11.3.1.10 The types of deliverables for each course module (CBT, hard copy materials, etc).
- 19.11.3.1.11 Project team hierarchy, sign-off authority, and delivery process.
- 19.11.3.1.12 Communication and reporting plan.
- 19.11.3.1.13 Change management plan.

- 19.11.3.2 The training must provide in-depth instruction, covering all equipment and components and their relevancy to the operation, maintenance/troubleshooting, and repairs. Training requirements include familiarity with new equipment systems, location, removal, and replacement. It is critical that all materials and instruction focus on the new passenger locomotive components.

Prior to submitting draft versions of training materials, the Contractor must submit detailed outlines and/or storyboards for approval. No development can commence without the approval of outlines and/or storyboards. Course and lesson objectives must be a part of the detailed outlines and/or storyboards.

The Contractor must submit all training materials for review to the Metra project team. The Metra project team requires fifteen (15) working Days (as defined in Exhibit 1-A) to review, edit, and return the training materials. The Contractor must have the ability to produce and submit materials according to a predetermined training plan and schedule.

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Once the Contractor receives the edits from Metra, they must resubmit the edited version within ten (10) working days for approval. All materials must be finalized within a three-version cycle. During materials development, the Contractor must work closely with Metra's project team to ensure the Contractor is meeting Metra's and project standards.

All final versions must be ready for delivery thirty (30) working days prior to the date scheduled training date.

All training materials will become the property of Metra at the completion of the development and training program validation. Metra will retain all materials utilized in the training program, and will use these for future internal training.

The Contractor must be responsible for the condition of all training materials and equipment for the duration of the training program, and must replace all damaged materials unless the damage results from Metra's negligence. The Contractor must update all materials, training aids, and mock-ups as necessary during development and course validation. Metra must have full copyrights to reproduce and modify training materials for future use at Metra.

Course duration (hours of instruction) and class size (number of trainees) will be clearly defined for each topic, depending upon the craft and topic involved. In addition, the proposal must clearly estimate the number of hours for development per hour of classroom instruction, for each module.

All ancillary equipment should be proposed to maximize the training objectives.

Operator field instruction of at least 4 hours is acceptable as an estimate; with more specific estimates of duration to be determined in the project plan.

The proposal must clarify whether proposed CBT modules are to support classroom modules or if they are to act as a stand-alone modules.

Metra will determine the class size. In general, class sizes will be from five (5) to ten (10) people.

Metra acknowledges the variances (experience and technical skills) in the workforce. The Contractor must work with the Metra project team to determine the appropriate number of pilot and validation classes.

After Metra accepts the lessons, and objectives for each module, the Contractor must deliver a pilot class to verify content and presentation. After making additional necessary revisions, the Contractor must deliver a validation class to allow Metra to verify and approve content and delivery. In order to validate the class, the audience in validation class must be at least 50% of the pilot class audience. Changes to the validation course content must be included with the final deliverables.

Requests for revisions will be made by the Metra project team. The project team can determine the correctness and accuracy of the content. They can also judge the quality of the content based on their extensive design and development experience.

The Contractor must supervise all classes and must comply with all of Metra's labor agreements, safety rules, other work rules, and policies. The Contractor must conduct classes during Metra's normal daytime hours of operation, Monday through Friday. The classes cannot be more than 8 hours per day, with total course duration to be mutually agreed upon by the Contractor and Metra.

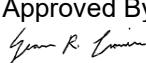
19.11.3.3 Metra is planning for a three-phase training approach. Phase I is described as the Introductory Phase, and will include:

19.11.3.3.1 Overview and conceptual information about the equipment.

19.11.3.3.2 Operation of the equipment.

19.11.3.3.3 Daily inspections.

19.11.3.4 Phase II is described as the Qualification phase, and will include:

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- 19.11.3.4.1 Maintenance.  
 19.11.3.4.2 Troubleshooting.  
 19.11.3.4.3 Repair.  
 19.11.3.5 Phase III is described as the Heavy Maintenance phase, and will include:  
     19.11.3.5.1 Equipment breakdown and rebuilding.  
     19.11.3.5.2 Equipment overhaul.  
 19.11.3.6 As part of this contract, Metra requires that the Contractor provide training on specific topics for employee specializing in specific crafts. It will be the responsibility of the Locomotive Builder to familiarize themselves with current Metra locomotive maintenance operations, equipment, and capabilities in order to determine what training would represent NEW TECHNOLOGY to Metra, and therefore need to be presented in order to operate, maintain, inspect, test, troubleshoot and repair the proposed locomotives as prescribed by the manufacturer's recommended operating or maintenance programs. Metra shall review those recommendations and make final determination of the actual training requirements based upon the technical aspects of the proposal.

<b>Topic</b>	<b>Craft and Number of Trainees</b>	<b>Totals</b>
Battery Prime Mover System	<ul style="list-style-type: none"> <li>• Machinists – 40 trainees (M)</li> <li>• Electricians – 40 trainees (M)</li> <li>• Managers – 25 trainees (M)</li> <li>• Instructors – 8 trainees (W)</li> </ul>	113 Trainees
Propulsion System	<ul style="list-style-type: none"> <li>• Electricians – 40 trainees (M)</li> <li>• Managers – 25 trainees (M)</li> <li>• Instructors – 8 trainees (W)</li> </ul>	73 Trainees
Locomotive Control System	<ul style="list-style-type: none"> <li>• Electricians – 40 trainees (M)</li> <li>• Managers – 25 trainees (M)</li> <li>• Instructors – 8 trainees (W)</li> </ul>	73 Trainees
Air Brake System	<ul style="list-style-type: none"> <li>• Machinists – 40 trainees (M)</li> <li>• Electricians – 40 trainees (M)</li> <li>• Managers – 25 trainees (M)</li> <li>• Instructors – 8 trainees (W)</li> </ul>	113 Trainees
Air Brake System Operations	<ul style="list-style-type: none"> <li>• Engineers – 40 trainees (T)</li> <li>• Managers – 25 trainees (T)</li> <li>• Instructors – 10 trainees (T)</li> </ul>	75 Trainees
Automatic Train Control	<ul style="list-style-type: none"> <li>• Electricians – 40 trainees (M)</li> <li>• Managers – 25 trainees (M)</li> <li>• Instructors – 8 trainees (W)</li> </ul>	73 Trainees
Low Voltage Electrical Systems	<ul style="list-style-type: none"> <li>• Electricians – 40 trainees (M)</li> <li>• Managers – 25 trainees (M)</li> <li>• Instructors – 8 trainees (W)</li> </ul>	73 Trainees
Head End Power System	<ul style="list-style-type: none"> <li>• Electricians – 40 trainees (M)</li> <li>• Managers – 25 trainees (M)</li> <li>• Instructors – 8 trainees (W)</li> </ul>	73 Trainees
Truck and Coupler System	<ul style="list-style-type: none"> <li>• Machinists – 40 trainees (M)</li> <li>• Managers – 25 trainees (M)</li> <li>• Instructors – 8 trainees (W)</li> </ul>	73 Trainees

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Electrical Cabinet Identification	<ul style="list-style-type: none"> <li>• Engineers – 40 trainees (T)</li> <li>• Managers – 25 trainees (T)</li> <li>• Instructors – 10 trainees (T)</li> </ul>	75 Trainees
Electrical Systems	<ul style="list-style-type: none"> <li>• Electricians – 40 trainees (M)</li> <li>• Managers – 25 trainees (M)</li> <li>• Instructors – 8 trainees (W)</li> </ul>	73 Trainees

(M) – Mechanical Department Employees

(T) – Transportation Department Employees

(W) - Workforce Education and Training

Note: This matrix contains a tentative list of topics and an approximate number of trainees. Actual topics and the number of employees requiring training in each topic will vary based on the equipment Metra ultimately purchases.

The training modules must be customized for the various technical, operational, and support staff impacted by the new equipment. The trainee groups include the following classifications and current number of existing employees:

- Workforce Education and Training (WFET) Instructors
- Mechanical
  - Apprentices
  - New Employees
  - Journeymen (Carmen, Electricians, Machinists, Sheet Metal Workers)
  - Foremen
  - Management Staff
  - Engine Watchmen
- Transportation
  - Engineers (Operators)
  - Trainmen
  - Instructors
  - Management Staff
  - Dispatchers

Note: The Contractor must provide training to the assigned Metra employee population on all components, systems, and subsystems that comprise the operation and maintenance of the new equipment.

Training must include CBTs, instructor-led classroom, and hands-on instruction using actual equipment, mock-ups, models, manuals, diagrams, and parts catalogs. All equipment must be located and the training conducted at Metra's Rock Island District 47th Street yard. At the conclusion of the training as set forth herein, all actual equipment, mock-ups, models, and other training materials are to become Metra's property. The property is necessary for Metra to train new employees in the future.

As part of this contract, Metra requires that, if needed, the Contractor provide training aids (mock-ups) for, but not limited to, the following equipment:

Battery Prime Mover Systems
Propulsion Systems
Air Brake Systems
Head End Power Systems

All courses must include a combination of classroom and hands-on instruction. For most course topics, Metra expects 40%-60% of the classroom time to be allocated to hands-on activities. In-class exercises, written exams, and practical skills evaluations must be designed and developed for each course in order to determine the extent to which students have learned and can apply the information identified in the course. Metra requires the Contractor to make recommendations for test frequency and methods.

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Classroom instruction for preventative maintenance courses must include not only the details and functioning of parts under discussion, but the essentials of their routine or periodic care, including lubrication schedules and materials. When methods of access, removal, dismantling, or application are not evident, the instruction must cover these matters.

The Builder shall make recommendations for test frequency, tolerance limits, and methods for testing, including instruments required, when applicable. The Builder shall assist Metra personnel in developing suitable preventative maintenance, daily and periodic inspection forms, and shall instruct Metra employees how these inspections are performed.

The Contractor must give special attention in the instructions, to matters relating to current and proposed safety and FRA inspection requirements and must provide detailed checklists to assure compliance.

It is important that the Contractor recommend, develop, and provide the most appropriate training aids and equipment in response to the Metra workforce needs and the passenger equipment subsystems being proposed.

After Metra accepts the Terminal and Enabling Learning Objectives for each module, the builder shall deliver a Module Executive Overview to verify module concept. In addition, for each module, a presentation will be made to selected members of the Labor/Management Committee involving the pertinent labor and management representatives affected by the subject matter or topic. After making revisions, if necessary, the Builder shall deliver a Module Pilot Class to verify content and presentation. After making revisions, if necessary, the Builder shall deliver a Module Validity Class to verify and approve content and delivery. After approval, the module will be accepted for delivery to the general population.

The Builder shall supervise all classes and shall comply with all of Metra's labor agreements, safety rules and other work rules. Classes will generally be conducted during Metra's normal daytime hours of operation, Monday through Friday, and no more than 8 hours per day with total course duration to be mutually agreed upon by the Builder and Metra.

The Builder shall provide all necessary training equipment. The Builder will equip a classroom approved by Metra with standard audio-visual equipment (overhead projector, slide projector, DVD video player, projection screen, dry erase marker board) and furniture (desks, chairs, and tables) as needed. Instruction, practical exercises, multimedia presentations or computer based instruction requiring use of computers, large screen video projection (PowerPoint® for example), audio equipment, specialized tools, or test equipment are acceptable. All such hardware and software used will be provided by the Builder and will become the property of Metra upon completion of the training.

Cost of any such hardware and software shall be borne by the Builder. Computer hardware and software compatibility shall be in accordance with the Training Materials Section.

#### 19.11.4 Operator and Inspector Training

The operations training program shall include, but not be limited to, the following: specifications; controls and indicators; systems (brakes, train control, instrumentation, audible & visual signaling and communications); operations (i.e., actual operation of the locomotive in maintenance yards and on the main tracks or operational simulator); troubleshooting procedures, and recovery operations (recovery from the situation, as in resolving the problem discovered when troubleshooting, i.e., fixing the problem).

Engineers must be trained in a fully operational cab simulator. Instruction will include comparisons to passenger locomotives currently in Metra service, with concentration on changes in operation, functions, features, locations and indication. A Metra supervisor or qualified instructor must accompany all Contractor instructors to ensure that the training complies with all Metra's safety and operational policies.

Operational instructions must follow a logical progression involving the details of the locomotives, the manipulation of all controls, and actual operation of the Locomotive components and systems. Actual operation must be conducted under Metra's operating rules and must be performed by Metra's qualified employees under the direction of the Contractor's

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representative. Operating instruction must include trouble indications, their proper reporting, and corrective measures available to the engineers and operators.

All bid respondents must take note of the provisions of 49 CFR § 238.109 in its entirety, and in particular § 238.109(b)(12), 'Training, Qualification, and Designation Program.' As part of this program, the railroad should, at a minimum: "Add new equipment to the qualification and training program prior to its introduction into service."

If bid respondents propose an alternative to fully functional passenger equipment, given the training objectives and the federal requirements of CFR § 238.109; bid respondents should stipulate the alternative very clearly.

#### Phase I – Overview and Operations Training

Phase I training must address topics and content capable of being effectively delivered prior to the availability of the first production unit. Examples of Phase I topics might be, but are not limited to:

- New equipment orientation (similarities, differences, safety)
- New equipment operation training (normal and emergency operations)
- New equipment maintenance training (craft specific classes on items such as an introduction to Daily Inspections).

#### 19.11.5 Maintenance Training

Metra's employees at the maintenance district of its choosing shall be exposed to the depth of detail that is necessary for the performance of all preventive (scheduled) and corrective (unscheduled) maintenance operations for all aspects of the locomotives. Students shall be afforded the opportunity to perform the more complex maintenance functions on the locomotive and in the shop, in addition to troubleshooting systems with faults artificially introduced in the equipment while using the appropriate subsystem test devices.

The program shall emphasize the details of performing heavy maintenance repair and rebuilding of major components. Metra performs complete locomotive overhauls. Metra will accept and may approve modules pertaining to heavy maintenance within the acceptance parameters of this Contract.

Metra may, however, defer the classroom delivery of heavy maintenance training to a selected population on a date to be determined which is closer to Metra's performance of that work.

As part of the BAFO, the Builder should specifically define mock-ups or simulator equipment to be used in any training module to maximize the learner's "hands-on" operation and skills.

Required mock-ups must include but are not limited to the following systems:

A cab mock-up with all controls with all dimensions and detail appropriate to train and orient operators and other trainees on newly located controls/devices.

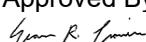
An operational braking system mounted on a training rack must be provided for the related training exercises.

The Builder will provide the appropriate mock-ups required for training of the engine system, head end power system and propulsion system.

Wherever possible, maintenance course modules and content shall be divided into two classifications: Electrical and Electronic Systems, and Mechanical Systems. To allow student participation during the demonstration and performance of maintenance functions, each course shall be separated into one of these classifications. It is understood that certain new systems may combine these disciplines, and there may be exceptions to this requirement.

#### Phase II - Maintenance Training

Training must be broad enough and deep enough to allow for the simulation of 'real life' activities that maintenance workers typically experience. This activity includes preventative, periodic (such as Air Brake System component rebuilds), and corrective maintenance operations for all new components on the passenger equipment. The procedures must also include the changes to existing systems as the result of changes in equipment and/or components. Students must have the opportunity to perform the more complex maintenance functions on the equipment and in the shop. The training must also include troubleshooting

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systems. Troubleshooting training must include artificially induced defects so the trainees will have the opportunity to repair them.

Metra requires that the proposal respondents include actual component training aids as part of their training modules. When components are not possible, photograph and 'exploded' graphics are necessary to the program.

### **Phase III – Heavy Maintenance Training**

Metra performs complete equipment overhauls and rehabs. The program must, therefore, provide the details of performing heavy maintenance, repair, and rebuilding of components.

Metra further requires CBT modules pertaining to heavy maintenance within the parameters of this Contract.

#### **19.11.6 Engineering and Supervisory**

An overview course shall be provided familiarizing generalists (approximately eighty seven (87) participants total, from Mechanical, Operating, Engineering and Materials) with the new equipment. The course shall cover, in executive overview fashion, all subjects to be covered in all other training courses, and shall be provided prior to those courses being conducted.

Class size will be between ten (10) to twelve (12) participants.

#### **19.11.7 Parts Catalog Seminar**

The Builder shall also include, as a part of its overall training program, a parts catalog seminar (or course of instruction) covering locomotive and locomotive component familiarization for material planners and operations support personnel (20 Materials Management personnel and from fifty (50) to seventy five (75) Mechanical personnel). This course of instruction shall be comprised of a number of classes with each class given to not more than ten (10) people per class. These classes shall be held during Metra's normal daytime hours of operation at a location in the Chicago, Illinois, metropolitan area designated by Metra. The course given to each class shall be of a total duration approved by Metra and shall include both classroom and field locomotive and component familiarization. An outline of this course of instruction shall be included in the Training Program Outline.

#### **19.11.8 Field Instruction and Warranty Field Instruction**

In addition to the formal training described above, regularly scheduled field instruction must be provided by the builder during the warranty period for selected Metra personnel. This instruction must be hands-on instruction, using the standards described above, with the intent of producing Journeyman level mastery of the troubleshooting and repair tasks encountered. This activity shall be in addition to normal builder warranty efforts.

Field instruction involving use of the locomotives, including both maintenance and operation, shall be presented by qualified and approved instructors (in accordance with Section 19.10.2) having thorough experience in maintenance, service, or operation as the case may require. Instructors must be capable of communicating their knowledge to others and must have their subjects properly organized prior to commencement of the class. Instruction in operation shall follow a logical progression involving the details of the locomotives, the manipulation of all controls, and actual operation. Actual operation shall be conducted under Metra's operating rules and shall be performed by Metra's qualified employees under the direction of the Builder's representative.

Operating instruction shall include trouble indications, their proper reporting, and corrective measures available to the operator.

If desired, the Builder may request to provide some of the field instruction in its own and its subcontractors' facilities. If the builder elects to provide this type of instruction as part of the formal instruction identified in Section 19.10.3, it must identify the number of hours and dates of the proposed training sixty (60) days prior to the date the training is to occur and obtain Metra's approval. Upon request of Metra, the Builder shall make these shops available for a limited number of Metra's supervisory and technical personnel to familiarize themselves with assembly

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methods. The Builder shall provide digital video and/or photograph portions of the locomotive which would normally be inaccessible or concealed on the delivered units solely for use in Metra's internal training programs.

#### 19.11.9 Training Material Standards

The following are standards for training materials that should be followed to assure compatibility with Metra's current methods of editing, production, duplication, storage, distribution, and delivery capabilities:

Minimum computer hardware configuration:

IBM compatible, Pentium III CPU, Intel Processor, 2 GHz processor or equivalent, 500 GB or greater hard drive

Software:

MS Windows 10 operating system

MS Office Suite (2019 or better)

MS Project

Graphics Format:

1 GB video memory capacity, type DDR3

Digital Storage and Distribution:

USB 2.0 or better

Tools for developing written materials must be:

- Microsoft Windows Office-based products, including:
  - Word
  - PowerPoint
  - Excel
  - Visio
  - Publisher
- Picasa (for graphics)
- Adobe Acrobat

Tools for developing CBTs:

- Captivate

Tools for developing web-based materials:

- Captivate
- Dreamweaver

Any web-based applications proposed as CBT (Computer Based Training) should be clearly detailed including such items as: previous or current direct involvement with such applications; specific advantages this would provide in this training effort; updating capabilities including a definition of the webmaster; linkage, if any, to other interactive training products being proposed (e.g., the cd-rom program on x will later migrate to the web, since this will improve...); etc.

Video Format:

Digital

Computer Based Instruction/Training:

Metra standard not yet established for authoring software (submit recommendation)

Photographs:

35 mm color negatives (master)

35 mm slides, horizontal/landscape orientation only (master/copy)

8 X 10 print (copy)

Digital .bmp (master)

Digital .jpg (copy)

Overhead Projection Transparencies:

N/A. All presentations should be in digital format, MS Powerpoint or .pdf

Training Manuals:

Type set in 14 pt. san serif font (Arial True Type preferred)

High quality B&W printed (copied)

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Masters shall be provided on USB drives in Microsoft Word or .pdf format

Blueprints (prints):

Readable paper copies

Reference Materials:

Copies of all reference materials will be provided by Contractor (i.e., FRA Regulations)

Tests:

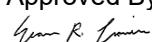
4 answer, multiple-choice, with answer keys and references to student manual location with a minimum of three banks of equivalent questions

Job Aids/Check Lists:

Pocket-sized and plastic or heavy weight paper laminated in plastic

#### 19.12 CONTRACT DELIVERABLES REQUIREMENT LIST

CDRL	Title
C-19-01	As-Built Drawings
C-19-02	Photographs
C-19-03	Drawing Lists and Bills of Material
C-19-04	Maintenance Manuals
C-19-05	Parts Manuals
C-19-06	Operator Instruction Book
C-19-07	Locomotive History Books
C-19-08	As-Built Specification
C-19-09	Field Service
C-19-10	Test Equipment
C-19-11	Training Program
C-19-12	Instructor Qualification Submittal

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## 20 PROPOSAL DELIVERABLES REQUIREMENTS LIST

PDR#	Title
P-3-01	Locomotive Width
P-3-02	Locomotive Height
P-3-03	Locomotive Weight
P-4-01	Exterior General Arrangement and Rendering
P-5-01	Battery Charging and Energy Monitor
P-6-01	Cab General Arrangement
P-8-01	Air Brake and Air Supply System
P-10-01	Truck System
P-12-01	Traction System
P-12-02	Battery System
P-13-01	Head End Power System
P-15-01	Battery Prime Mover System

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## 21 CONTRACT DELIVERABLES REQUIREMENTS LIST

CDRL	Title
C-1-01	Drawing Submittals
C-1-02	Car-Body Stress Analysis
C-1-03	Contractor's Quality Assurance Manual and Procedures
C-1-04	Contractor's Organizational Chart with Personnel Assigned to Metra's Contract
C-1-05	Contractor's Management's Declaration of their Commitment to Quality and the Implementation of the Contractually Required MQP and FTA QMS Guidelines
C-1-06	Contractor's Project Quality Plan and Procedures
C-1-07	Contractor's Ratio of Inspection to Production Personnel
C-1-08	Contractor's Software Quality Assurance Plan
C-1-09	Contractor's Supplier and Subcontractor Qualification, Quality Compliance, and Management Plan and Procedures
C-1-10	Contractor's List of all supplier and subcontractors, their qualifications, and quality certifications (ANSI-ASQ ISO)
C-1-11	Contractor's First Article Inspection (FAI) Plan and Procedures
C-1-12	Contractor's MRB Plan and Procedures
C-1-13	Corrective and Preventative Plan and Procedures
C-3-01	Clearance Diagram
C-4-01	Car-Body Strength Test Document
C-4-02	End Structure Design
C-4-03	Underframe Design
C-4-04	Jacking Pad Location
C-4-05	Safety Appliance Location
C-4-06	Cab and Short Hood Arrangement and Design
C-4-07	Long Hood Arrangement and Design
C-4-08	Draft Gear and Coupler Design
C-4-09	Pilot Design
C-4-10	Lighting Locations and Design
C-4-11	Oscillating Light
C-5-01	Battery Charging and Energy Monitor Design
C-5-02	Propulsion Battery Charging
C-5-03	DC Fast Charge Pantograph
C-5-04	480VAC Charging
C-6-01	Cab General Arrangement
C-6-02	Cab HVAC Design
C-7-01	Locomotive Cab Controls General Arrangement
C-7-02	Event Recorder
C-7-03	Alerter
C-7-04	Communication System
C-7-05	Cab Digital Video Recorder System
C-7-06	IETMS PTC System
C-8-01	Air Brake System
C-8-02	Deadman Pedal
C-8-03	Air Compressor
C-8-04	Main Reservoir and Air Dryer
C-8-05	Air Piping
C-9-01	Bell and Bell Controls
C-9-02	Horn and Horn Controls

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<b>CDRL</b>	<b>Title</b>
C-10-01	Truck Design Review
C-10-02	Service History of Truck
C-10-03	Handbrake
C-10-04	Truck Ground
C-11-01	Sand System
C-12-01	Traction System
C-12-02	Traction Generator
C-12-03	Traction Motors
C-12-04	Dynamic Brakes
C-12-05	Layover System
C-13-01	Head End Power System
C-13-02	Head End Power Controls
C-14-01	MU, HEP, and Trainline Cables and Receptacles
C-15-01	Battery System
C-15-02	Main Locomotive Battery
C-15-03	Propulsion/Auxiliary Battery
C-15-04	Propulsion/Auxiliary Battery Control
C-15-05	Propulsion/Auxiliary Battery Charging
C-15-06	DC Fast Charge Pantograph
C-15-07	Battery Thermal Conditioning
C-16-01	Exterior Styling
C-17-01	Material Certifications
C-17-02	Material Maintenance
C-17-03	Interior and Exterior Stainless Steel Samples
C-17-04	Stainless Steel Coil Test Reports
C-17-05	LAHT Tension and Bend Test Reports
C-17-06	Casting Qualification Report
C-17-07	Elastomer Certification
C-17-08	Visual Inspection Criteria for Glazing
C-17-09	Thermoplastic Sheet Color and Surface Finish Samples
C-17-10	Thermoplastic Test Certifications
C-17-11	Fiberglass Reinforced Plastic Test Certifications
C-17-12	Melamine Test Certifications
C-17-13	Leak Test for Air and Hydraulic Piping System
C-17-14	Piping, Tubing, and Pressure Vessel Specifications
C-17-15	Proposed Flushing and Cleaning Procedure for Pipe
C-17-16	Bearing Specification and Data
C-17-17	Paint Inspection and Acceptance Criteria
C-17-18	Adhesives Utilized
C-17-19	Insulation Application, Retention, and Data
C-17-20	Fire Safety Analysis
C-17-21	Threaded Fastener Data
C-17-22	Welding Documentation
C-17-23	Welding Inspection Plan
C-17-24	Brazing Documentation
C-17-25	Corrosion Control Plan
C-17-26	Wire and Cable Data and Specifications
C-17-27	Software Quality Assurance Plan
<b>CDRL</b>	<b>Title</b>
C-18-01	Master Test Plan

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C-18-02	Test Procedures
C-18-03	EMI/EMC Test
C-19-01	As-Built Drawings
C-19-02	Photographs
C-19-03	Drawing Lists and Bills of Material
C-19-04	Maintenance Manuals
C-19-05	Parts Manuals
C-19-06	Operator Instruction Book
C-19-07	Locomotive History Books
C-19-08	As-Built Specification
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C-19-12	Instructor Qualification Submittal

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**RFP No. 177045**

**ALL-ELECTRIC PASSENGER LOCOMOTIVES**

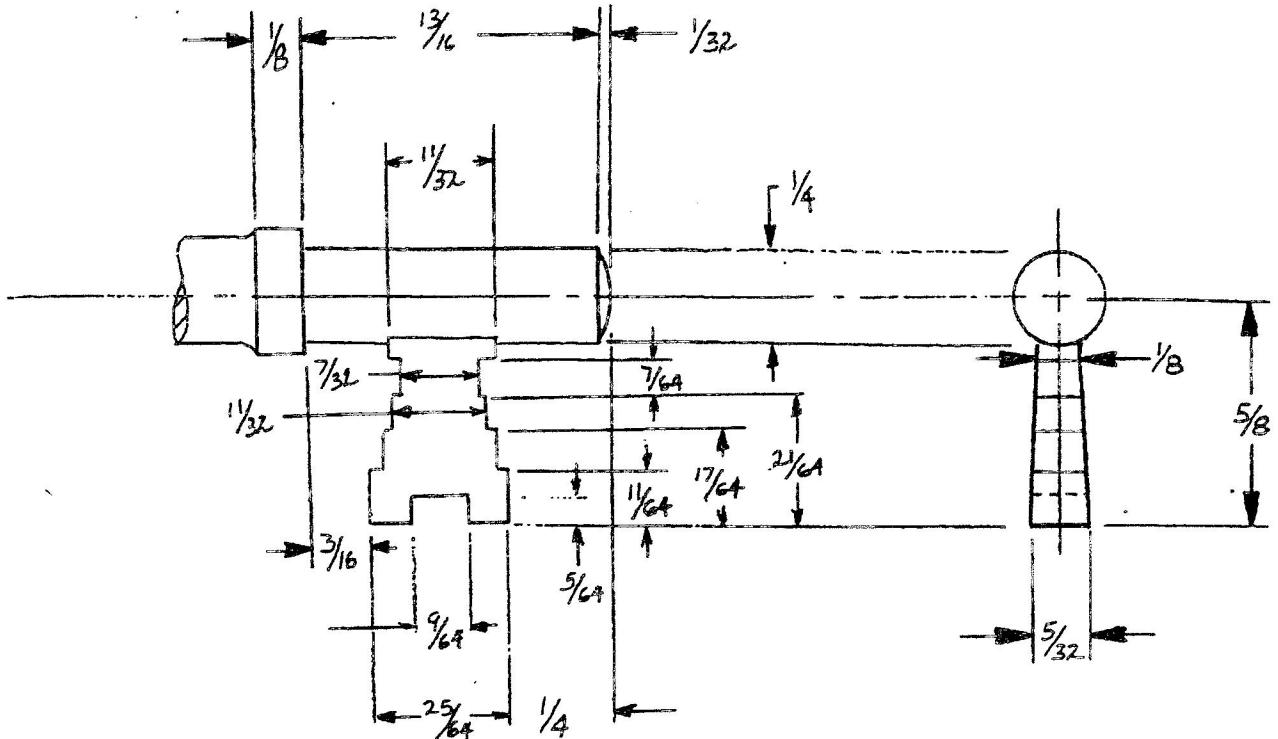
**APPENDICES TO SPECIFICATIONS**

**Appendix A: Drawing List and Drawings**

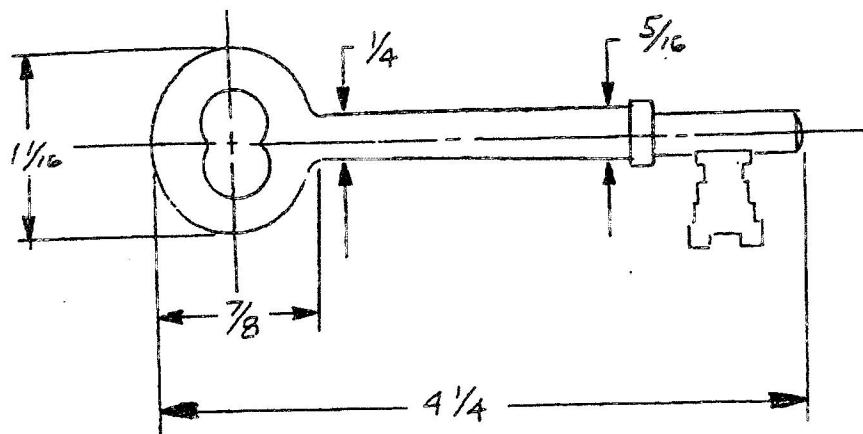
**Appendix B: Metra Mechanical Department Quality Plan**

**Appendix C: Rock Island District Schedule and Operations**

<b>Drawing numbers referenced in Metra Specification M-22-001</b>
M-250
M-327
M-524
M-888
M-1897
M-2110

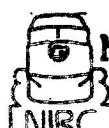


## BIT DETAIL



**NOTES:**

- ## II. MATERIAL TO BE BEASt



## Northeast Illinois Railroad Corporation

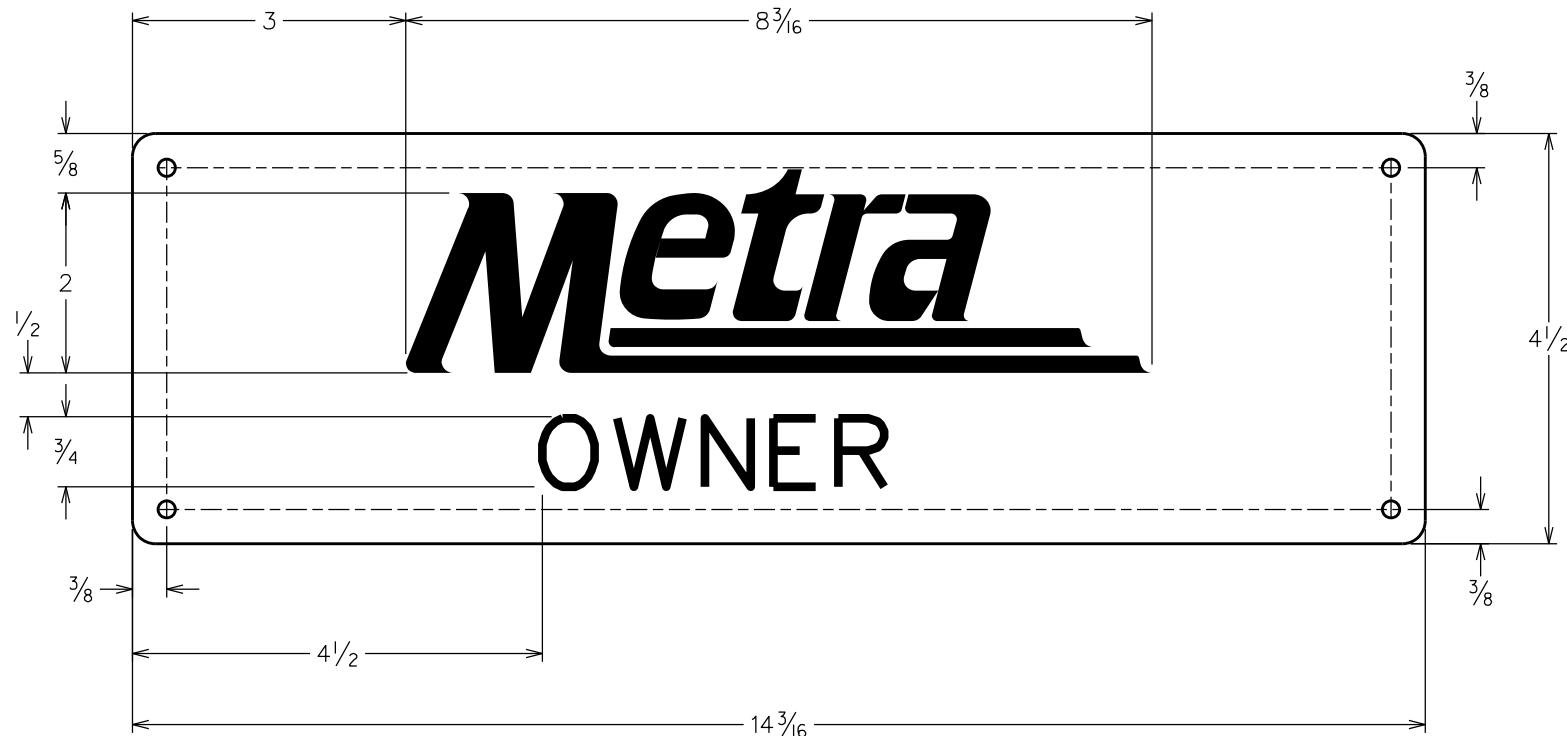
## **MECHANICAL DEPARTMENT.**

**UNCONTROLLED COPY**

## STANDARD KEY

CALENT.

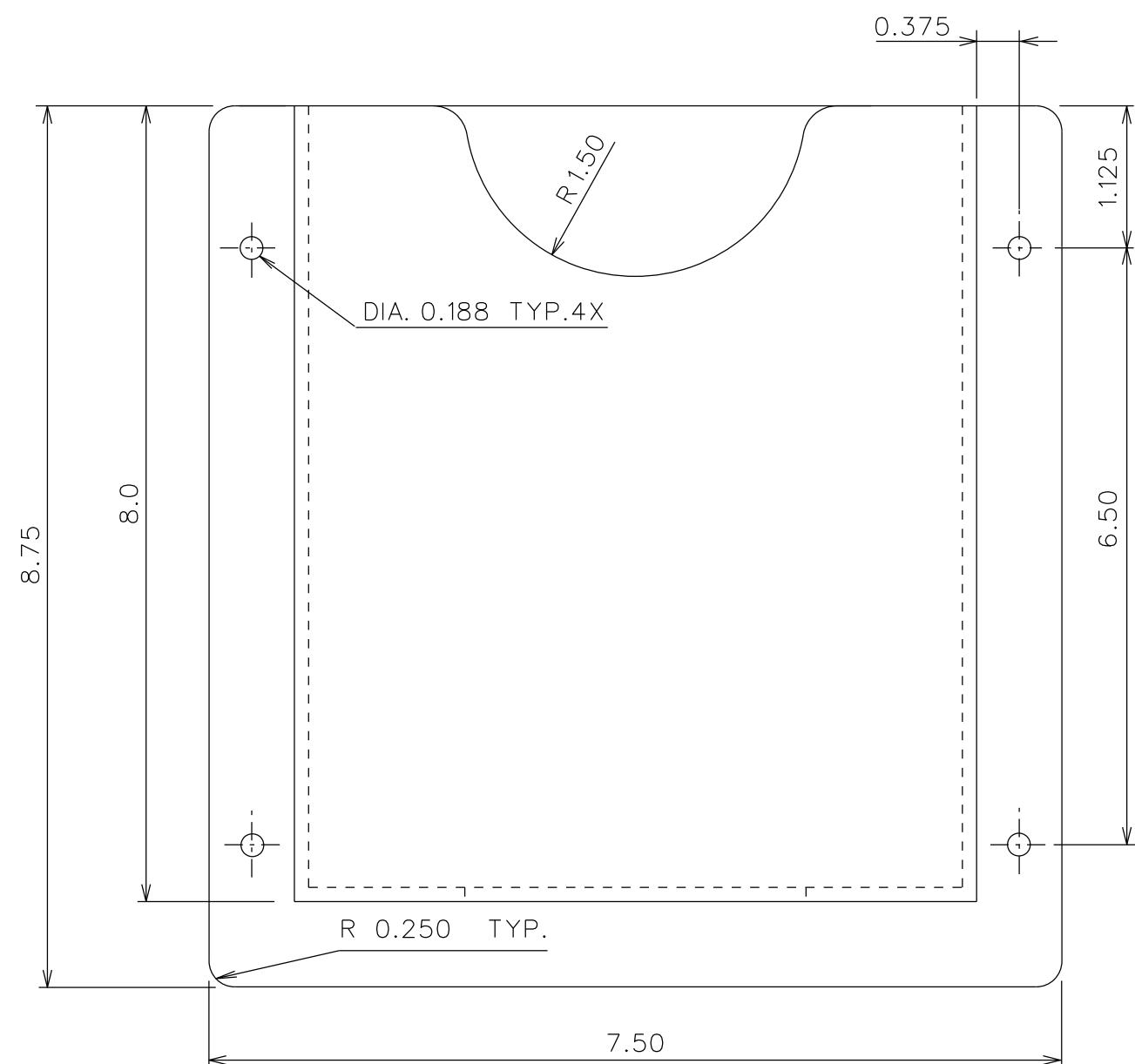
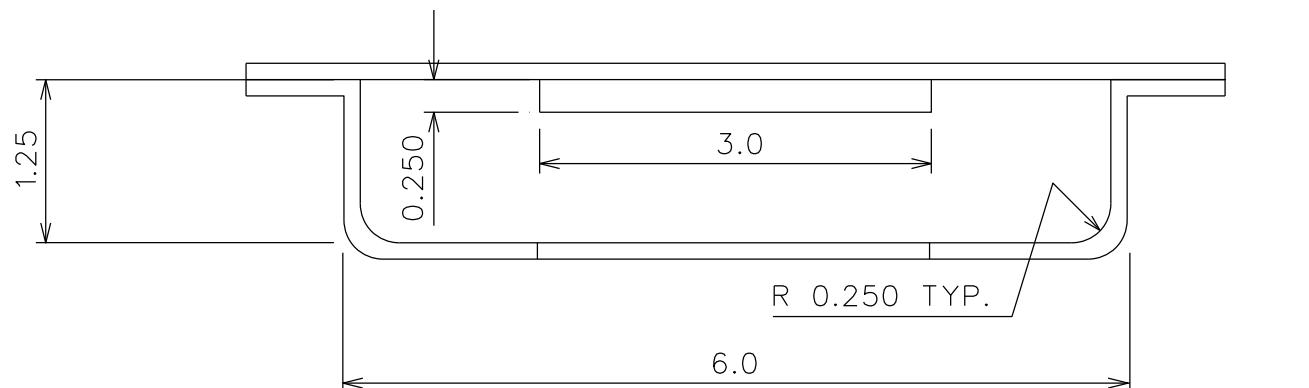
DWG NO M-250



NOTES:

- 1) MATERIAL: 16 GA. STAINLESS STEEL TYPE 304  
WITH A.I.S.I. NO. 4 FINISH
- 2) LETTERS SHALL BE ACID OR SAND ETCHED  
AND FILLED WITH BLACK PAINT - HELVETICA MED.

				<b>Metra</b>	MECHANICAL DEPARTMENT CHICAGO, IL 60661
				TITLE <b>TRUST PLATE LOCOMOTIVES</b>	
REDRAWN	A	6/28/05	MMN	DRAWN BY: W. KORAN	DRAWING NUMBER: M-327
DESCRIPTION	REV.	DATE	DRAWN	DATE: 3/18/96	REV.

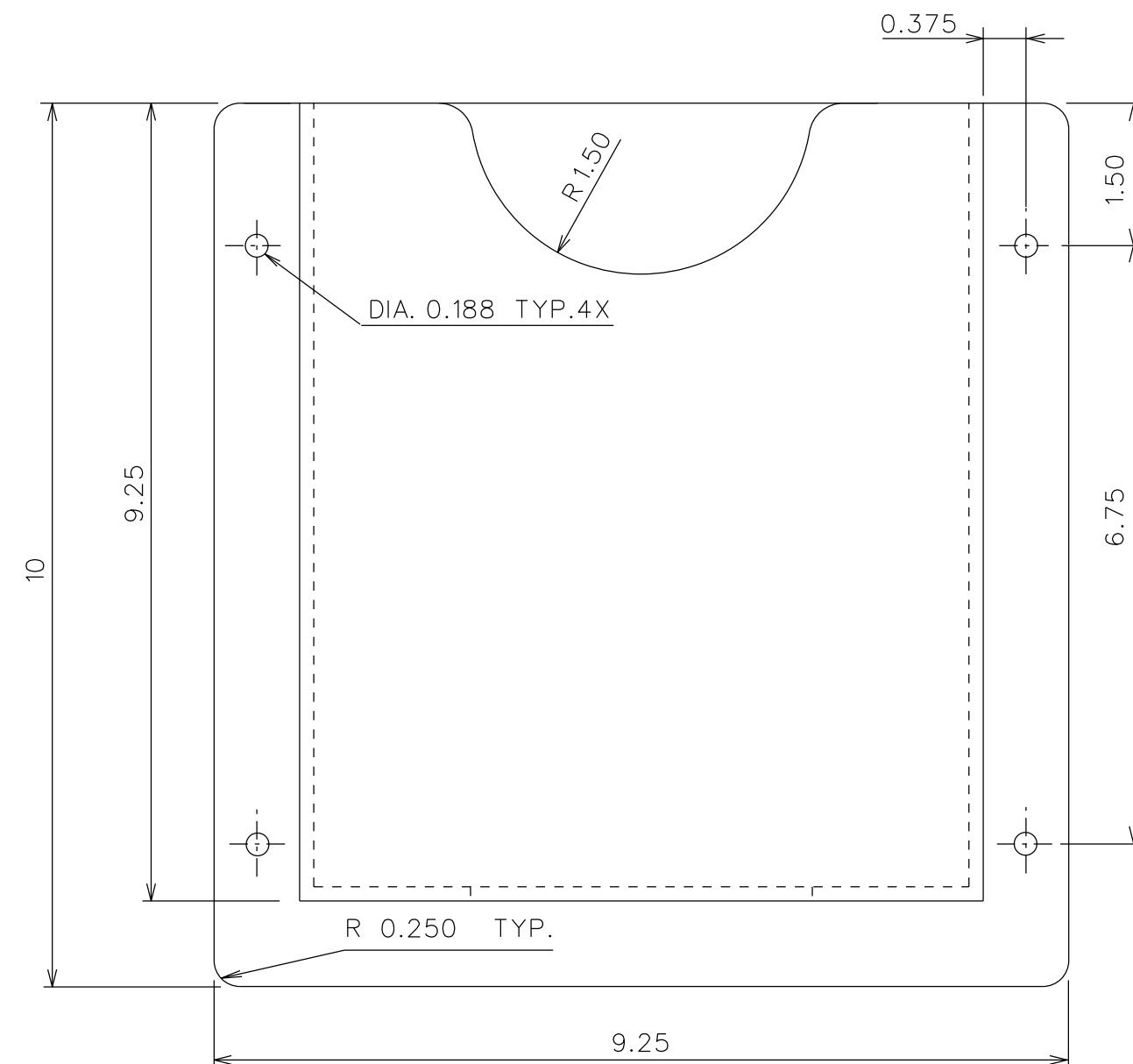
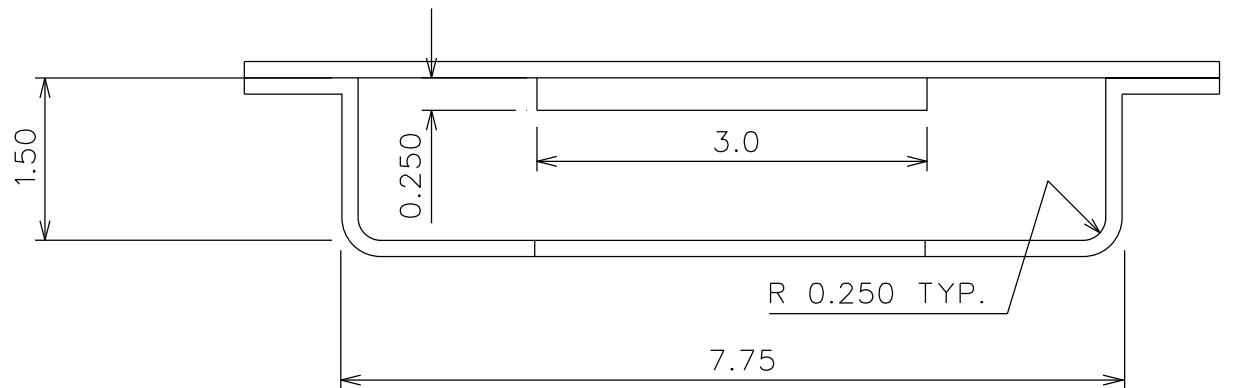


NOTES:

- 1 HOLDER TO BE CONSTRUCTED OF  $1\frac{1}{8}$ " THICK CLEAR ACRYLIC SHEET , 2 PIECES.
- 2 FRONT PIECE TO BE THERMOFORMED TO SHAPE.
- 3 FRONT AND REAR PIECES TO BE CEMENTED TOGETHER.
- 4 ALL BENDS TO BE  $90^\circ$  EXCEPT WHERE NOTED.

**Metra** MECHANICAL DEPARTMENT  
CHICAGO, IL 60661

TITLE			
HOLDER - HAZARDOUS MATERIAL BOOK			
DRAWN BY: F. MASCARENHAS		DRAWING NUMBER: M-524	
DATE: 7/12/99			
DESCRIPTION	REV.	DATE	DRAWN



NOTES:

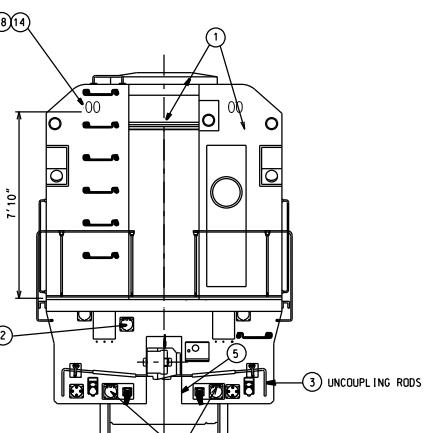
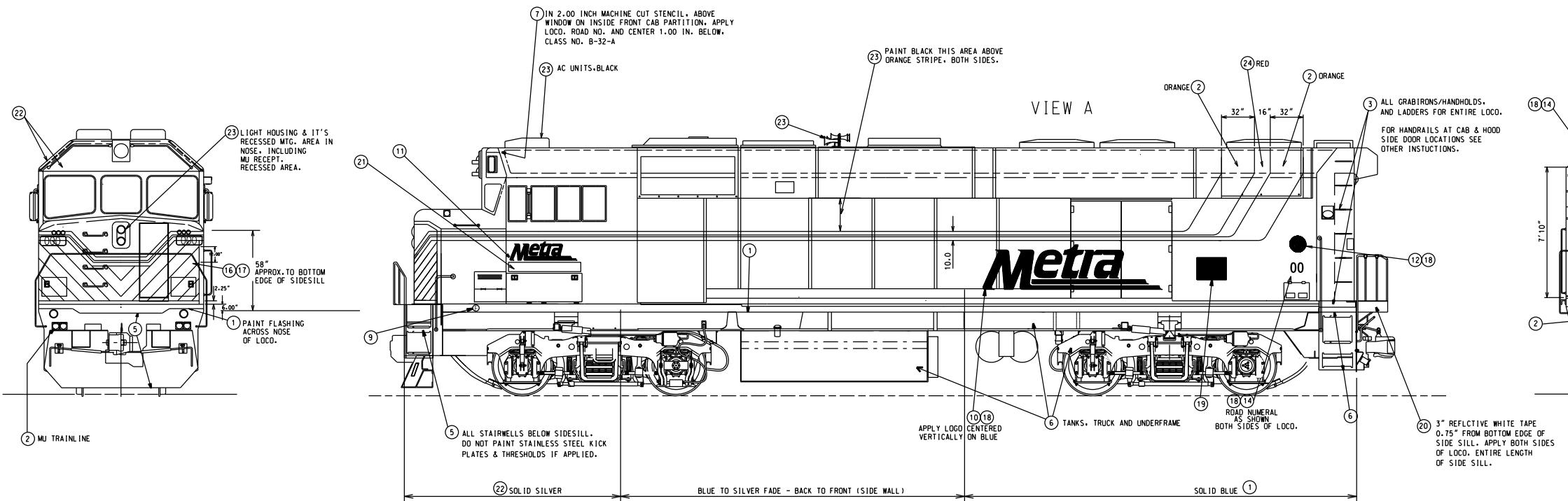
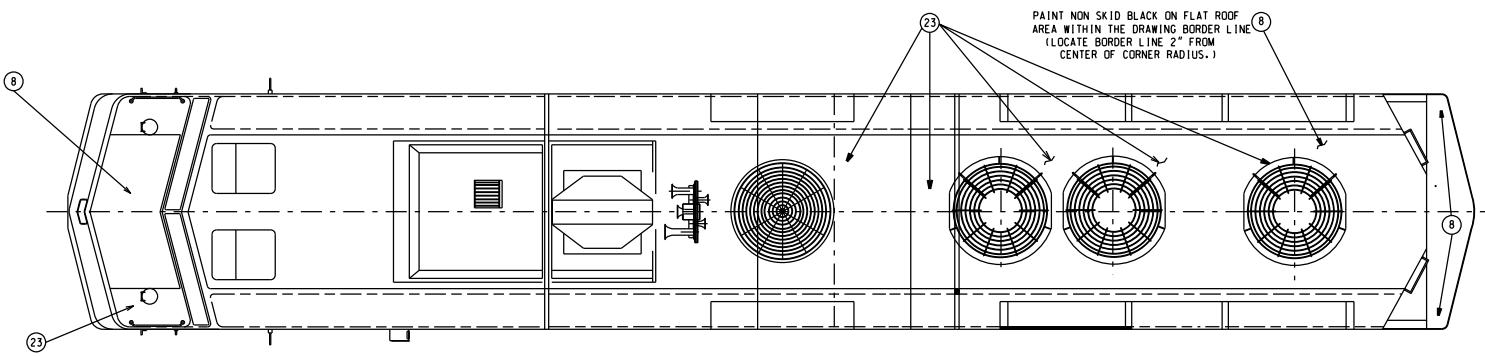
- 1 HOLDER TO BE CONSTRUCTED OF  $\frac{1}{8}$ " THICK CLEAR ACRYLIC SHEET , 2 PIECES.
- 2 FRONT PIECE TO BE THERMOFORMED TO SHAPE .
- 3 FRONT AND REAR PIECES TO BE CEMENTED TOGETHER.
- 4 ALL BENDS TO BE  $90^\circ$  EXCEPT WHERE NOTED.

METRA STOCK NO.: 31-31316-6

**Metra** MECHANICAL DEPARTMENT  
CHICAGO, IL 60661

TITLE			
HOLDER - LOCOMOTIVE TROUBLE SHOOTING GUIDE			
DRAWN BY: F. MASCARENHAS		DRAWING NUMBER: M-888	
DATE: 9/30/03		REV. A	
CHANGED DIMENSIONS TO ACCOMODATE NEW BOOK		A	7/12/05 MMN
DESCRIPTION		REV.	DATE DRAWN

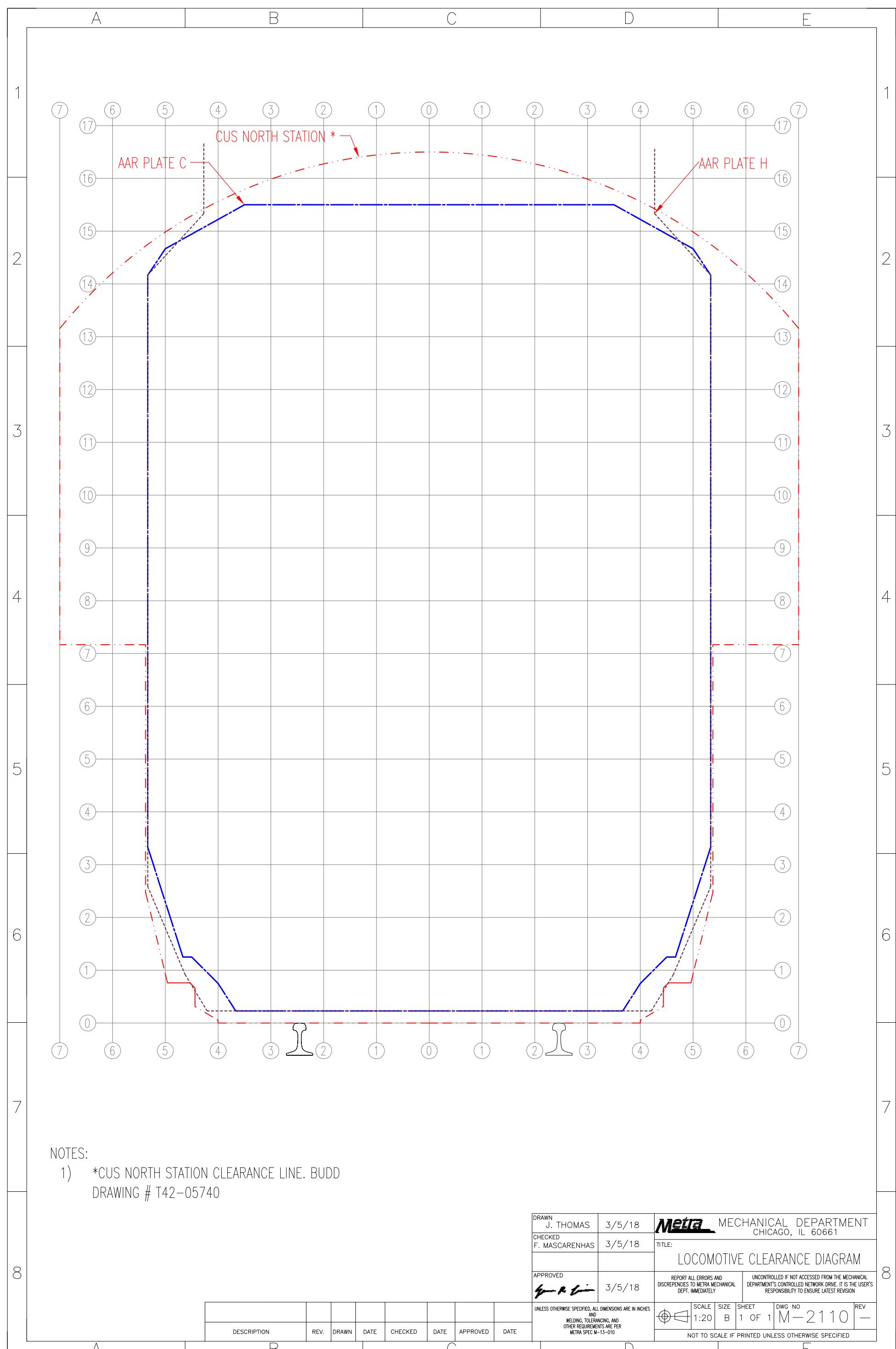
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2	PAINT - HS POLY-ORANGE	48-07760-6
3	PAINT - CLEAR COAT	48-07750-7
4	PAINT - REFLETV - WHITE	48-07795-2
5	PAINT - FLAT BLACK	48-05026-4
6	PAINT - ENAMEL-BLACK	48-07775-4
7	PAINT - ENAMEL SD GY	48-07025-4
8	PAINT - NOD SKID BLACK	48-07105-4
9	LETTER - F	49-52258-4
10	LOGO - METRA 36" WHITE	49-52214-7
11	LOGO - METRA 12" BLUE	M-271-9
12	LOGO - RTA - 18.00" DIA	49-52224-6
13	PAINT - ENAMEL - RED	48-07785-3
14	NUMBER, 8" - RFLTV - SET	M-274
15	ACTIVATOR, CLEAR COAT	48-07715-0
16	TAPE - 8" - RFLTV, RED	45-75200-3
17	TAPE - 8" - RFLTV, WHITE	45-75205-2
18	SEALER EDGE	
19	FLAG AMERICAN 50 STAR	49-52266-7
20	TAPE - 4" - RFLTV WHITE	45-75210-2
21	DECAL - LOCO. NAME	
22	PAINT HS POLY SILVER	48-07765-5
23	PAINT HS POLY BLACK	48-07775-4
24	PAINT DARK RED IMRON	48-07785-3



**NOTE:**

1. CAB & INTERIOR OF THE LONG HOOD INCLUDING COMPONENTS TO BE PAINTED WITH ITEM 7 (SUÈDE GRAY)
  2. DO NOT PAINT COAT HOOKS IN CAB.
  3. PAINT MU CABLES AS FOLLOWS :
    - "HEAD END POWER" - (RED ITEM 13)
    - "MU" - (ORANGE ITEM 2)
  4. PAINT BOTTOM OF JUMP SEAT WITH ITEM 6.
  5. PAINT OVERSPEED TRIP HANDLE WITH ITEM 3.
  6. APPLY ALL DECALS BEFORE CLEAR COAT.

							APPROVED 	10/22/15	REPORT ALL ERRORS AND DISCRENCIES TO METRA MECHANICAL DEPT. IMMEDIATELY		UNCONTROLLED IF NOT ACCESSED FROM THE MECHANICAL DEPARTMENT'S CONTROLLED NETWORK DRIVE. IT IS THE USER'S RESPONSIBILITY TO ENSURE LATEST REVISION			
								UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES AND WELDING, TOLERANCING, AND OTHER REQUIREMENTS ARE PER METRA SPEC M-13-10 (Latest Revision)	SCALE NTS	SIZE D	SHEET 1 OF 1	DWG NO M-1897	REV	
DESCRIPTION	REV.	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE	NOT TO SCALE IF PRINTED UNLESS OTHERWISE SPECIFIED						
5			6			7		8						





## METRA MECHANICAL DEPARTMENT

### QUALITY PLAN

**Revision: 01**

**Table of Contents**

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--	--	Revision History	4	01
--	--	Introduction	5	01
--	--	Definitions	6	01
--	--	Quality and Project Lifecycle	7	01
--	--	References	8	01
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2	2.2.2	Documented Quality System	12	01
3	2.2.3	Design Control	15	01
4	2.2.4	Document Control	17	01
5	2.2.5	Purchasing	20	01
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8	2.2.8	Inspection and Testing	29	01
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(1) MQP= Metra Mechanical Department Quality Plan

(2) Federal Transit Administration (FTA) Quality Management System Guidelines, (2019 Update).

## MANAGEMENT COMMITMENT AND AUTHORIZATION

Metra's Mechanical Capital Program includes projects that involve design, construction, procurement, and installation of materials providing for the operation of a safe, reliable, and convenient commuter railroad system. Metra Mechanical Department's Quality Plan (MQP) has been established to ensure these objectives are accomplished in a manner that provides for continued satisfactory performance during its useful life.

The MQP reflects the management policy and includes objectives that apply to all personnel and activities associated with capital programs. The MQP applies to the Metra's Mechanical and/or corporate personnel and the Metra's Third-Party Contracts. Metra's Mechanical Quality Plan (MQP) incorporates the required fifteen (15) elements of a quality program, which are found in the Federal Transit Administration (FTA) Quality Management System Guidelines, (2019 Update).

The MQP applied to all activities in completing the Mechanical capital projects. In addition, it is the responsibility of the Third-Party Contractors and their sub-consultants/sub-contractors performing activities or furnishing materials, parts, equipment, or services for Metra Mechanical Department projects to implement the Third-Party Contractor Quality Management Plan (TPCQM).

Quality encompasses many functions and activities that extend to all personnel and activities involved in the implementation of the Mechanical Department's Quality Plan.

### Approved By:



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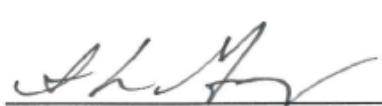
Kevin Clifford  
Chief Mechanical Officer  
Mechanical Department

### Concurred By:



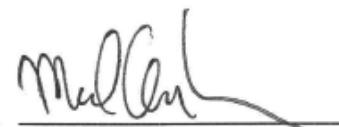
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### Revision History

Revision No.	Date	Sections	Description	Prepared By	Concurred By	Approved By
00	11/17/15	Entire Document	Entirely new document that incorporates the latest Corporate Quality Plan revision and FTA Quality Management System Guidelines FTA-PA-27-5194-12.1 (2012 Update). Supersedes all previously issued Mechanical Department Quality Control Plan revisions and amendments.	M. Alimirah K. Chaudhari	M. Simos K. McCann	J. Derwinski
01	1/10/2023	Entire Document	Incorporated the latest Corporate Quality Plan revision and FTA Quality Management System Guidelines FTA-PA-27-5194-12.1 (October 2019 Update).  The new requirements and details included in the revised FTA QMS Guidelines are incorporated throughout all sections of the Metra MQP.  Added Purpose to all sections  Updated Appendix: A Updated MQPP-03.01 Updated MQPP-05.01	J. Downey C. Ramos	S. Cronin S. George M. Alimirah	K. Clifford

## INTRODUCTION

Metra's Mechanical Department Quality Plan (MQP) incorporates the required sections of the fifteen elements of a quality program which are listed in the U.S. Department of Transportation Federal Transit Administration (FTA), Quality Assurance and Quality Control Guidelines, document, Federal Transit Administration (FTA) Quality Management System Guidelines, (2019 Update).

It is the responsibility of Metra's Mechanical Department personnel and Third-Party Contractors to incorporate the applicable elements of a quality program listed in the Federal Transit Administration (FTA) Quality Management System (QMS) Guidelines, as well as the quality requirements listed in the Metra's Corporate Quality Plan (CQM), and industry standards, as applicable, into their project plans, procedures, etc., per contractual agreements as appropriate.

The MQP is meant to serve as a guideline for the steps that are taken when planning or executing a project in the Mechanical Department. This plan will serve to document Metra's Mechanical Department quality system, to instruct and guide employees whose actions affect product quality and reliability.

## DEFINITIONS

**Management:**

Metra organization responsible for managing the project. In addition, the management group of any consultant under contract with Metra.

**Designer:**

The organization responsible for design. This could be the Metra itself, and/or a consultant or contractor providing engineering services.

**Purchaser:**

Metra or other organizations responsible for specifying, contracting, and accepting requirements for goods or services.

**Supplier or Vendor:**

Any organization providing services, products, or materials for Metra Mechanical Capital Projects. The supplier could be a product manufacturer, or a provider of raw materials or a village or a community.

**Contractor or Consultant:**

Any organization providing services or products to Metra Mechanical under direct contractual agreement. It could be Project Management Consultant, Project Administration Consultant, etc. The contractor could be part of Metra organization working on any projects/programs.

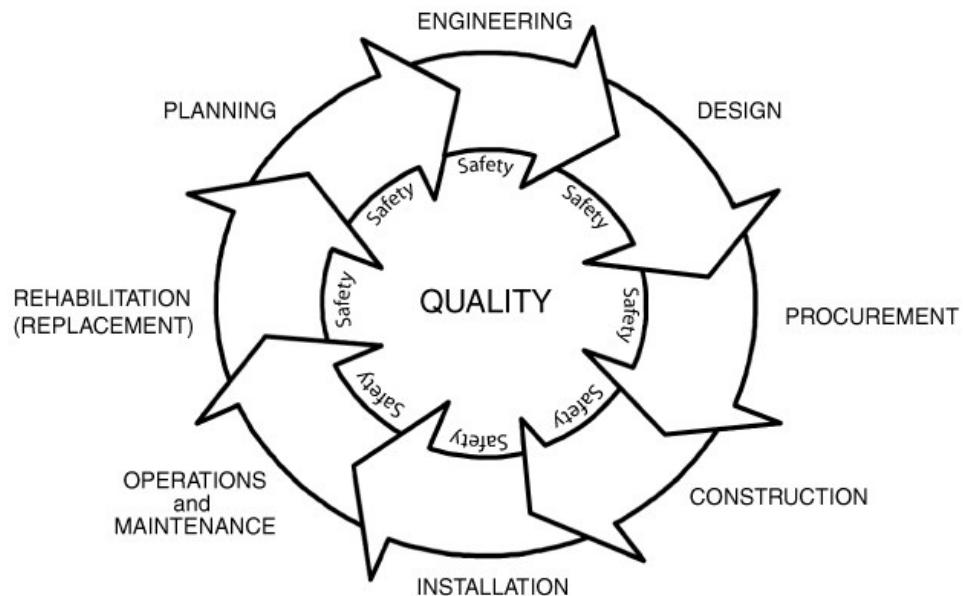
**Sub-contractor or Sub-consultant:**

Any organization supplying services or products under contract to a contractor or consultant. The sub-contractor/sub-consultant would not contract directly with Metra Mechanical, but with a contractor/consultant or another subcontractor/sub-consultant.

**Third-Party Contract or Third-Party Contractor:**

A common term used in MQP, which includes Designer, Purchaser, Supplier or Vendor, Contractor, or Consultant. In some cases, the purchaser may be the Sub-contractor or Sub-consultant of the Designer, Supplier or Vendor. Material suppliers and services consultants would also fall under this definition.

## QUALITY AND THE PROJECT LIFECYCLE



#### REFERENCES

1. Metra's Corporate Quality Manual (CQM) 02
2. Federal Transit Administration (FTA) Quality Management System Guidelines, (2019 Update).

## 1.0 MANAGEMENT RESPONSIBILITY

### 1.1 PURPOSE

- 1.1.1 This section is meant to provide an overview of Metra's Mechanical Department commitment to quality and the general layout of the organizational structure of the department and responsibilities, and levels of authority.
- 1.1.2 It is the policy of the Mechanical Department that all capital projects be planned and completed with an effective quality management program with defined objectives and quality goals.

### 1.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 1.3 AUTHORITY/RESPONSIBILITIES

- 1.3.1 The Chief Mechanical Officer has the ultimate authority and responsibility to ensure that the Mechanical Department Quality Plan is issued, implemented, and maintained.
- 1.3.2 The Senior Director, Capital Projects, Senior Director, Operations, Director, Capital Projects, and District Directors have been given the responsibility and authority of quality oversight to ensure that MQP is understood, implemented, and maintained.
  - 1.3.2.1 Have the functional day-to-day authority and responsibility for the implementation of the Metra Mechanical Department Quality Plan.
  - 1.3.2.2 Develop and review Project Management Plans to assure that appropriate quality assurance and quality control measures are included in the scope of their projects by Metra and Third-Party Contractors as applicable.
- 1.3.3 The Quality Manager is independent and reports to the Senior Director, Mechanical Capital Projects. The Quality Manager is responsible for, and has authority and independence to:
  - 1.3.3.1 Verify the implementation of the MQP in accordance with approved procedures, instructions, and established requirements.
  - 1.3.3.2 Develop/Review quality implementing procedures by usage of The Fifteen Elements of Quality Program checklist.
  - 1.3.3.3 Manage quality control program and quality surveillances and inspections to ensure compliance to the MQP.
  - 1.3.3.4 Coordinate, as necessary, the quality audits/reviews performed by the Metra Corporate Quality Assurance personnel.

- 1.3.3.5 Work with Metra Corporate Quality Assurance personnel and others, as necessary, in resolving and completing corrective action for non-conformance.
- 1.3.4 The Quality Control personnel have the responsibility to conduct quality control inspections, identify quality concerns, recommend solutions, and verify implementation of these solutions and are independent of those having direct responsibility for the work being performed.
- 1.3.5 Project Managers, Supervisors, and Project Support Personnel have the responsibility to implement the approved procedures and carry out inspections necessary to ensure that their projects and personnel comply with the requirements of the Mechanical Quality Plan.
- 1.3.6 It is the responsibility of all Metra's Mechanical Department personnel to incorporate this plan as part of their work and assignments as applicable.
- 1.3.7 The management of the Third-Party Contractor performing activities or furnishing materials, equipment or services for Mechanical Department Capital Projects should also declare and document their commitment to quality and the implementation of the contractually required FTA QMS guidelines. Once the MQP or the requirements listed in the plan are invoked via contractual documents for Third Party Contractor it should be carried out for the life of the project. Alternately, on a case-by-case basis, the Mechanical Department may approve use of other recognized quality guidelines such as the quality assurance guidelines published by the Association of American Railroads.

## 1.4 ORGANIZATIONAL STRUCTURE

- 1.4.1 Metra's Mechanical Department organizational structure is illustrated in the tree diagram, Appendix A. Specific levels of authority and lines of communication are established for activities affecting quality that are fully described in applicable implementing procedures and/or instructions. Metra's Mechanical Department will ensure communication between its different levels and functions regarding the processes of the Quality Plan.
- 1.4.2 Communication tools will include memorandums, staff meetings, project reports, and emails. Communication with our third-party contractors is on-going throughout design and implementation of a project and includes project kick-off meetings, progress meetings and periodic workshops.
- 1.4.3 Persons responsible for ensuring and verifying that activities affecting have been correctly performed, will have sufficient authority, access to work areas, and organizational freedom and independence to:
  - 1.4.3.1 Identify quality problems.
  - 1.4.3.2 Initiate, recommend, or provide solutions to quality concerns.

- 1.4.3.3 Verify implementation of solutions.
- 1.4.3.4 Ensure the further processing, testing, delivery, installation, or use is controlled until a nonconformance, deficiency, or unsatisfactory conditions has been rectified.
- 1.4.4 Quality personnel will be independent of the pressures of production and of cost and schedule considerations in quality decisions. Personnel will have direct access to responsible management at a level where appropriate actions are acknowledged.
- 1.4.5 The responsibility of project deliverables including the project records by the Third-Party Contracts resides with the designated Project Manager for the project. The responsibilities for the management of the day-to-day technical work, interfaces, and quality assurance/quality control requirements should be identified in the applicable Project Management Plans.
- 1.4.6 Persons responsible for quality should be listed on a project organization chart or a separate quality organization chart such that the individuals responsible for quality assurance and quality control activities are clearly identified.
- 1.4.7 Project stakeholders (individuals/departments that either impact or are impacted by a project) and the associated impacts should be identified by management during project development and managed through project startup.

## 2.0 DOCUMENTED QUALITY MANAGEMENT SYSTEM

### 2.1 PURPOSE

This section identifies the documented quality program provisions and program application associated with the Mechanical Quality Plan. This section also covers the periodic review of the Mechanical Quality Plan.

### 2.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 2.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 2.4 PROGRAM REQUIREMENTS

- 2.4.1 The Mechanical Quality Plan establishes the basic policies and specifies the objectives and the requirements for the procedures to be employed by Mechanical Department and the Third-Party Contractors to:
  - 2.4.1.1 Comply with the applicable requirements of the Federal Transit Administration Quality Management System Guidelines.
  - 2.4.1.2 Comply with other regulatory and special contractual requirements imposed by Metra and its Mechanical Department.
- 2.4.2 The Mechanical Quality Plan provides that activities affecting quality be accomplished in accordance with the Quality Plan, and other detailed approved procedures or instructions, as necessary.
- 2.4.3 Procedures and/or instructions for the management responsibility, documented quality system; design control; document control; purchasing; product identification and traceability; process control; control of measuring and test equipment; inspection and testing; inspection and test status; nonconformance; corrective action; risk analysis and mitigation; maintenance of quality records; quality audits; and training should be developed by Metra and Third-Party Contractors, as applicable.
- 2.4.4 Quality Assurance includes quality control, which comprises the verification of those physical characteristics of material, structure, component, or equipment, which provide a means to control the quality of the material, structure, component, or equipment to pre-determined requirements.

- 2.4.5 Once the Mechanical Quality Plan and/or requirements are invoked for the Third-Party Contractors, contractual agreement, it shall be carried out for the life of the contract.

## 2.5 PROGRAM IMPLEMENTATION

- 2.5.1 The Mechanical Quality Plan and the procedures shall apply to project activities affecting quality related to design, materials procurement, manufacturing, project management and other activities.
- 2.5.2 The procedures or instructions should generally include the following, as applicable:
- 2.5.2.1 Purpose / Objective and scope of the document
  - 2.5.2.2 Responsibilities for performing specific activities.
  - 2.5.2.3 Definitions and terms used in the document.
  - 2.5.2.4 Step-by-step instructions to control attributes such as sequence of operations of specific methodology including the quantitative and qualitative criteria to insure that specified activities have been performed satisfactorily, identifying, and acquiring any inspection equipment or skills, interfaces, reviews, approvals, or actions.
  - 2.5.2.5 Interrelated procedures or instructions.
  - 2.5.2.6 Reference documents or information necessary to perform the activities.
  - 2.5.2.7 Quality Records requirements.
  - 2.5.2.8 Appendix B provides guidelines for implementation of the requirements of the Mechanical Quality Plan for capital projects.

## 2.6 PROGRAM REVISIONS

- 2.6.1 Any employee of Metra may request for revision to the Mechanical Quality Plan. The revision requests shall be thoroughly evaluated prior to incorporation into the revised Mechanical Quality Plan.
- 2.6.2 The changes to the revised Mechanical Quality Plan should be processed and documented.

## 2.7 CONTROL, ISSUES, DISTRIBUTION, STORAGE, AND DISPOSITION OF MECHANICAL QUALITY PLAN

- 2.7.1 The controlled version of the Mechanical Quality Plan is the electronic version that resides in Metra Mechanical Departments' Controlled Network Drive and specifically designated controlled hard copies. All other copies of the Mechanical Quality Manual are to be considered "Uncontrolled Copies".
- 2.7.2 Historical copies of the revised Mechanical Quality Plan shall be maintained as 'Permanent' records.

## 2.8 MANAGEMENT REVIEW

- 2.8.1 The Metra Mechanical Department Quality Plan should be reviewed by the Mechanical Department management as necessary but at least once every three years. This review includes assessing opportunities for improvement and the need for changes to the quality management system including the quality policy and quality objectives.

### 3.0 DESIGN CONTROL

#### 3.1 PURPOSE

This section is meant to outline the design control activities and assign responsibilities to ensure design inputs are correctly identified and design outputs are documented and verified to ensure they meet the design input requirements. In addition, any changes to the drawings, specifications, and other documents are documented and processed appropriately.

#### 3.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

#### 3.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

#### 3.4 PROGRAM REQUIREMENTS

- 3.4.1 The design process is a standardized, thorough, thought out and planned process. Design activities are identified and responsibilities for accomplishing these activities are assigned. The design inputs shall be identified, and the design output will be documented and verified to meet design input requirements. The final design will be reviewed and approved as a controlled document. The design control activities will also encompass the design changes and configuration management.
- 3.4.2 The design control activities include identification, review, and documenting the design inputs, design basis, regulatory requirements, and performance objectives.
  - 3.4.2.1 Procedures should be developed for design control activities to include checking of drawings, calculations, and specifications against design standards; peer review of drawings; review for constructability as well as documentation of these actions.
- 3.4.3 When, by the terms of the contract, the Third-Party Contractor is responsible for all or any part of the design, a design control program should be developed and implemented by the Third-Party Contractor on a timely basis.
  - 3.4.3.1 The design control program should include provisions for review of the integration of the elements of the design including those performed by outside consultants and subconsultants.

- 3.4.4 Once the Mechanical Quality Plan and/or its requirements are invoked for third party contracts by contractual documents, it shall be carried out for the life of the contract.

### 3.5 PROGRAM IMPLEMENTATION

- 3.5.1 Design activities will be properly planned and controlled. Design input requirements will be determined and documented. These inputs will include functional, performance, applicable regulatory requirements, previous designs, and other necessary requirements. Requirements will be complete, unambiguous, and not in conflict with each other.
- 3.5.2 Design outputs will meet the input requirements and provide necessary information for production and purchasing, detail acceptance criteria, and specify the characteristics that are essential for its safe and proper use.
- 3.5.3 Design reviews will be performed to evaluate the ability of the results of design to meet requirements, and to identify any problems and determine any necessary actions. Participants in such review will include representatives of functions concerned with the design and development stage(s) being reviewed.
- 3.5.4 Design verification and validation are performed to ensure that the design outputs meet the design input requirements. Design outputs will be provided in a form that enables verification against the design inputs and will be approved prior to release.
- 3.5.5 Design changes will be governed by the same measures as those applied to the original design. The changes will be reviewed, verified, validated, as appropriate, and approved before implementation.
- 3.5.6 All design output documents shall be reviewed and approved by the Mechanical Department before issuance. Design documents will be controlled, and records maintained.

## 4.0 DOCUMENT CONTROL

### 4.1 PURPOSE

Procedures shall be established and maintained for control of documents and data. Document control measures shall ensure that all relevant documents are current and available to all users needing them. Control of documents shall include the review of documents by authorized personnel, distribution and storage of those documents, archiving of obsolete documents, and control of changes to the documents. Whenever possible, changes to the same authorized personnel who reviewed and approved the original documents shall review controlled documents and data. Any superseded documents retained for record shall be clearly identified as such.

### 4.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 4.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 4.4 PROGRAM REQUIREMENTS

- 4.4.1 Documents shall be controlled to ensure that correct, current, and applicable documents are available at the location where they are used.
- 4.4.2 Document control measures shall provide for the following:
  - 4.4.2.1 Identification of documents to be controlled.
  - 4.4.2.2 Identification of personnel, positions, or departments responsible for preparing, reviewing/providing concurrence, approving, and issuing documents.
  - 4.4.2.3 Review of documents by authorized personnel for adequacy, completeness, and correctness prior to approval and issuance.
  - 4.4.2.4 Approval prior to the commencement of the activity controlled by that document.
  - 4.4.2.5 Distribution of latest applicable documents to personnel or areas of activity.
  - 4.4.2.6 Development, revision, issuance, etc. of documents for maintaining consistency.

- 4.4.2.7 Maintaining the history of documents from the initial review/issue/submittal until final approval.
  - 4.4.2.8 Document distribution and management shall be managed. Management and distribution through an electronic system is the preferred method.
  - 4.4.2.9 Control of obsolete documents to prevent improper use.
- 4.4.3 Once the Mechanical Quality Plan and/or its requirements are invoked for the Third-Party Contractor by contractual documents, it shall be carried out for the life of the project.

#### **4.5 PROGRAM IMPLEMENTATION**

- 4.5.1 The procedures or instructions shall generally include the following, as applicable:
  - 4.5.1.1 Purpose and scope of the document.
  - 4.5.1.2 Responsibilities for performing specific activities.
  - 4.5.1.3 Definitions and terms used in the document.
  - 4.5.1.4 Step-by-step instructions when required to control attributes such as sequence of operations or specific methodology including the quantitative and qualitative criteria to ensure that specified activities or actions have been performed satisfactorily.
  - 4.5.1.5 Interrelated procedures or instructions.
  - 4.5.1.6 Reference documents and/or information necessary to perform the activities.
  - 4.5.1.7 Quality records requirements.
  - 4.5.1.8 Attachments, exhibits, appendices, charts, manuals, etc.
- 4.5.2 Changes to documents shall be reviewed and approved by the same individuals who performed the original review and approval, if possible. The level of review should be appropriate to the types of revisions made.
- 4.5.3 The review times for all design and design change documents, including but not limited to drawings, specifications, documents requiring changes, shall be established with appropriate personnel.
- 4.5.4 Review and approval authorities shall have access to pertinent project related background data or information upon which to base their review and approval.

- 4.5.5 A document repository and/or software (document management system) can be helpful in meeting the requirements of this section. However, the Mechanical Department must retain control of the documents including any software used (i.e., Metra must control access to and maintenance of the document repository).
- 4.5.6 The Mechanical Department should develop standardized naming conventions for project documents to provide for consistency in identification and control of documents. The naming conventions should include provisions for identification of revision level and date so that the current versions of documents are always used.

## 5.0 PURCHASING

### 5.1 PURPOSE

This section establishes requirements and assigns responsibilities for the control of procured products and services to ensure conformance with the specified procurement requirements.

### 5.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 5.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 5.4 PROGRAM REQUIREMENTS

- 5.4.1 Measures should be established to ensure that the purchased service or product conforms to the specified requirements. This includes personnel competence and required qualifications of a third-party vendor's personnel.
- 5.4.2 The procurement document control program shall include preparation, review, and approval of Mechanical Department controlled procurement documents and revisions to these documents, to ensure that the requirements to procure the products and/or services are properly and adequately specified.
- 5.4.3 The processing of procurement documents are performed by Metra's Procurement Department and not the Mechanical Department. These documents include: Invitations for Bids, Requests for Proposal, Purchase Orders, Blanket Purchase Orders, Task Orders, Master Agreements, Contracts, Contract Modifications, Change Orders, etc.
- 5.4.4 Once the Mechanical Quality Plan is invoked for the Third-Party Contractors by contractual documents, it should be carried out for the life of the project.

### 5.5 PROGRAM IMPLEMENTATION

- 5.5.1 Procurement documents issued at all levels should include provisions for following, either by reference or including the actual document, as appropriate:
  - 5.5.1.1 Quality Assurance Program - The quality assurance requirements and the elements of the program applicable to the products and/or services.

- 5.5.1.2 Basic Technical Requirements - Regulatory requirements, design criteria, drawings, specifications, Metra Standards, industrial standards, test and inspection requirements, etc.
- 5.5.1.3 Right of Access - Permission for authorized representatives of Metra to have access to the Third-Party Contractor's facilities and records for the purposes of visitation, inspection, surveillance and/or quality assurance audits.
- 5.5.1.4 Documentation Requirements - Records to be prepared, submitted with the shipment, maintained and/or made available for information, review and/or approval, e.g., drawings, specifications, procedures, part list, inspection and test records, personnel and procedure qualifications, materials, chemical and physical test results, and Safety Data Sheets (SDS) should be identified, referenced. In addition, instructions on record retention and disposition shall be provided.
- 5.5.1.5 Sub-Contractor Procurement - Applicable requirements of the Mechanical Quality Plan and the Third-Party Contractors shall be extended to the Sub-Contractors/Sub-Consultants.
- 5.5.1.6 Scope of Work - A definition of the scope of work should be included, where appropriate.
- 5.5.1.7 Installation Requirements - Information on manufacture/product requirements, parts list, maintenance requirements, operational inspection requirements, if any, shall be specified.
- 5.5.1.8 Identification - Provisions for adequate identification of parts, equipment and/or supplies should be included.
- 5.5.1.9 Handling Storage and Shipping - Adequate requirements for handling, storage, cleaning, packaging, and shipping shall be specified.
- 5.5.1.10 Delivery Location - Instructions as to where the products or services are required to be delivered/provided should be identified.
- 5.5.1.11 Special Instructions - The procurement documents should clearly identify any applicable special instructions, e.g. On-Site Inspection etc.
- 5.5.1.12 Provisions for Nonconformance - Methods for corrective actions and handling nonconforming parts, equipment, or processes as well as requirements for special inspections shall be included.

- 5.5.1.13 Project Deliverables – Physical, project records (electronic and/or hard copy), maintenance & operating manuals, warranties, guarantees, spare parts, training, inspection, and test results, etc.
- 5.5.1.14 Communication – Appropriate timeline established for response time, e.g. delivery of product, inspection reports, corrective action report for nonconformance, information request, etc.

## 5.6 PROCUREMENT DOCUMENTS REVIEW

- 5.6.1 A review of the procurement documents and any changes to these documents shall be made to ensure that:
  - 5.6.1.1 The correct quality assurance requirements and technical requirements are specified for the procurement of products and/or services.
  - 5.6.1.2 The products and/or services are received as ordered.

## 5.7 MECHANICAL DEPARTMENT PROCUREMENT DOCUMENTS CHANGES

Procurement document changes shall be subjected to the same degree of control as that utilized in the preparation of the original procurement documents.

## 5.8 PROGRAM REQUIREMENTS – PROCURED PRODUCTS OR SERVICES

- 5.8.1 Measures shall be established to ensure that the products or services, whether purchased directly or through the Third-Party Contractors, should conform to the procurement document requirements, e.g., Certificate of Conformance, Quality Verification Statement, etc. Additionally, third party vendors must be able to demonstrate that personnel are qualified and competent to be able to meet specified requirements.
- 5.8.2 Once the Mechanical Quality Plan and/or its requirements are invoked for outside organizations and third parties by contractual documents, it should be carried out for the life of the contract.

Third party contractor quality management requirements should include:

- Contractor Quality Plan that complies with the applicable elements of the FTA QMS Guidelines and the Metra CQM
- Contractor Quality Manager who is independent of production
- Contractor Quality Staff who can supplement the Quality Manager in inspecting and documenting the quality of the work

- Inspection and Test plan
- Hold points or witness points, to halt the work at key milestones so that inspection and testing can occur before subsequent work makes inspection/testing more difficult or impossible
- Inspection and test status (see Element 10)
- Nonconformance procedures (see Element 11)
- Corrective/Preventive action procedures (see Element 12)
- Records of inspection and test results showing conformity with acceptance criteria (see Element 13)

## 5.9 PROGRAM IMPLEMENTATION – PROCURED PRODUCTS OR SERVICES

5.9.1 The control of procured products or services per procurement documents is accomplished by controlling:

5.9.1.1 The Selection of responsible and responsive procurement sources within:

    5.8.1.1.1 Metra's Procurement Department

    5.8.1.1.2 Metra's Mechanical Department

5.9.1.2 The acceptance of products at the source and/or upon receipt at specified Metra locations.

5.9.2 Review and evaluation of procurement source's quality assurance program to meet the Mechanical Quality Plan requirements may be performed by:

5.9.2.1 Review and evaluation of supplier quality assurance program document description.

5.9.2.2 Supplier facility survey.

5.9.2.3 Evaluation regarding implementation of a quality program furnished by the vendor/consultant/supplier in the past.

5.9.2.4 Quality assurance audit of the vendor/supplier facility to verify conformance to the applicable fifteen quality program elements of FTA's QMS Guidelines, MQP and the Metra CQM, if required.

5.9.2.5 Continued evaluations to verify compliance with the quality assurance requirements of the procurement documents, by Metra and/or its Third-Party Contractors.

- 5.9.3 The procured products, parts, or equipment are controlled upon receipt at the specified Metra locations by:
- 5.9.3.1. Review of procurement documents provided by the supplier.
  - 5.9.3.2. Performing receipt inspections to procurement documents and maintaining the inspection status.
  - 5.9.3.3. Documenting the results of receipt inspection, acceptability of supplier furnished documentation, and the resulting determination of conformance or nonconformance to the procurement/contractual documents.
  - 5.9.3.4. Releasing the products to the intended work area for installation or further work.
  - 5.9.3.5. Conducting special tests and measurements, as necessary to verify that the hardware performs per applicable technical requirements stated in the certificate of conformance, if necessary.
  - 5.9.3.6. Establishing special receiving requirements, when needed.

## 6.0 PRODUCT IDENTIFICATION AND TRACEABILITY

### 6.1 PURPOSE

This section establishes requirements for identifying and controlling product to prevent the use of incorrect or defective material and assigns responsibilities to ensure that only correct and accepted materials, parts, and components are used or installed.

### 6.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 6.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 6.4 PROGRAM REQUIREMENTS

- 6.4.1 The program should ensure that materials, parts, and components are identified by appropriate means. The program shall ensure that only correct and accepted items, which meet the requirements, are used and installed during rehabilitation, repairs, and/or maintenance.
- 6.4.2 Product identification should be maintained to track materials, parts, and components during fabrication via processes such as stamping, tagging or physical separation.

### 6.5 PROGRAM IMPLEMENTATION

- 6.5.1 To the extent possible, the physical identification of items shall be accomplished by physical separation. Where physical separation is either impractical or insufficient, procedural controls, e.g., marking, tagging, labeling or other appropriate means, may be employed. Identification may be either on the item or on records traceable to the item. When identification marking is used, the marking should be clear, unambiguous, and applied in such a manner as not to affect the function of the item.
- 6.5.2 When items are subdivided, markings shall be transferred to each part of the item, if possible, and shall not be obliterated or hidden by surface treatments or coatings.
- 6.5.3 When required by design, standards, specifications, or etc., the items shall be traceable to specific documentation such as drawings, specifications, standards, physical and/or chemical material test reports, etc.

- 6.5.4 Items, which fail to possess the required identification or items for which record traceability has been lost or items that do not meet the requirements, shall be segregated, isolated, and controlled to prevent use and/or installation.

## 7.0 PROCESS CONTROL

### 7.1 PURPOSE

This section establishes requirements and assigns responsibilities for the control of special processes that affect the quality of items during production and installation.

### 7.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 7.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 7.4 PROGRAM REQUIREMENTS

- 7.4.1 The program shall ensure that special processes are planned, implemented, controlled, and performed by qualified personnel, which complies with applicable codes, standards, regulatory, and contractual requirements, in monitoring the product characteristics during production and installation.
- 7.4.2 Once the Mechanical Quality Plan and/or its requirements are invoked for the Third-Party Contractors by contractual agreement, be carried out for the life of the project.

### 7.5 PROGRAM IMPLEMENTATION

- 7.5.1 For the special processes, may include but are not limited to, welding, heat treatment, chemical cleaning, nondestructive examination, special coatings, manufacturing sequencing, etc.
- 7.5.2 Special processes, specifically where an inspection may not reveal deficiencies, should be controlled by procedures, instructions, drawings, checklists and/or other appropriate means using qualified personnel. These means shall ensure that the specified acceptance/rejection parameters are correctly sequenced, monitored, and controlled. This shall include personnel and equipment requirements, calibration requirements, if any, and acceptance criteria, as appropriate.
- 7.5.3 When a special process affecting quality is not addressed by an existing code, standard, or regulatory requirement, the necessary qualifications of personnel or procedures shall be identified, defined, and controlled.
- 7.5.4 The special process documentation should include prerequisite conditions, processing steps, conditions to be maintained during the steps of the process,

inspections and test requirements, verification methods, personnel qualifications, and record requirements.

- 7.5.5 The special process requirements for the Third-Party Contractors may be provided or identified by the procurement and/or design documents.
- 7.5.6 Appropriate quality records shall be maintained for personnel or special process qualifications as defined in implementing procedures and instructions.

## 8.0 INSPECTION AND TESTING

### 8.1 PURPOSE

This section establishes requirements and assigns responsibilities for planning and performing inspections and testing of items and activities affecting quality during materials receipt, work in progress and final installation, to provide assurance that the final accepted item or activity conforms to specified requirements.

### 8.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 8.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 8.4 INSPECTION AND TESTING PROGRAM REQUIREMENTS

- 8.4.1 The items or activities affecting quality shall be inspected and tested in conformance with approved documents. The inspection and testing documents should contain the requirements and acceptance/rejection limits of the design documents, standards and/or regulatory requirements.
- 8.4.2 Once the Mechanical Quality Plan and/or its requirements are invoked for the Third-Party Contractor per contractual documents, it shall be carried out for the life of the project.
- 8.4.3 The Mechanical Department should determine who will conduct the inspection and testing for each project. The inspection and testing requirements can be performed by internal (force account) staff, an independent third party, and the contractor or a combination of these three, as applicable. **NOTE: When there are contractors on the project, some level of responsibility for inspection and testing should be placed on the contractor to be overseen/verified by Metra personnel.**
- 8.4.4 Inspection and testing activities must be conducted by personnel with the proper credentials such as an accredited lab, certified technicians, etc.

### 8.5 INSPECTION PROGRAM IMPLEMENTATION

- 8.5.1 Inspections activities should be carried out using the approved inspection and test plans, inspection checklists, and/or drawings.
- 8.5.2 Characteristics of products/components to be inspected and/or tested by approved methods.

- 8.5.3 Results of inspection and/or test results shall be documented, and the inspection results shall document whether they meet requirements, drawings, specifications, and/or standards, etc.
- 8.5.4 Personnel other than those who performed the work should perform the acceptance inspections.
- 8.5.5 Personnel and/or the Third-Party Contractors performing inspections shall be qualified to perform the inspections.
- 8.5.6 To the extent possible, status indicators, such as markings, labels, or other suitable means, shall be employed to maintain inspection and test status.
- 8.5.7 If contractually mandated inspection and/or test 'Hold Point' is required, the specific 'Hold Point' shall be indicated in appropriate documents. Work shall not proceed without the consent of the person who assigned the 'Hold Point' and/or a designated representative. Such consent should be documented prior to continuation of work beyond the designated 'Hold Point'.
- 8.5.8 Inspection of items in process shall be performed where necessary.
- 8.5.9 Final inspection should include a record review of results and resolution of nonconformance identified by prior inspections.
- 8.5.10 The final inspection report should provide the vendor's name, facility location, inspection date, type of inspection, identification and signature of inspector, inspection results, conformance status, recommended actions, etc.

## **8.6 TESTING PROGRAM IMPLEMENTATION**

- 8.6.1 Unless designated otherwise, the organization responsible for the design of the item that is being tested shall provide the testing requirements and acceptance/rejection criteria.
- 8.6.2 Attributes or properties to be tested as well as testing methods shall be specified, and testing results shall be documented.
- 8.6.3 Each person who performs the testing for acceptance shall be qualified to perform the assigned testing tasks.

## **8.7 TESTING PROCEDURES**

- 8.7.1 Written test procedures shall be developed to demonstrate design and performance characteristics as specified in design and operating requirements/specification. Test procedures shall include the following, as applicable:
  - 8.7.1.1 Test objectives.

- 8.7.1.2 Provisions for assuring that established test prerequisites have met.
- 8.7.1.3 Required equipment and instrumentation.
- 8.7.1.4 Required inspection 'Witness' and/or 'Hold Points'.
- 8.7.1.5 Required environmental/surrounding conditions.
- 8.7.1.6 Safeguards to be taken in preparation and performance of test.
- 8.7.1.7 Personnel qualifications.
- 8.7.1.8 Requirements for data acquisition.
- 8.7.1.9 Recognized industry standard test methods, supplier manuals, maintenance instructions, and/or approved drawings may be used in place of specially prepared test procedures, as long as these documents include adequate instructions to ensure satisfactory performance of the test.

## **8.8 INSPECTION AND TESTING RESULTS**

- 8.8.1 All inspection and test results shall be documented and evaluated by qualified personnel to assure that the test requirements satisfy requirements.

## **8.9 INSPECTION AND TESTING DOCUMENTATION**

- 8.9.1 Inspection and test documentation of the inspected/tested item or activity should, generally, identify:
  - 8.9.1.1 Item inspected/tested.
  - 8.9.1.2 Date of the inspection/test.
  - 8.9.1.3 Individual performing the inspection/test and/or recording the inspection/test data.
  - 8.9.1.4 Testing requirements.
  - 8.9.1.5 Type of test.
  - 8.9.1.6 Type of inspection and/or inspection procedure.
  - 8.9.1.7 Individuals(s) approving the test
  - 8.9.1.8 Inspection/test results.
  - 8.9.1.9 Acceptance/rejection criteria.

- 8.9.1.10      Recommended actions, if any.
- 8.9.1.11      Individuals(s) evaluating the test results.

## 9.0 INSPECTION, MEASURING, AND TEST EQUIPMENT

### 9.1 PURPOSE

This section establishes requirements and assigns responsibilities to assure tools, gauges, instruments, and other Measuring and Test Equipment (M&TE) used in activities affecting quality are identified, properly controlled, calibrated, and adjusted at specified intervals to maintain accuracy within specified limits.

### 9.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 9.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 9.4 PROGRAM REQUIREMENTS

- 9.4.1 IM&TE required to carry out inspection and testing should be identified, controlled, calibrated, and maintained to demonstrate the conformance of work to the specified requirements. The schedule of testing for IM&TE requiring calibration and recalibration must be documented.
- 9.4.2 The specifications, special conditions, etc. for the Requests for Proposal (RFPs) and Invitations for Bid (IFBs) should include the requirement that all contractor's IM&TE is to be calibrated and have identified calibration intervals prior to use on the project.
- 9.4.3 The program is intended to ensure that tools, gauges, instruments, and other Measuring and Test Equipment (M&TE) used in activities affecting quality are identified, properly controlled, calibrated, and adjusted at specified intervals to maintain accuracy within specified limits.

### 9.5 PROGRAM IMPLEMENTATION

The program shall ensure tools, gages, instruments, and other inspection monitoring, such as measuring, test equipment, and other devices, are used in activities affecting quality to be of proper range, type, and accuracy to verify conformance and established requirements.

### 9.6 CALIBRATION REQUIREMENTS AND NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY TRACEABILITY

- 9.6.1 To ensure accuracy; inspection, measuring, and test equipment shall be controlled, calibrated, adjusted, and maintained at prescribed intervals and/or

prior to use against certified equipment having known relationships to nationally recognized standards and accepted values of physical constants to the extent possible.

- 9.6.2 If no national standards exist, the basis for calibration of a reference should be documented. This requirement is not intended to imply a need for special calibration and control measures on rulers, tape measures, levels, and such other devices, if normal commercial practices provide adequate accuracy.

## 9.7 CALIBRATION INTERVALS AND METHODS

- 9.7.1 Calibration methods and intervals for each item shall be defined and based on the type of equipment, equipment use, manufacturer's recommendations, stability characteristics, required accuracy, and other conditions affecting measuring control.
- 9.7.2 When inaccuracy of the equipment is suspected, a special calibration may be performed.
- 9.7.3 The calibration status, including the due date of next calibration of M&TE, shall be visible through the use of tags, labels, and/or decals attached to the equipment, as applicable or identification traceable to the equipment log.

## 9.8 OUT-OF-CALIBRATION EQUIPMENT

- 9.8.1 When inspection, measuring, and test equipment is found to be out of calibration, an evaluation should be made and documented of the validity of previous inspection or test results and of the acceptability of items previously inspected or tested.
- 9.8.2 Inspection, measuring, and test equipment consistently found out of calibration should be repaired or replaced.
- 9.8.3 The evaluation results for the validity of previous inspection and/or test results shall be documented, when necessary.

## 9.9 HANDLING AND STORAGE

Measuring and test equipment that is susceptible to loss of accuracy due to improper handling, storage, and/or changes in ambient environmental conditions shall be identified. In addition, special precautions shall be taken to ensure the required accuracy of the measuring and test equipment is identified.

## 9.10 CALIBRATION RECORDS

- 9.10.1 Records shall be maintained, and equipment suitably marked to indicate calibration status and to permit traceability to calibration records.

## 10.0 INSPECTION AND TEST STATUS

### 10.1 PURPOSE

This section establishes requirements and assigns responsibilities for identifying the inspection and test status of work, during production and installation to assure that only those items that have passed the required inspections and tests are used and installed.

### 10.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 10.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 10.4 PROGRAM REQUIREMENT

- 10.4.1 The program shall provide means for ensuring that required inspections and tests are performed and that the acceptability of items with regard to inspections and tests performed is readily apparent. Nonconforming items shall be clearly identified.
- 10.4.2 Once the Mechanical Quality Plan and/or its requirements are invoked for the Third-Party Contractors by contractual documents, it shall be carried out for the life of the project.

### 10.5 PROGRAM IMPLEMENTATION

- 10.5.1 To the extent possible, status indicators, such as physical location, tags, markings, routing sheets, stamps, labels, inspection records, hold point records, or other suitable means shall be used to maintain inspection and test status. The status indicators indicate whether the production and/or installation is in conformance or nonconformance with the inspection and tests performed.
- 10.5.2 The program shall provide the means to ensure that only items that have passed the required inspections and tests per design documents, specification, and/or standards are accepted.
- 10.5.3 Written documentation should include provisions for the authority for application and removal of tags, markings, labels, and stamps.
- 10.5.4 In cases, where required documented evidence is not available, the associated equipment or materials shall be considered nonconforming. Appropriate documentation shall be available showing acceptability of the equipment and/or materials prior to its installation.

## 11.0 NONCONFORMANCE

### 11.1 SCOPE

This section establishes requirements and assigns responsibilities for the control of nonconforming work

### 11.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 11.3 RESPONSIBILITIES

See Section 1.0

### 11.4 PROGRAM REQUIREMENTS

- 11.4.1 The quality program must include a process for identification and resolution of nonconforming work, service, items, activities, or any conditions adverse to quality which include defective material and equipment (which should be segregated where possible), failures, malfunctions, deficiencies, deviations, and other conditions leading to nonconformances.
- 11.4.2 Written procedures should be developed to control items, services, activities, etc. which do not conform to specific requirements to prevent their inadvertent use or installation.
- 11.4.3 Written procedures should include adequate instruction for identification, documentation, segregation, disposition, and notification of nonconforming product materials, service, or work to all affected parties.
- 11.4.4 The responsibility for review and authority for the disposition of non-conforming work should be defined in the written procedures and instructions.
- 11.4.5 The Project Manager/Resident Engineer (Metra or Third-Party Contractor) should identify and report the nonconformance.
- 11.4.6 Metra management should determine the disposition for the nonconformance (e.g., Repair, Rework, Scrap, Use-As-Is, etc.). Dispositions of 'use-as-is' and 'repair' should be determined with documented concurrence (including technical justification) from the engineer of record.

- 11.4.7 The program should have provisions for re-inspection by the Project Manager/Resident Engineer that the proposed corrective action has been completed satisfactorily.
- 11.4.8 Written procedures should include appropriate controls for documenting, interfacing, and disposition of non-conforming items by various organizations.

## **11.5 PROGRAM IMPLEMENTATION – IDENTIFICATION AND SEGREGATION OF NONCONFORMING WORK**

- 11.5.1 Nonconforming items shall be controlled by marking and physical segregation. Where physical segregation is not practical, nonconforming items may be controlled by tagging or other means of identification.
- 11.5.2 Nonconforming services or activities shall be controlled by proper documentation and/or revised procedures or specifications, as necessary.

## **11.6 DISPOSITION OF NONCONFORMING ITEMS, SERVICES, OR ACTIVITIES**

- 11.6.1 The program shall control further processing, testing, delivery, and installation of a nonconforming and/or defective work pending a decision on its disposition.
- 11.6.2 The disposition and acceptance of the Nonconforming items may be accomplished by:
  - 11.6.2.1 **Rework** - This item can be reworked so that it is brought into conformance with the original requirements without exception.
  - 11.6.2.2 **Repair** - Restoring the item to a condition to make it acceptable for intended use as determined by engineering evaluation, even though the item does not conform to the original requirements of the drawing, procedure, or specification. A proposed disposition of 'Repair' requires concurrence by the engineer of record.
  - 11.6.2.3 **Use-as-is** – Allows the use of an item that does not meet all requirements when it is determined by engineering evaluation that the item will satisfy its intended use. A proposed disposition of 'Use-as-is' requires concurrence by the engineer of record.
  - 11.6.2.4 **Scrap** - An item that is incapable of being reworked or repaired and is not accepted; the item is removed and disposed of.
- 11.6.3 Appropriate justification and documentation shall be provided to verify acceptability of nonconforming items disposition as rework, or retest, or repair, or Use-as-is or accept as-is.

- 11.6.3.1 Installed items not in service that are nonconforming or become nonconforming, as a result of any reason, shall be corrected or resolved prior to operational support.
- 11.6.3.2 An item that is not complete or correct to the original requirement of a drawing, procedure, or specification may be released for use after an engineering evaluation if it is found to meet the intent of the drawing, procedure, or specification and is not detrimental to other components or the performance requirements. A deviation will need to record and filed if such an item is used.

## 12.0 CORRECTIVE ACTION

### 12.1 PURPOSE

This section establishes requirements and assigns responsibilities for the identification, reporting, and correction of conditions adverse to quality performance and compliance. Deficiencies and errors found during the normal review process are not included in the scope of this section, unless reoccur consistently and constantly.

### 12.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 12.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 12.4 PROGRAM REQUIREMENTS

- 12.4.1 Procedures should ensure that conditions adverse to quality are promptly located/identified, documented, reported to appropriate levels of management and corrected. Conditions adverse to quality include defective material and equipment (which should be segregated where possible), failures, malfunctions, deficiencies, deviations, and other conditions leading to nonconformances.
- 12.4.2 Procedures should include provisions for addressing root cause and actions taken to correct and prevent recurrence of the conditions adverse to quality.
- 12.4.3 Continuous improvement procedures should be established for analyzing the process to detect and eliminate causes of nonconforming products and services.
- 12.4.4 Trend analyses of repeated or recurring nonconformances or deficiencies/findings identified in the workplace or during quality audits should be performed. The results of trend analyses should be presented to the appropriate management staff for action as needed.
- 12.4.5 Procedures for risk analysis, detection of potential nonconformances and mitigation/elimination of causes of nonconformances should be incorporated into the corrective action program.

### 12.5 PROGRAM IMPLEMENTATION

- 12.5.1 Corrective actions need to improve the process and prevented recurrence of issues and deficiencies.
- 12.5.2 Root cause(s) need to be effectively and accurately identified.

12.5.3 Results of corrective actions need to be measured and validated.

12.5.4 Monitor effectiveness of correct action plans to avoid relapse(s) of issues and deficiencies.

## 13.0 QUALITY RECORDS

### 13.1 PURPOSE

This section establishes requirements and assigns responsibilities for the collection, filing, indexing, storage, maintenance, retrieval, and disposition of quality assurance records necessary to provide evidence of quality in the design, procurement, manufacturing, installation, inspection, testing, nonconformance, corrective action, auditing, and training.

### 13.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 13.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 13.4 PROGRAM REQUIREMENTS

- 13.4.1 The term 'record(s)' used throughout this section is to be interpreted as 'quality assurance record(s)' or 'project records' inclusive of all attachments etc.
- 13.4.2 The records system shall be defined, implemented, and enforced in accordance with written procedure, instructions, and/or other appropriate documentation. The procedures shall include the distribution of records, control of records withdrawn from storage, and the replacement, restoration, or substitution of lost or damaged records.
- 13.4.3 Once the Mechanical Quality Plan and/or its requirements are invoked for the Third-Party Contractors by contractual documents, it shall be carried out for the life of the project.

### 13.5 PROGRAM IMPLEMENTATION

A record system shall be established, which addresses the requirements and assigns responsibilities for the collection, filing, indexing, distribution, storage, maintenance, safekeeping, retrieval, retention, replacement, restoration and substitution of lost records, and disposition of quality assurance records.

### 13.6 RECORDS RETENTION PERIOD AND DISPOSITION

- 13.6.1 All records shall be identified by appropriate numbering and/or naming convention.

- 13.6.2 Record retention must comply with Metra's records management policies (Metra intranet link provided below) to ensure federal, state and any additional applicable regulations are met.

<https://employee.metra.com/Department/materials-management/Page/records-management>

- 13.6.3 All records after completion of the project shall be forwarded to Metra by its Third-Party Contractors for retention by Metra, as identified in the contractual documents.
- 13.6.4 The Third-Party Contractors final payment should be released only after all the required project documents have been turned over after project completion.

## **13.7 RECORDS ADMINISTRATION**

- 13.7.1 The Quality Plan, procedures, design procedures, design specifications, procurement documents, inspection/test procedures, operational procedures, manufacturing procedures, and/or other documents shall specify the records to be generated, supplied, or maintained.
- 13.7.2 Documents that are later to be designated as records shall be accurate and completely filled out. Documents shall provide sufficient information to permit identification.
- 13.7.3 The records shall include the results of reviews, inspections, tests, audits, monitoring of work performance, qualifications of personnel, procedures, and equipment; test and measuring equipment calibrations; materials receipt inspection; and other documentation required by the Quality Plan, regulatory requirements, specifications, and contractual agreements.
- 13.7.4 The records shall provide sufficient information to permit identification between the record and the item and/or activity to which it applies.
- 13.7.5 The Third-Party Contractors shall submit records to Metra for inclusion in the quality assurance records system, as applicable.
- 13.7.6 Some records may be kept by the Third-Party Contractors and maintained on an available basis for a specified time. Such records may be offered to Metra after the Third-Party Contractors no longer plan to keep them.
- 13.7.7 All records shall be legible, identifiable, and retrievable.
- 13.7.8 All incoming and outgoing project records shall be considered valid only if stamped with the initial/signed and dated by authorized personnel. Alternatively, all the records shall be received, sent, scanned if needed, and logged electronically.

**13.8 RECORDS FILING, INDEXING, DISTRIBUTION, REPLACEMENT, RESTORATION, OR SUBSTITUTION OF LOST OR DAMAGED RECORDS**

13.8.1 The quality records procedures shall address the filing, indexing, distribution, replacement, restoration, or substitution of damaged records, as appropriate.

**13.9 RECORDS STORAGE, MAINTENANCE, SAFEKEEPING, RETRIEVAL, AND DISPOSITION**

13.9.1 Records shall be stored in facilities, which provide suitable environment to minimize deterioration or damage, prevent loss, preclude entry of unauthorized personnel, and facilitate retrieval without undue delay, and final disposition after project completion.

## 14.0 QUALITY AUDITS

### 14.1 PURPOSE

This section provides a comprehensive system of planned and periodic audits of Metra's Mechanical Department and the Third-Party Contractors to verify compliance and effectiveness of the Mechanical Quality Plan.

### 14.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 14.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 14.4 PROGRAM REQUIREMENTS

- 14.4.1 The audit program shall include elements of audit schedule, audit plan and checklist, audit performance, audit reporting, and audit follow-up and closure.
- 14.4.2 The audit schedule shall be reviewed periodically and revised as required.
- 14.4.3 A written audit plan and checklist shall be prepared before each audit.
- 14.4.4 Appropriately trained, experienced, and qualified personnel, not having direct responsibilities in the areas being audited, and with sufficient authority and organizational freedom, shall perform the audits in accordance with the written audit plan and checklist.
- 14.4.5 The auditing personnel shall document and review the audit results with the audited organization.
- 14.4.6 The audited organization management shall take necessary action to correct the deficiencies revealed by the audit in order to preclude repetition.
- 14.4.7 Once the Mechanical Quality Plan and/or its requirements are invoked for the Third-Party Contractors by contractual documents, it shall be carried out for the life of the project.

### 14.5 PROGRAM IMPLEMENTATION

- 14.5.1 Audits shall be conducted on a scheduled and timely basis. Each applicable element of the Mechanical Quality Plan shall be audited for the active and selected projects, when practical. The significant quality activities shall be overviewed once during the lifetime of the ongoing activity selected:

- 14.5.1.1 Commensurate with the status and importance of activities.
  - 14.5.1.2 As early as practical during the project life.
  - 14.5.1.3 At intervals consistent with the activities being undertaken.
  - 14.5.1.4 When significant changes have been made in the Quality Assurance Program.
- 14.5.2 Audits should be performed to provide an objective evaluation of compliance with established requirements, methods, and approved procedures or instructions. They should also be performed to identify quality assurance program deficiencies and verify implementation of recommended corrective action.
- 14.5.3 Deficient areas shall be re-audited as necessary until corrective actions have been accomplished. All conditions requiring immediate corrective action shall be identified immediately to responsible management or department of the audited organization.
- 14.5.4 Quality audits should be performed to:
- 14.5.4.1 Provide an objective evaluation of compliance with established requirements, methods, and approved procedures or instructions and contractual requirements.
  - 14.5.4.2 Identify deficiencies within the quality program. Deficiencies can be classified as 'major' or 'minor':
    - Major Deficiency – A repetitive or systemic deficiency
    - Minor Deficiency – A failure to adhere to plans or requirements
  - 14.5.4.3 Verify implementation of corrective action(s).
  - 14.5.4.4 Identify areas of improvement.
  - 14.5.4.5 Identify areas requiring preventative measures.
- 14.5.5 Personnel conducting the audit should document and review the audit results with the audited organization.
- 14.5.6 Quality audit deficiencies should be incorporated into the appropriate departmental or project tracking system/log for nonconformances.
- 14.5.7 The audited organization's management should take necessary action to correct the deficiencies identified by the audit in order to preclude recurrence.

14.5.8 Follow-up audits should be conducted in areas found to be deficient in previous audits, as necessary, to verify corrective actions have been implemented and maintained.

14.5.9 All conditions requiring immediate corrective action should be identified immediately to responsible management or department of the audited organization.

## **14.6 AUDIT REPORTS AND FOLLOW-UP**

14.6.1 The audit report shall:

- 14.6.1.1 Contain sufficient information to be a stand-alone document.
- 14.6.1.2 Include an evaluation of quality assurance practices, procedures, and instructions, the effectiveness of implementation, and conformance with policy directives.
- 14.6.1.3 Include an evaluation of work areas, activities, processes, items, and review of documents and records.
- 14.6.1.4 Be distributed to the management personnel of Metra and the Third-Party Contractors, as appropriate.

14.6.2 The audited management or department shall review audit results.

14.6.3 The audit response shall be evaluated and accepted, or further corrective action requested.

14.6.4 The audit deficiency shall be closed after verification of corrective action for the deficient area identified during the audit.

14.6.5 The audit shall be closed following closing of all deficiencies of the audit.

14.6.6 Audit records shall be maintained in accordance with Section 13.0.

## 15.0 TRAINING

### 15.1 PURPOSE

This section identifies the training requirements of personnel involved in performing work-affecting quality for Metra capital projects.

### 15.2 SCOPE

The requirements of this section apply to the Mechanical Department personnel, Third Party Contracts per contractual agreements, and all other stakeholders performing work activities affecting quality.

### 15.3 AUTHORITY / RESPONSIBILITIES

See Section 1.0

### 15.4 PROGRAM REQUIREMENTS

15.4.1 Minimum position requirements should be established for internal (force account) personnel as well as third party personnel who affect quality on capital projects. For example, the minimum requirements for a quality auditor may include coursework and/or certification as a quality auditor.

15.4.1.1 For a comprehensive list of quality personnel qualifications, see Section 3.6.3 of the FTA QMS Guidelines (2019 Update).

[https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/funding/grant-programs/capital-investments/8536/final-qms-guidelines-2019\\_1.pdf](https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/funding/grant-programs/capital-investments/8536/final-qms-guidelines-2019_1.pdf)

15.4.2 Personnel performing activities affecting quality should be qualified based on appropriate education, training, and/or experience, as required, to include:

15.4.2.1 Qualification and certification, if necessary, in the principles and techniques of the activity being performed.

15.4.2.2 Training based on individual education, experience, training, and position, as necessary.

15.4.2.3 Training to ensure that suitable proficiency in accordance with established criteria is achieved and maintained.

15.4.2.4 Provision of technical, project, quality assurance, quality control, safety, and any other special training required for the completion of the project.

15.4.2.5 Provision of the required training prior to the start of the project to include quality plan/procedure training for all project participants, including contractors, consultants, subcontractors, subconsultants.

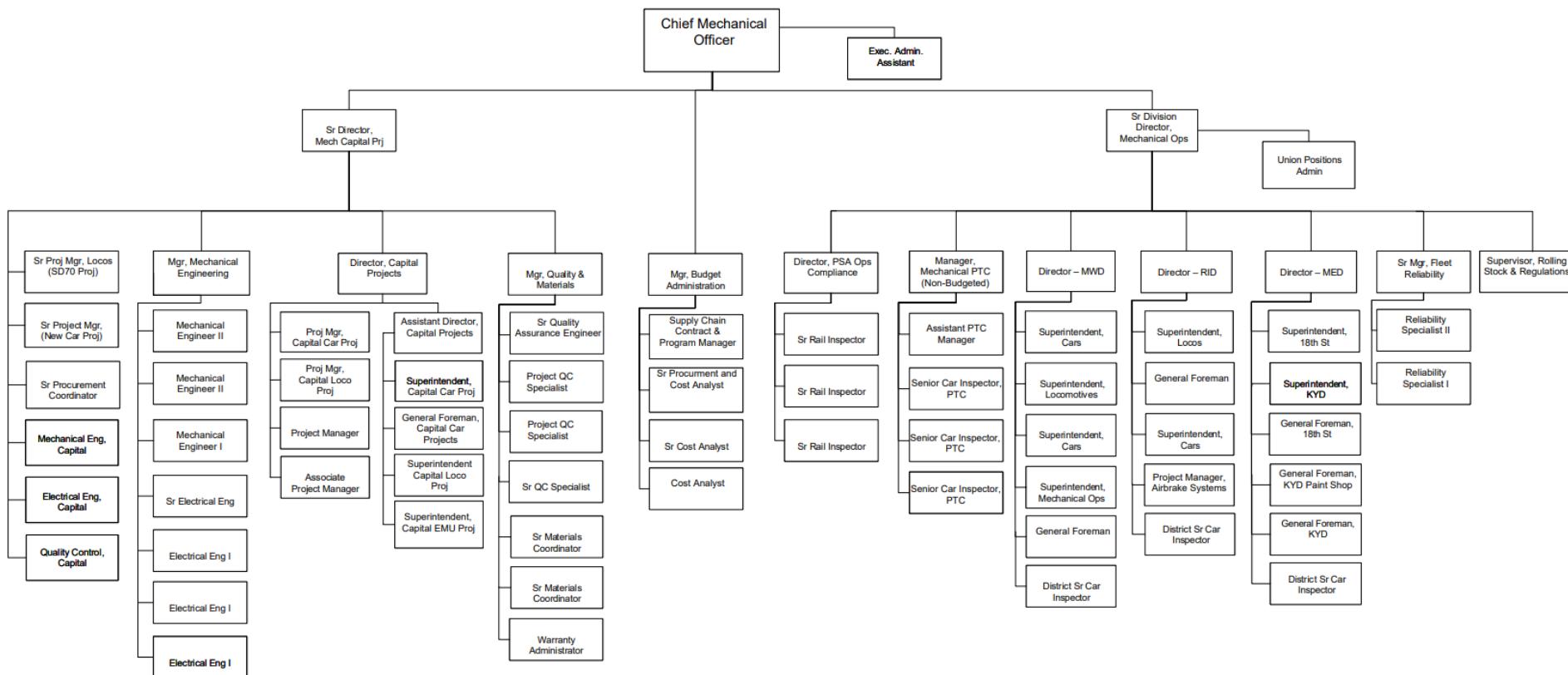
15.4.3 All such training should be documented as objective evidence of training completion.

## 15.5 PROGRAM IMPLEMENTATION

- 15.5.1 All personnel assigned to perform activities affecting quality should be given appropriate training prior to performing those activities. This training includes, as applicable, the purpose, scope, and implementation of the technical and quality assurance program elements that are to be employed, as well as the objectives and requirements of the applicable codes and standards.
- 15.5.2 The proficiency of personnel performing and verifying activities affecting quality should be maintained by re-training, re-examination, and/or re-certifying as determined by management.
- 15.5.3 All training shall be provided by the qualified and/or certified personnel as needed.
- 15.5.4 Records for initial training and subsequent and/or additional training received by all personnel shall be documented and maintained per Section 13.0.
- 15.5.5 Training and subsequent and/or additional training received by all project personnel should be documented and records maintained.

## Appendix A

### Metra Mechanical Department Organizational Structure



## Appendix B

QA/QC Activity by Metra Corporate, Mechanical and Third-Party Contractor (TPC) Personnel	Rolling Stock Contractor (RSC)	Project Management Consultant (PMC)	Positive Train Control Project Third Party Contracts	Metra Force Account Management	Metra Force Account Construction	Metra Force Account Maintenance	Positive Train Control Project Metra Force Account
Work Scope Major Capital Projects <sup>(2)</sup>	<b>For FTA Quality Management System Applicability See Below</b>						
Q. A. Corporate Oversight <sup>(1)</sup>	DCQ	DCQ	DCQ	DCQ	DCQ	DCQ	DCQ
Q. A. Activities by TPC <sup>(2)</sup>	TPC	TPC	TPC				
Q. C. Activities by TPC <sup>(2)</sup>	TPC	TPC	TPC				
Q. C. Activities by Mechanical <sup>(2)</sup>	(QCM)(PMM)	(QCM)(PMM)	(QCM)(PMM)	(QCM)(PMM)	(QCM)(PMM)	(QCM)(RRI)	(QCM)(PMM)
<b>FTA QMS Elements</b>							
2.2.1 Management Responsibility	X	X	X	X	X	X	X
2.2.2 Documented Quality System	X	X	X	X	X	X	X
2.2.3 Design Control	X		X	X			X
2.2.4 Document Control	X	X	X	X	X	X	X
2.2.5 Purchasing	X	X	X	X			X
2.2.6 Product ID and Traceability	X		X	X	X	X	X
2.2.7 Process Control	X	X	X	X	X	X	X
2.2.8 Inspection and Testing	X	X	X	X	X	X	X
2.2.9 Inspection, Measuring, & Test Equipment	X	X	X	X	X	X	X
2.2.10 Inspection and Test Status	X	X	X	X	X	X	X
2.2.11 Nonconformance	X	X	X	X	X	X	X
2.2.12 Corrective Action	X	X	X	X	X	X	X
2.2.13 Quality Records	X	X	X	X	X	X	X
2.2.14 Quality Audits	X	X	X	X	X	X	X
2.2.15 Training	X	X	X	X	X	X	X

**Notes:**

- "Grant Management and Accounting (GMA) is responsible to provide the corporate QA oversight per approved procedures.
- The QA/QC activities required by Third Party Contractors and Metra Force Account should be conducted in accordance with approved procedures/instructions, which meet the FTA QMS Guidelines and the railroad industry standards for capital projects. See Mechanical Department Quality Plan for details on implementation.

**Legend:**

GMA = Grant Management and Accounting, QMS = Quality Management System, FTA = Federal Transit Administration

(QCM) = Quality Control (Mechanical), (PMM) = Project Manager (Mechanical), (RRI) = Rolling Stock Rail Inspectors (Mechanical)

Third Party Contracts Projects
Metra Force Account Projects



## **METRA MECHANICAL DEPARTMENT**

### **QUALITY PLAN**

# **Procedures**

## Mechanical Department Quality Plan

PROCEDURE TITLE: DESIGN CONTROL

Mechanical Department MQPP Procedure # MQPP-03.01

### REVISION HISTORY

DOCUMENT REVISION HISTORY				
REVISION DATE	REVISION NUMBER	SECTION NUMBER	REASON FOR REVISION	DESCRIPTION
5/5/16	N/A	N/A	N/A	NEW PROCEDURE
12/14/22	A	2.1.3.8.1	Added configuration management to section	Added configuration management to section

# Mechanical Department Quality Plan

**PROCEDURE TITLE: DESIGN CONTROL**

**Mechanical Department MQPP Procedure # MQPP-03.01**

## 1. SCOPE

- 1.1. The design process is a thorough, thought out and planned process. Design activities are identified, responsibilities for accomplishing the design activities are assigned. The design input shall be identified, and the design output will be documented and verified that it meets design input requirements. The final design will then be reviewed and approved as a controlled document.
- 1.2. The purpose of this procedure is to provide instructions and to assign responsibilities for design of the any project(s) and/or program(s). Design activities shall be done by the Mechanical Department, Contractor and/or Consultant.

## 2. PROCEDURES

- 2.1. *CARS & LOCOMOTIVES FORCE ACCOUNT AND OUT SOURCED PROJECTS*
  - 2.1.1. *Input*
    - 2.1.1.1. The Mechanical Department will initiate the design input for a project(s) and/or program(s). The Mechanical Department staff will describe the system in terms of performance characteristics, physical characteristics, applicable standards, environmental regulations, and packaging requirements. This description will mainly be done through the release of procedures, specifications, drawings and Bills of Material.
  - 2.1.2. *Planning*

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DESIGN CONTROL**

**Mechanical Department MQPP Procedure # MQPP-03.01**

2.1.2.1. The Mechanical Department shall establish a design plan prior to the start of any design activities. The plan identifies design activities, assigns responsibilities, and drafts a schedule for the project(s) and/or program(s), including man-hours.

2.1.3. *Individual Responsibilities*

2.1.3.1. *Program Manager*

2.1.3.1.1. Responsibilities include definition and management of technical and deliverable interfaces, project and/or program administration, planning, scheduling and status evaluation, problem solving, change management, quality assurance, design and final subsystem integration and acceptance.

2.1.3.1.2. This work also includes: Contract interpretation by the Mechanical Department Staff, tracking, and timely approval processing of the project and/or program change functions. Mutual responsibilities with the contractor's Program Manager include coordinate Metra's participation in First Article Inspections (FAI), and establishment and joint management and tracking of the documentation and deliverables and the quality control thereof. Mutual responsibilities also include inter-organization visits and design cycle review coordination. Program Manager and Engineer's approval is required for all design, drawing, and technical specification.

2.1.3.2. *Engineers*

2.1.3.2.1. An engineer in their field of expertise, is responsible for design development, subsystem integration, design analysis, conformance to Metra's requirements and/or specifications and the development of design verification test plans. Engineer will

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DESIGN CONTROL**

**Mechanical Department MQPP Procedure # MQPP-03.01**

ensure the timely review of all design and technical specification and assist in the resolution of all technical action items throughout the life of the Projects and/or Programs. Engineer and Program Manager's approval is required for all design, drawing, and technical specification.

**2.1.3.3. *Project Manager***

2.1.3.3.1. Responsible for all inspection activities and quality audits at facilities, including Metra sites, contractor and/or subcontractor, where project(s) and/or program(s) are being executed. The Project Manager shall work with Quality Assurance group to schedule announced and unannounced quality audits. The Program Manager shall participate in design cycle review and pre-production meetings.

**2.1.3.4. *Consultants***

2.1.3.4.1. Metra reserves the right to acquire and utilize technical and management services from various sources, including outside consultants. This work shall be under the direction of the Mechanical Department and may be performed on a continuing or periodic basis (i.e., during design reviews, initial project startup, special training, and on-construction site). Metra will allow the consultants and its employees to sign appropriate nondisclosure agreements with any entity involved in project(s) and/or program(s), subject to the approval of Metra.

**2.1.3.5. *Design Verification***

2.1.3.5.1. The purpose of the design verification is to assure that the design output matches the design input requirements prior to acquiring any fabrication. It will be the

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DESIGN CONTROL**

**Mechanical Department MQPP Procedure # MQPP-03.01**

responsibility of Engineer, in their field of expertise, to verify that specification and/or drawing meet the design input requirements.

2.1.3.5.2. Verification can be done through methods including calculations, testing, utilizing existing service proven designs, or a combination of these methods.

**2.1.3.6. *Design Reviews***

2.1.3.6.1. The Mechanical Department has the responsibility of ensuring that designs are thoroughly reviewed with appropriate entity involved in project(s) and/or program(s). Furthermore, a product(s) (i.e. car, locomotive, components, and etc.) that completes a project(s) and/or program(s), prior to its release for service, will undergo final design review that will be conducted by the Mechanical Department and/or consultant hired by the Mechanical Department, where it will be decided whether the product(s) design is suitable for service.

**2.1.3.7. *Design Changes***

2.1.3.7.1. Design changes or modifications may either be requested by the Mechanical Department or field personnel, based on the specific experiences of the employee with the product. Any design change will need to go through design cycle before any approval can be granted. Final approval will be authorized by Mechanical Department Head after it has met all the requirements of design cycle. Element 4.0 must be followed in order to complete design change.

2.1.3.7.2. Design changes or modifications may either be requested by the Mechanical Department or the Contractor, based on either production problems or non-

## Mechanical Department Quality Plan

**PROCEDURE TITLE: DESIGN CONTROL**

**Mechanical Department MQPP Procedure # MQPP-03.01**

conformance to the design inputs that Metra presented to the Contractor at the beginning of the project(s) and/or program(s). Standard procedures must be followed or as required by contract. Furthermore, the design change process should include development of ‘As-Built’ drawings as part of the design documentation at the completion of the project(s) and/or program(s).

### 2.1.3.8. *Design Output*

- 2.1.3.8.1. The primary design output consists of the documentation that defines the product(s) and instructions for its manufacturing. The documentation includes configuration management, applicable drawings, specifications, bills of material, etc.
- 2.1.3.8.2. All design output documents shall be reviewed and approved by the Mechanical Department before issuance. Design documents will be controlled in accordance with Element 4.0: Document Control.

## Mechanical Department Quality Plan

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

### REVISION HISTORY

DOCUMENT REVISION HISTORY				
REVISION DATE	REVISION NUMBER	SECTION NUMBER	REASON FOR REVISION	DESCRIPTION
5/5/16	N/A	N/A	N/A	<b>NEW PROCEDURE</b>
12/8/16	A	2.1.2.1.1, 2.3.2.1.1, and 3.2.5.1	Updated reference to file locations	Updated reference to Specification, Modification, and ECN file locations in the S-Drive

## Mechanical Department Quality Plan

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

### 1. SCOPE

- 1.1. Procedures shall be established and maintained for control of documents and data. Document control measures shall ensure that all relevant documents are current and available to all users. Control of documents shall include the review of documents by authorized personnel, distribution and storage of those documents, elimination of obsolete documents, and control of changes to the documents. Whenever possible, changes to the same authorized personnel who reviewed and approved the original documents shall review controlled documents and data. Any superseded documents retained for record shall be clearly identified as such.
- 1.2. Documents shall be controlled to ensure that correct and applicable documents are available at the location where they are used.

### 2. PROCEDURE

#### 2.1. *CONTROL OF SPECIFICATIONS*

- 2.1.1. *Issue*
- 2.1.1.1. Prior to the issue and release of a specification, it is reviewed for adequacy and correctness and will be approved by the Mechanical Department. A specification shall not be ready for distribution until authorized by the Mechanical Department. The specification will also include a revision sheet to indicate the changes made to the document. (An example of the template used for drawings can be found in Appendix "A").

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

2.1.1.2.

*2.1.2. Numbering*

2.1.2.1. Each new specification must be assigned a unique number. The author of the document must assign specification the next available number in the “Master Specification List” file and complete the description, revision level, creation date, created by, and affectivity fields. The master specification list file is located at:

**2.1.2.1.1. S:\MECHANICAL\Engineering and Quality**

**Documents\Common\Master\_Spec\_List.xls**

2.1.2.2. The numbering system for specifications will be a capital “M”, followed by a dash, the last two digits of the year, followed by another dash, and then the last three numbers, which will be sequential starting with 001 for the first specification written for that year. For example, M-15-001 will be the first specification written in the year 2015. The numbers will be used for tracking purposes.

*2.1.3. Distribution*

2.1.3.1. Distribution to departments and personnel will have to be approved by the Mechanical Department personal prior to release. The Mechanical Department shall notify involved personal of specification changes using appropriate method of communication.

*2.1.4. Master List*

2.1.4.1. A Master List of all the most current and updated specifications will be kept at a location approved by the Mechanical Department office. The author of specification

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

in the Mechanical Department will be in charge of updating this list. The list will contain the specification number, the creation date, revision number, current approved revision date (if any), and the title of the specification.

2.1.4.2. Electronic master copy of the most updated version of each Mechanical Department specification will be located at a specified location approved by the Mechanical Department.

2.1.5. *Revisions*

2.1.5.1. The author of revision of a specification(s) in Mechanical Department, whom has approval to make changes to the specification(s), will handle the control of revisions to specifications. Using the master list explained above, the author will add the revision information to the master database. A revised specification will have the same number as the original, but followed by an A if it is the first revision, a B if it is the second and so on.

2.1.6. *Review*

2.1.6.1. Specification shall be reviewed by Project Manager, Program Manager, Quality Representative, Engineer and any other personal that deemed sufficient knowledgeable in topics covered by the specification.

2.1.6.2. Author of the Specification shall be excluded from review, but reviewer of each department representative shall be included per above requirements.

2.2. *CONTROL OF DRAWINGS*

2.2.1. *Issue*

## Mechanical Department Quality Plan

### PROCEDURE TITLE: DOCUMENT CONTROL

#### Mechanical Department MQPP Procedure # MQPP-04.01

- 2.2.1.1. Prior to the issuance and release of a drawing, it is reviewed for adequacy and correctness. A drawing is ready to issue when it has the authorized approval by the Mechanical Department personal indicated on it. (An example of the template used for drawings can be found in Appendix “B”).
- 2.2.2. *Numbering*
- 2.2.2.1. The creator of a drawing will assign a number to that drawing. The numbering system for drawings will be sequential, starting from the last number used. The creator of the drawing will update the database of current drawings and will assign a number based on that list. The numbers will be used for tracking purposes.
- 2.2.3. *Distribution*
- 2.2.3.1. Distribution to departments and personnel will have to be owner of the document. Electronic communication, a method approved by the Mechanical Department, will be used for notification of drawings. All requests for drawings from personnel in the field shall be directed towards the Mechanical Department personal for handling. All drawings that are printed or copied from appropriate location of drawing will be considered at “Reference Only”. Also, the Mechanical Department will maintain a database of what drawings are distributed to what field personnel.
- 2.2.4. *Master List*
- 2.2.4.1. A Master List of all the most current and updated drawings will be kept in a dedicated database system. The only people who will have access to revise the drawing master list are the Mechanical Department personal, whom has approval to make changes.
- 2.2.5. *Revisions*

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

Revisions to drawings will be handled through the use of an Engineering Change Notice or ECN. An example of the Engineering Change Notice (ECN) form is given in Appendix "C".

**3.2.5.1           Engineering Change Notice (ECN) Procedures**

The steps below outline the procedures for handling drawing/schematic changes and completing ECN forms.

1. All revisions to drawings/schematics must be handled through the use of an ECN form. All requests must be directed to the Department Head, Mechanical Capital Projects.
2. A request for a drawing/schematic change must be submitted using the drawing database found at:  
**S:\MECHANICAL\Engineering and Quality Documents\Common**
3. All ECN forms will be assigned a number, the next available ECN number field in the drawing database ECN form must be filled out with the requestor's name, the next available ECN number, drawing/schematic number, drawing/schematic title, current revision level, new revision level, the reason for the change, detailed description of the change, and affectivity.
4. Once the form is completed, it must be printed along with and the associated drawing/schematic and both documents must be submitted to the Department Head, Mechanical Capital Projects.
5. The Department Head, Mechanical Capital Projects has the authority to approve, request change, or disregard an ECN, once approved; no changes may be made to the ECN. There are two approvals steps for each ECN, the first is for approval of the changes and the second is for the verification of the changes and closing of the ECN.

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

6. If the changes are approved (first approval), the Department Head, Mechanical Capital Projects will then delegate the responsibility of performing the changes requested in the ECN to the originator of the ECN or a member of his staff and will provide them with a copy of the approved ECN.
7. The staff member responsible for making the changes outlined in the ECN form will then open the associated drawing/schematic and verify the following:
  - i. The drawing/schematic file name matches the actual drawing/schematic
  - ii. The current revision level on the drawing/schematic matches the current revision level on ECN form
  - iii. Will verify that there are no inconsistencies between the ECN form and the drawing/schematic
8. Once the above information is verified a copy of the drawing/schematic will be saved in the following folder:  
**S:\MECHANICAL\Engineering and Quality\Documents\Common\Forms\ECN\ECN\_Drawings\_In\_Progress**
9. Since the drawing/schematics, spec, and mod folders on the S drive must only contain approved versions of documents, changes may not be made on the drawing/schematic at its original location. Changes to the drawing/schematic will be made on the copy of the file in the above folder.
10. Once the changes are completed the staff member will verify that they have completed all the approved changes outlined in the ECN (and only the approved changes), they will submit a hard copy of the ECN, current version of the associated drawing/schematic, and a copy of the revised associated drawing/schematic to the Department Head, Mechanical Capital Projects.

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

11. The Department Head, Mechanical Capital Projects will then verify the changes and approve/disapprove the revision of drawing/schematic and the closing of the ECN (second approval signed on the bottom right of the ECN form).
12. Once the ECN is closed, the designated Quality Team Member will then move the ORIGINAL drawing/schematic to an archive folder and replace this drawing/schematic with the approved revised drawing/schematic from the ECN\_Drawings\_In\_Progress folder, the revised drawing/schematic will then be removed from the ECN\_Drawings\_In\_Progress folder.
13. The designated Quality Team Member will then update the status of the ECN in the file as “CLOSED” and indicating the person approving the ECN/drawing/schematic and the approval date.
14. The designated Quality Team Member will also send a notice to the staff members regarding the closing of the ECN and the currently approved revision of the associated drawing/schematic.
15. Staff members will be responsible for updating the files and records in their areas with the latest update of the drawing/schematic. This includes ensuring that employees they supervise are provided with the latest revisions and old revisions are removed and discarded.
16. All hard copies of the ECN forms (both approved and rejected) and the associated approved drawings/schematics will be controlled as a controlled record and kept in a binder by the Quality Team.

### **2.2.6.      *Review***

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

- 2.2.6.1. Drawings shall be reviewed by Project Manager, Program Manager, Quality Representative, Engineer and any other personal that deemed sufficient knowledgeable in topics covered by the specification.
- 2.2.6.2. Author of the drawing shall be excluded from review, but reviewer of each department representative shall be included per above requirements.

**2.3. CONTROL OF MODIFICATIONS**

**2.3.1. Issue**

- 2.3.1.1. Prior to the issue and release of a modification, it is reviewed for adequacy and correctness. A modification is ready to issue when it has the authorized approval indicated on it by the Mechanical Department. (An example of the template used for modifications can be found in Appendix “D”).

**2.3.2. Numbering**

- 2.3.2.1. Each new modification must be assigned a unique number. The author of the document must assign modification the next available number in the “Master Modification List” file and complete the description, revision level, creation date, created by, and affectivity fields. The Master Modification list file is located at:

**2.3.2.1.1. S:\MECHANICAL\Engineering and Quality Documents\Common  
|Master\_Modification\_List.xls**

- 2.3.2.2. The numbering system for specifications will be a capital “M”, followed by a dash, the last two digits of the year, followed by another dash, and then the last three numbers, which will be sequential starting with 001 for the first specification written

## Mechanical Department Quality Plan

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

for that year. For example, M-15-001 will be the first specification written in the year 2015. The numbers will be used for tracking purposes.

2.3.3. *Distribution*

- 2.3.3.1. Distribution to departments and personnel will have to be approved by the Mechanical Department personal before release.

2.3.4. *Master Copies*

- 2.3.4.1. A Master Copies all the most current and updated modification will be kept in a dedicated database system. The Mechanical Department will maintain these copies.

2.3.5. *Revisions*

- 2.3.5.1. The author of revision of modification in Mechanical Department, whom has approval to make changes to the modification(s), will handle the control of revisions to modification(s). A revised modification will have the same number as the original, but followed by an A if it is the first revision, a B if it is the second and so on.

2.3.6. *Review*

- 2.3.6.1. Specification shall be reviewed by Project Manager, Program Manager, Quality Representative, Engineer and any other personal that deemed sufficient knowledgeable in topics covered by the specification.

- 2.3.6.2. Author of the modifications shall be excluded from review, but reviewer of each department representative shall be included per above requirements.

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

**2.4. CONTROL OF COMPUTER SYSTEM SOFTWARE**

**2.4.1. Inclusion**

2.4.1.1. Computer system software to include, but not limited to, Computer Aided Drafting (CAD), Maximo data system, Event Recorder System Reader, EM2000 System Reader, Cab Signal System Reader, Propulsion System Reader, DVR System Reader, Battery and Inverter System Reader, MPI-QES System Reader, ETMS System Reader, MPI-Epic Airbrake System, Load Bank System, and Airbrake System.

**2.4.2. Issue**

2.4.2.1. Prior to the issue and release of software, it is reviewed for adequacy and correctness by the vendor and documentation submitted to Metra's Project Manager. In addition, Metra has the right to request a beta version of software for evaluation. The Project Manager, Program Manager, Quality Representative, Engineer and any other personnel deemed sufficient knowledgeable in topics will be included in the review as appropriate.

**2.4.3. Numbering**

2.4.3.1. Software will be numbered and tracked by the software part number that it has when assigned by the vendor of the software. These numbers will be used for tracking purposes only.

**2.4.4. Distribution**

2.4.4.1. Distribution to departments and personnel will be authorized by the Department Head, Mechanical Capital Projects. If software is issued to a certain class of equipment, the

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

Department Head, Mechanical Capital Projects will have to authorize the uploading of the software to the equipment. The owner will handle distribution of the Software Revision Tracking Report through Maximo data system. The District shall update the Maximo data system once updating of software has been completed.

**2.4.5. *Master List***

2.4.5.1. A Master List of all the most current software will be located in Maximo data system. The Master List shall include Software Name, Manufacturer Name, Version, System it is used for, Description, and Units it will be used on. The Project Quality Control Specialist shall contact supplier annually to confirm revision level of software. If supplier developed update to software, the Project Quality Control Specialist shall obtain latest software and provide it to Mechanical System Administrator for testing, verification and Installation.

**2.4.6. *Revisions***

2.4.6.1. The manufacturer of software shall notify Chief Mechanical Officer of changes to software revision. The Chief Mechanical Officer shall assign a personal to investigate and distribute if it's required. Revised software shall be verified by Mechanical Department System Administrator with the assistance of Mechanical Department Electrical Engineer to inherent compatibility with all other software and equipment. After thorough investigation, software shall be provided to Metra's IT Department to install on assets. Metra's IT Department shall update software within five (5) business day of receiving software. The Mechanical Department System

## Mechanical Department Quality Plan

**PROCEDURE TITLE: DOCUMENT CONTROL**

### **Mechanical Department MQPP Procedure # MQPP-04.01**

Administrator shall follow through installation and update Maximo Data system to reflect changes.

2.5. *CONTROL OF ROLLING STOCK SOFTWARE*

2.5.1. *Inclusion*

2.5.1.1. Rolling stock software to include, but not limited to Onboard Signal System, Train Control System, Engine Management System, Head End Power (HEP) Management System and Positive Train Control System.

2.5.2. *Issue*

2.5.2.1. Prior to the issue and release of software, it is reviewed for adequacy and correctness by the vendor. However, Metra has the right to request a beta version of software for evaluation. The Chief Mechanical Officer shall assign a personal in the Engineering group to investigate and distribute if it's required. New software shall be verified by Mechanical Department Engineering group to inherent compatibility with all other software and equipment. The Mechanical Department Engineering group shall create Field Modification, if software passes testing and verification, to update any changes to software. The Mechanical Department Engineering group shall follow through installation and insure Maximo Data system to reflect changes.

2.5.3. *Numbering*

2.5.3.1. Software will be numbered and tracked by the software part number that it has when assigned by the vendor of the software. These numbers will be used for tracking purposes only.

## Mechanical Department Quality Plan

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

2.5.4. *Distribution*

- 2.5.4.1. Distribution to departments and personnel will be authorized by Department Head, Mechanical Capital Projects of software. If software is issued to a certain class of equipment, the Department Head, Mechanical Capital Projects will have to authorize the uploading of the software to the equipment. The distribution of the Software Revision Tracking Report through will be handled Maximo data system. The owner and District shall update the Maximo data system once updating of software has been completed.

2.5.5. *Master List*

- 2.5.5.1. A Master List of all the most current software will be located in Maximo data system. The Master List shall include Software Name, Manufacturer Name, Version, System it is used for, Description, and Units it will be used on. The Project Quality Control Specialist shall contact supplier annually to confirm revision level of software. If supplier developed update to software, the Project Quality Control Specialist shall obtain latest software and provide it to Mechanical Department Engineering group for testing, verification and Installation.

2.5.6. *Revisions*

- 2.5.6.1. The manufacturer of software shall notify Chief Mechanical Officer of changes to software revision. The Chief Mechanical Officer shall assign a personal in the Engineering group to investigate and distribute if it's required. Revised software shall be verified by Mechanical Department Engineering group to inherent

## Mechanical Department Quality Plan

**PROCEDURE TITLE: DOCUMENT CONTROL**

**Mechanical Department MQPP Procedure # MQPP-04.01**

compatibility with all other software and equipment. The Mechanical Department Engineering group shall create Field Modification, if software passes testing and verification, to update any changes to software. The Mechanical Department Engineering group shall follow through installation and insure Maximo Data system to reflect changes.

2.5.7. *Review*

2.5.7.1. The Project Manager, Program Manager, Quality Representative, Engineer and any other personal deemed sufficient knowledgeable in topics will be included in the review as appropriate.

**3. ATTACHMENTS**

**Appendix A: Specification Template**

**Appendix B: Drawing Template**

**Appendix C: ECN Form**

**Appendix D: Modification Template**

**Appendix E: Software Control Table**

# APPENDIX A



## **Mechanical Department**

**SPECIFICATION  
TITLE GOES HERE**

**SPECIFICATION No. M-**

**REVISION:**

**DATE:**

## RECORD OF REVISIONS

REVISION	PREPARED BY	DATE	DESCRIPTION	APPROVED BY	DATE

**NOTE:** This document is to be considered “uncontrolled” when printed as a hardcopy from the network. The revision level must be verified prior to use.

Date:	Document No.	Page:	Prepared By:	Revision:	Approved By:
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# APPENDIX B

1	2	3	4	5	6	7	8
E							
D							
C							
B							
A							
1	2	3	4	5	6	7	8

ITEM NO.	DESCRIPTION	MATERIAL/ DRAWING	QTY	REMARKS

Metra MECHANICAL DEPARTMENT CHICAGO, IL 60661							
TITLE: TITLE GOES HERE							
DRAWN X. XXXXX XX/XX/XX CHECKED X. XXXXX XX/XX/XX  APPROVED  <small>UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES. NEGLIGENCE, FORGIVENESS, AND OTHER REQUIREMENTS ARE PER METRA SPEC M-13-D10 (Latest Revision)</small>				<small>REPORT ALL ERRORS AND DISCREPANCIES TO METRA MECHANICAL DEPT. IMMEDIATELY</small> <small>UNCONTROLLED IF NOT ACCESSED FROM THE MECHANICAL DEPARTMENT'S CONTROLLED NETWORK DRIVE. IT IS THE USER'S RESPONSIBILITY TO ENSURE LATEST REVISION</small>  X:X SCALE : SIZE B 1 OF 1 DWG NO M-XXXX REV <small>NOT TO SCALE IF PRINTED UNLESS OTHERWISE SPECIFIED</small>			
DESCRIPTION	REV.	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE

# APPENDIX C

ECN number:	<input type="text" value=" "/>	ECN--	Next ECN Number:	<input type="text"/>
Drawing number:	<small>Note: Do not use any letters, only numbers for drawing numbers. For non-Metra ECNs, please contact management to determine how to proceed.</small>			
Current DWG Rev:				
To Revision:	<input checked="" type="checkbox"/> Metra Drawing?			
# of Sheets:				
Sheet Number that changes:				
Prepared by:	Name: <input type="text"/> Date: <input type="text"/>			
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Closing Approved by Date:	Review 2 <input type="text"/> <input type="text"/>			
Current Requisition Open?	<a href="#">Please Select</a> <input type="button" value="▼"/>			
Description of Change:	<input type="text"/> 			
Reason for Change:	<input type="text"/>			
Effectivity:	<input type="text"/>			

[Add Another ECN](#)[Save and Exit](#)

# APPENDIX D



# MECHANICAL DEPARTMENT EQUIPMENT MODIFICATION PROCEDURE

## GENERAL INFORMATION

## RECORD OF REVISIONS

REVISION	PREPARED BY	DATE	DESCRIPTION	APPROVED BY	DATE

**DESCRIPTION:**

**JUSTIFICATION:**

**AFFECTIVITY:**

**RELATED DOCUMENTS:**

**TOOLS REQUIRED:**

**MATERIAL REQUIRED:**

<u>Description</u>	<u>QTY./CAR</u>
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Date:	Document No.	Page: Page 1 of 2	Prepared By:	Revision:	Approved By:
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SAFETY STATEMENT GOES HERE

**PROCEDURE**

Date:	Document No.	Page: Page 2 of 2	Prepared By:	Revision:	Approved By:
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# APPENDIX E

## Onboard Cab Signal and Engine Management Software and Hardware Revisions

Acceptable Software/Hardware Revisions:

- For F40PH-3 (Loco Numbers 100-149, 173-184, 215, 216 with Siemens/PHW Cab Signal)
- For F40PHM-3 (Loco Numbers 185-214 with Siemens/PHW Cab Signal)

Location	Function	Part. No	Revision	Acceptable Revisions	Notes
Back wall of cab (EM2000 Display)	Main Engine Software, CPM402 (100-149, 215, 216)	11582	24.08.01	24.08.01	
• Back wall of cab (EM2000 Display)	Main Engine Software, CPM500 (174, 175, 183, 184 Only)	12305	30.17.00	30.17.00	
• Back wall of cab (EM2000 Display)	Main Engine Software, CPM500 (150-173, 176-182, 185-214)	12446	30.17.05	30.17.05	
• Back of ATC Enclosure	Enclosure	D4652H01-A01	1	1	
Inside ATC Enclosure	ATC Cardfile	D1249H02-A01	0	0	
Inside ATC Enclosure	Power Supply	D1249H23-A01	1	1	
• Left side of ATC Enclosure	Interconnect PCB	D4652H08-A01	2	2	
Left side of ATC Enclosure	ISO RS-232 PCB	C1249H62-A01	1	1	
Left side of ATC Enclosure	Configuration Module PCB	D1249H10-A01	3	3	
Back of ATC Enclosure	Switch Panel	D4652H48-A01	0	0	
Inside Cardfile	Motherboard PCB	D1249H06-A01	2	2	
<b>G60-A05 MAIN</b>	Main PCB Hardware	D065G60-A05	3	0-3	
<b>G60-A05 MAIN</b> on IC1	Main PCB application software	A071G02-A31	6	6	
<b>G60-A05 MAIN</b> on IC16	Main PCB vital power supply	A071G03-A01	1	1	
Attached to <b>G60-A05 MAIN</b> PCB	Daughter PCB Hardware	C065G66-A05	3	0-3	
Attached to <b>G60-A05 MAIN</b> PCB on IC3	Daughter PCB - added memory	A071G05-A08	6	6	
<b>G09-A22 I/O</b>	I/O PCB Hardware	D065G09-A22	2	0-2	
<b>G09-A22 I/O</b> on IC1	I/O PCB application software	A071G04-A36	2	2	
<b>G09-A22 I/O</b> on IC16	I/O PCB vital power supply	A071G03-A01	1	1	
Attached to <b>G09-A22 I/O</b>	Daughter PCB Hardware	B065G29-A22	1	1	
<b>G09-A23 DECODER</b>	Decoder PCB Hardware	D065G09-A23	2	0-2	
<b>G09-A23 DECODER</b> on IC1	Decoder PCB application software	A071G04-A34	1	1	
<b>G09-A23 DECODER</b> on IC16	Decoder PCB vital power supply	A071G03-A01	1	1	
Attached to <b>G09-A23 DECODER</b>	Daughter PCB Hardware	B065G29-A23	0	0	
<b>G09-A24 SPEED I/O</b>	Speed I/O PCB Hardware	D065G09-A24	3	1-3	
<b>G09-A24 SPEED I/O</b> on IC1	Speed I/O PCB application software	A071G04-A35	2	2	
<b>G09-A24 SPEED I/O</b> on IC16	Speed I/O PCB vital power supply	A071G03-A01	1	1	
Attached to <b>G09-A24 SPEED I/O</b>	Daughter PCB Hardware	B065G29-A24	0	0	
<b>H32-A03 INTERFACE</b>	Interface PCB Hardware	D302H32-A03	3	1-3	
<b>H50-A10 CAB TEST</b>	Cab Test PCB Hardware	D185H50-A10	3	1-3	
<b>H50-A10 CAB TEST</b> on IC1	Cab Test PCB application software	A071G02-A32	1	0-1	
<b>H04-A02 DETECTOR</b>	ATS Detector PCB Hardware	D293H04-A02	2	2	
<b>G06-A12 60HZ</b>	60Hz Filter PCB Hardware	D109G06-A12	2	1-2	
<b>G06-A13 100HZ</b>	100Hz Filter PCB Hardware	D109G06-A13	2	1-2	
Cab of locomotive	ADU	D1249H37-A01	0	0	
Cab of locomotive	ADU Display PCB	D1249H38-A01	2	1-2	

• Added/Changed

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- For F40PH-2 (Loco Numbers 150-172 with Alstom Cab Signal)
- For F40PHM-2 (Loco Numbers 185-214 with Alstom Cab Signal)

Location	Function	Part. No	Revision	Acceptable Revisions	Notes
Slot 5 board	System Processor	40025-139-01	H	H	
Slot 5 board	PCB Hardware	59473-849-05	M	K,L,M	
Slot 13 board	Governor	40025-140-01	H	H	
Slot 13 board	PCB Hardware	59473-849-06	P	M, N, P	
Slot 11 board	System Test Board	40025-141-01	F	C, D, F	
Slot 11 board	PCB Hardware	59473-901-05	H	F, G, H	
Slot 6 board	Vital Input	39780-273-01	B	B	
		39780-273-02	B	B	
Slot 6 board	PCB Hardware	59473-845-03	J	H,J	
Slot 7 board	Vital Input	39780-273-03	B	B	
		39780-273-04	B	B	
Slot 7 board	PCB Hardware	59473-845-05	H	H	
Slot 8 board	Single Break Output	39780-275-01	A	A	
Slot 8 board	PCB Hardware	59473-885-01	F	E, F	
Slot 9 board	Single Break Output	39780-275-02	A	A	
Slot 9 board	PCB Hardware	59473-885-02	F	E, F	
		39780-274-01	B	B	
Slot 10	Double Break Output	39780-274-02	A	A	
Slot 10	PCB Hardware	59473-876-01	H	G, H	
Slot 14	VPC	40025-068-01	D	B, C, D	
Slot 14	PCB Hardware	59473-848-06	K	E, F, G, H, K	

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Current Revision: 4/22/2020 Approved by: *John R. Lamm*  
 Previous Revision: 5/8/2018

## Onboard Cab Signal and Engine Management Software and Hardware Revisions

Acceptable Software/Hardware Revisions:

- For MPI Locomotives (401-427 with Siemens/PHW Cab Signal)

Location	Function	Part. No	Revision	Acceptable Revisions	Notes
Inside short hood	EPIC CCU (406, 407, 408, 409, 410, 412)	N/A	D	D	
Inside short hood	EPIC BCU (406, 407, 408, 409, 410, 412)	N/A	D	D	
Inside short hood	EPIC CCU (all except 406, 407, 408, 409, 410, 412)	N/A	B	B	
Inside short hood	EPIC BCU (all except 406, 407, 408, 409, 410, 412)	N/A	B	B	
Back wall of cab (QES-III MMI)	Main Engine Software	N/A	11A10MC	11A10MC	
Back wall of cab (QES-III Software)	CPU Software for Original Inverter HEP with Mechanical Injection	2102886 Rev. -	11B01MC	11B01MC	See MOD-18-006
Back wall of cab (QES-III Software)	CPU Software for Caterpillar HEP with Mechanical Injection Only	2081415 Rev. C	11A13MC	11A13MC	See MOD-18-006
Back wall of cab (QES-III Software)	Comm CPU Software for Full Rehabbed (with Caterpillar HEP and EFI)	2097222 Rev. D	30095 1.0.2.0	30095 1.0.2.0	See MOD-18-006
Back wall of cab (QES-III Software)	Configurable Parameter File for Full Rehabbed (with Caterpillar HEP and EFI)	2097223 Rev. E	4	4	
Back wall of cab (QES-III Software)	CDU Display for Full Rehabbed (with Caterpillar HEP and EFI)	2090515 Rev. F or higher	5.1.4.0 or higher	5.1.4.0 or higher	
Back wall of cab (QES-III Software)	CDU Help/Config File for Full Rehabbed (with Caterpillar HEP and EFI)	2097221 Rev. A	A	A	
(EFI Controller, MVC-01 System)	EFI Controller Metra Firmware for Full Rehabbed (with Caterpillar HEP and EFI)	2102528	63.0.0.8	63.0.0.8	
(EFI Controller, MVC-01 System)	EFI Controller Parameters (Metra) for Full Rehabbed (with Caterpillar HEP and EFI)	2102530	1.0.0	1.0.0	
(Caterpillar, ECM System)	ECM Software for C18 for Caterpillar HEP Only	N/A	3948205	3948205	
Back of ATC Enclosure	Enclosure	D1249H01-A01	0	0	
Inside ATC Enclosure	ATC Cardfile	D1249H02-A01	0	0	
Inside ATC Enclosure	Power Supply	D1249H23-A01	1	1	
Left side of ATC Enclosure	Interconnect PCB	D1249H08-A01	3	1-3	
Left side of ATC Enclosure	ISO RS-232 PCB	C1249H62-A01	1	1	
Left side of ATC Enclosure	Configuration Module PCB	D1249H10-A01	3	1-3	
Back of ATC Enclosure	Switch Panel	D1249H48-A01	0	0	
Inside Cardfile	Motherboard PCB	D1249H06-A01	2	2	
<b>G60-A05 MAIN</b>	Main PCB Hardware	D065G60-A05	3	0-3	
<b>G60-A05 MAIN</b> on IC1	Main PCB application software	A071G02-A31	6	4-6	
<b>G60-A05 MAIN</b> on IC16	Main PCB vital power supply	A071G03-A01	1	1	
Attached to <b>G60-A05 MAIN</b> PCB	Daughter PCB Hardware	C065G66-A05	3	0-3	
Attached to <b>G60-A05 MAIN</b> PCB on IC3	Daughter PCB - added memory	A071G05-A08	6	4-6	
<b>G09-A22 I/O</b>	I/O PCB Hardware	D065G09-A22	2	0-2	
<b>G09-A22 I/O</b> on IC1	I/O PCB application software	A071G04-A36	2	2	
<b>G09-A22 I/O</b> on IC16	I/O PCB vital power supply	A071G03-A01	1	1	
Attached to <b>G09-A22 I/O</b>	Daughter PCB Hardware	B065G29-A22	1	1	
<b>G09-A23 DECODER</b>	Decoder PCB Hardware	D065G09-A23	2	0-2	
<b>G09-A23 DECODER</b> on IC1	Decoder PCB application software	A071G04-A34	1	1	
<b>G09-A23 DECODER</b> on IC16	Decoder PCB vital power supply	A071G03-A01	1	1	
Attached to <b>G09-A23 DECODER</b>	Daughter PCB Hardware	B065G29-A23	0	0	
<b>G09-A24 SPEED I/O</b>	Speed I/O PCB Hardware	D065G09-A24	3	1-3	
<b>G09-A24 SPEED I/O</b> on IC1	Speed I/O PCB application software	A071G04-A35	2	0-2	
<b>G09-A24 SPEED I/O</b> on IC16	Speed I/O PCB vital power supply	A071G03-A01	1	1	
Attached to <b>G09-A24 SPEED I/O</b>	Daughter PCB Hardware	B065G29-A24	0	0	
<b>H32-A03 INTERFACE</b>	Interface PCB Hardware	D302H32-A03	3	1-3	
<b>H50-A10 CAB TEST</b>	Cab Test PCB Hardware	D185H50-A10	3	1-3	
<b>H50-A10 CAB TEST</b> on IC1	Cab Test PCB application software	A071G02-A32	1	0-1	
<b>H04-A02 DETECTOR</b>	ATS Detector PCB Hardware	D293H04-A02	2	2	
<b>G06-A12 60HZ</b>	60Hz Filter PCB Hardware	D109G06-A12	2	1-2	
<b>G06-A13 100HZ</b>	100Hz Filter PCB Hardware	D109G06-A13	2	1-2	
Cab of Locomotive	ADU	D1249H37-A01	0	0	
Cab of Locomotive	ADU Display PCB	D1249H38-A01	2	1-2	

• Added/Changed

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## Onboard Cab Signal and Engine Management Software and Hardware Revisions

Acceptable Software/Hardware Revisions:

**For Cab Cars (8400-8478, 8501-8608)**

Location	Function	Part. No	Revision	Acceptable Revisions	Notes
Slot 5 board	System Processor	40025-190-01	F	F	
Slot 5 board	PCB Hardware	59473-849-19	H	F, G, H	
Slot 13 board	Governor	40025-189-01	B	B	
Slot 13 board	PCB Hardware	31166-037-08	G	D, E, F, G,	
Slot 11 board	System Test Board	40025-184-01	C	B, C	
Slot 11 board	PCB Hardware	59473-901-08	H	E, F, G, H	
Slot 6 board	Vital Input	39780-273-01	B	B	
		39780-273-02	B	B	
Slot 6 board	PCB Hardware	59473-845-03	J	H, J	
Slot 7 board	Vital Input	39780-273-03	B	B	
		39780-273-04	B	B	
Slot 7 board	PCB Hardware	59473-845-05	H	H, J	
Slot 8 board	Single Break Output	39780-275-01	A	A	
Slot 8 board	PCB Hardware	59473-885-01	F	E, F	
Slot 9 board	Single Break Output	39780-275-02	A	A	
Slot 9 board	PCB Hardware	59473-885-02	F	E, F	
Slot 10	Double Break Output	39780-274-01	B	B	
		39780-274-02	A	A	
Slot 10	PCB Hardware	59473-876-01	H	G, H	
Slot 14	VPC	40025-068-01	D	D	
Slot 14	PCB Hardware	59473-848-06	K	E, F, G, H, J, K	

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**• For Highliner Cars (1201-1226)**

Component	Function	Revision	Acceptable Revisions	Notes
• VVVF Inverter (Toshiba)	Software	111	111	
• Friction Brake Control Unit (Knorr)	Software	MB04B MB03B	1.20 1.00	1.10 & 1.20 1.00
• Auxiliary Power Unit (Faiveley)	Inverter	OS revision Application	1 3.1	1 3.1
	LVPS	OS revision Application	2.3 2.6	2.3 2.6
• Master Mobile Information Terminal (GeoFocus)	UCM: (uProc CTRL Module)	8.2.0 (8.2.6-B2)	8.2.0 (8.2.6-B2)	S-Car Only S-Car Only
	BSC: (Base Sys MMIT Code)	8.2.2 (8.2.6-B2)	8.2.2 (8.2.6-B2)	S-Car Only S-Car Only
	CUST: (Customer MMIT Specific)	8.1.34 (Metra) Palos Heights	8.1.34 (Metra) Palos Heights	S-Car Only S-Car Only
	LTGW: (LonTalk Gateway)	08/19/2004	08/19/2004	S-Car Only
	EMS: (Electronic Messaging Sys)	01/10/2004	01/10/2004	S-Car Only
	AUD: (Audio Adaptor Firmware)	1.14 or > (Metra)	1.14 or > (Metra)	S-Car Only
	LTGW: (LonTalk Gateway)	08/19/2004	08/19/2004	N-Car Only
	EMS: (Electronic Messaging Sys)	01/10/2004	01/10/2004	N-Car Only
• Analog Speed Indicator Control Module (Bach-Simpson)	SCI 52409-11	V1.0	V1.0	
• LED Sign (Hi-Tech)	Software	1.5	1.5	

• Added/Changed

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**• For Highliner Cars (1227-1386)**

Component	Supplier	Parts No.	Revision	Acceptable Revisions	Notes
• VVVF Inverter	Toshiba	SVF069-A1	111	111	
• Auxiliary Power Supply Unit	Faiveley	A538344	5.3	5.01 - 5.3	
• Friction Brake Control Unit	Knorr	807573	V1.32	V1.31 - V1.32	
• Master Terminal (LMT)	LATA	800-0006-01	2.6	2.6	S-Car only
• Control Terminal	LATA	800-0002-01	BLD 3.4.1	BLD 2.3.5 - BLD 3.4.1	
• Satellite Terminal (LST)	LATA	800-0006-02	2.6	2.6	N-Car Only
• LED SIGN	Hi-Tech	A07X02457	1.5	1.5	
• Radio Unit	Linovation (GE)	300588-039A (GE 12RII LC)	2.50O	2.50O	

• Added/Changed

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## Onboard PTC Software Revisions

Acceptable Software/Hardware Revisions:

	Component	Part. No	Revision	Acceptable Revisions	Notes
• TMC	TMC-4-15 TRAIN MANAGEMENT COMPUTER  (The Individual cards in TMC's Software is managed by the Transportation Department)	32547-22	6.3.17.2.1	6.3.17.2.1	Firmware & software updates downloaded automatically though the PTC Network via Cell, 200MHz Radio, and Wifi Systems and is controled by the PTC group
• CDU	CCP-CDU-04 ETMS	26870-22	6.3.17.2.1	6.3.17.2.1	Firmware & software updates downloaded automatically though the PTC Network via Cell, 200MHz Radio, and Wifi Systems and is controled by the PTC group
NSM	NSM-04 I-ETMS (NAVIGATION SENSOR MODULE)	28914P	1.4	1.4	
Transducer	SCD PSXD 3-PIN METRI-PACK Pressure Transducers (Vendor P/N 26908P)	26908P	A	A	
	ASY CABLE DIO-2400-CLASSIC 40FT (WRE P/N 29348-2)	29348-2	A	A	
Tri Mode	ASY TRI-MODE ANTENNA COMMLINK (Vendor P/N 28368P)	28368P	A	A	
Junction Box	ASY - CELL MODEM JUNCTION BOX ETMS (Vendor P/N 29552P)	29552P	A	A	
Data Recorder	PTC RECORDER I-ETMS/LEGACY LINK CONFIG (Vendor P/N 32189-15)	32189-15	U	U	
220 radio	133970 Locomotive ITC 220MHz Transceiver (CalAmp 133970)	133970	A	A	
AT&T modem	Sierra 4G MODEM AT&T	N/A	A	A	
Verizon Modem	Sierra 4G MODEM VERIZON	N/A	A	A	
• Event Recorder	Bach Simpson Event Recorder - Locomotive	23-04296-3	V3.02	V3.01	V3.02 Version Modified for PTC
• Event Recorder	Bach Simpson Event Recorder - EMUs	23-04295-5	V2.22	V2.21	V2.02 Version Modified for PTC
• Event Recorder	Bach Simpson Event Recorder - Cab Car	23-04293-0	V3.02	V3.01	V3.02 Version Modified for PTC

- Added/Changed

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Current Revision: 4/22/20 Approved by: *James R. Lewis*

Previous Revision: N/A

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# Laptop Equipment Software

Appendix B

Software	Company	Version	System	Description	Loco	Car	HL	Cables
WinDnld	Wabtec / Bach-Simpson	1.47	Event Recorder	Downloads data from event recorder. No special installation. Set Baud Rate to 38400 for Serial to USB. Has Logon Password for configuration. Setup File: Metra WinDNLD.msi For T5+ Event Recorder when using new HP laptops need EasySync Serial to USB adapter	Yes	Yes	Yes	Serial / USB
WinDas	Wabtec / Bach-Simpson	4.24	Event Recorder	Opens event recorder download files. No special installation or configuration. Setup File: Generc Setup.msi	Yes	Yes	Yes	n/a
Tera Term Pro	Freeware	2.3	EM2000	Freeware emulator interfaces with EM2000. No special installation or configuration. Setup File: Setup.exe	Yes	No	No	Serial / USB
PTEMetra	PHW Inc	0.93	Cab Signal	Downloads cab signal data. No special installation or configuration. Setup File: Setup.exe	Yes	No	No	
PTE for Highliner2	Toshiba	PRED 251-0102 (R155)	Propulsion	Only for Metra Electric new Highliners. No special installation or configuration. Setup File: Setup.msi	No	No	Yes	RS-422 / USB
HDPlayer	Apollo	3.5.1	DVR	Downloads DVR files from a removed DVR hard drive. No special installation or configuration. Setup File: HDPlayer.msi	Yes	Yes	Yes	USB
RasPlus	Apollo	2.5.6	DVR	Download DVR files from a still onboard DVR hard drive. See Maint Practice 27 for install. Load setup file Metra.xml file to configure. Setup File: Setup.exe	Yes	Yes	Yes	Ethernet
Mona	Faiveley	3.7.5.2	Battery / Inverter	This is the new version used for Highliners and Gallery cars. See Install Guide for install and config. See Maint Practice 21 as reference. Need "null adapter" to operate. Setup File: Need to run 3 batch files	No	Yes	Yes	Serial / USB
QTRON Quads	Wabtec	5.7.1.5	MPI-QES	MPI QES diagnostic tool, QTRON Installation Code: QUADS500 Customer Code: 1C16 Codes are in all CAPS. Setup File: QUADS_5.7.1.5.exe	Yes	No	No	Serial / USB
• Q-Tron / MPI	Wabtec	5.7.3.0 or higher	Laptop/PTE	QUADS Diagnostic Software for Original Inverter HEP with Mechanical Injection Part No.: 2060930 Revision: H or higher File Name: QUADS_5.7.3.0.exe	Yes	MP36	No	No
Das III	Wabtec	1.1.0.15	ETMS	Only for Rock Island for ETMS. Two install files; one needs password. Setup File: dotNetFx40_Full_x86_x64.exe DAS_III.exe	Yes	Yes	No	
Epic	Wabtec	1.1.0	MPI-Epic Airbrake	Diagnostic terminal for Epic Airbrake tests. No special installation. Set Opt to Com 1. Setup File: EPIC Diagnostic Maintenance Terminal.msi	Yes	No	No	
Communicator Ext	Electro Ind	3.0.546	Load Bank	Uses infrared to connect to Loco load bank. See setup document. Setup file: Setup.exe	Yes	No	No	Infrared
• DVR	Railhead	4.3.0	DVR	Railhead splash screen (Installed by Metra)	Yes	Yes	Yes	
The above software requires no special licensing, activation, or keys. All software should be installed on all laptops. Some downloads require WordPad to open.								
Service Terminal ST03A	Knorr	Old: 2.4.07 New: 3.2.10	Airbrake	Only for Metra Electric new Highliners. This software requires a license and activation for usage on laptops. Include METRA_ST03.prz project file. Setup File: Setup.exe	No	No	Yes	
• DVR	PowerView	3.0.6904	DVR	DVR Playback tool software (Installed by PRS)	Yes	No	No	

• Added/Changed

Current Revision: 4/22/2020 Approved by: *John R. Lewis*

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Previous Revision: 5/8/2018

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## Mechanical Department Quality Plan

**PROCEDURE TITLE:** Purchasing

**Mechanical Department MQPP Procedure # MQPP-05.01**

### REVISION HISTORY

<b>DOCUMENT REVISION HISTORY</b>				
<b>REVISION DATE</b>	<b>REVISION NUMBER</b>	<b>SECTION NUMBER</b>	<b>REASON FOR REVISION</b>	<b>DESCRIPTION</b>
5/5/16	N/A	N/A	N/A	<b>NEW PROCEDURE</b>
3/12/20	A	4.1, 4.2, 5.1	Updated to reflect new Metra electronic TRAX System process	Updated to reflect new electronic TRAX System process
12/14/22	B	4.1, 4.2, 5.1	Updated to reflect D365 as Metra electronic procurement system	Updated to reflect D365 as Metra electronic procurement system that replaced TRAX

# Mechanical Department Quality Plan

**PROCEDURE TITLE:** Purchasing

**Mechanical Department MQPP Procedure # MQPP-05.01**

## 1.0 PURPOSE

- 1.1 The purpose of this document is to establish the procedure for the procurement of products and services as it relates to the Metra Mechanical Department Capital projects.

## 2.0 SCOPE

- 1.1 This procedure applies to all Mechanical Department employees when purchasing procuring products or services. This document establishes the procedure for the procurement of products and services as it relates to the Metra Mechanical Department Capital projects.

## 3.0 PROCEDURE/PROCESS/INSTRUCTIONS

### 4.1 Procurement of products and services

- 4.1.1 Requisition – Complete the following prior to submittal to procurement department through the D365 System:
  - 4.1.1.1 Requisition Checklist – Complete for upload to D365.
  - 4.1.1.2 Independent Cost Estimate (ICE) – Complete for upload to D365.
  - 4.1.1.3 Price List – Complete and upload to D365. If specification does not specify a timeline for project deliverables, specify on price list.
  - 4.1.1.4 Technical requirements and scope of work including but not limited to specifications, drawings, salient characteristics, etc. – Complete and upload to D365.
  - 4.1.1.5 Requisition through D365 – Complete and upload all documents listed in 4.1.1.1 through 4.1.1.4 and make sure to specify the correct delivery location and any special instructions.
  - 4.1.1.6 Mechanical Department Management approval – Obtain signatures through D365 workflow.
  - 4.1.1.7 Financial Approval – Obtain grants or budget approval based on type of funding being used for procurement through D365 workflow.
  - 4.1.1.8 Insurance/Risk – Obtain signature and documents if required through D365 workflow.
- 4.1.2 Submittal through D365 – After all the signatures are obtain through D365 the requisition moves through the workflow to the Procurement Department for processing through D365.

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE:** Purchasing

**Mechanical Department MQPP Procedure # MQPP-05.01**

4.1.3 Vendor compliance evaluation – Request will be sent from the Procurement Department and must be performed prior to the award of contract. Evaluation shall be completed to ensure the vendor is capable of the following:

4.1.3.1 Meeting all technical requirements including but not limited to all specifications and drawings.

4.1.3.2 Meeting all delivery requirements

4.1.3.3 Meeting all project deliverables

**4.2 Procured products and services**

4.2.1 A purchase order will be issued from the procurement department through D365.

4.2.2 Upon receipt of purchase order:

4.2.2.1 Contact the vendor for a schedule for all deliverables

4.2.2.2 Review and either approve or deny all deliverables

4.2.2.3 Ensure all deliverables have been met

4.2.2.3.1 If vendor is not capable of meeting the deliverables of the contract the process of putting the vendor in breach of contract shall be started.

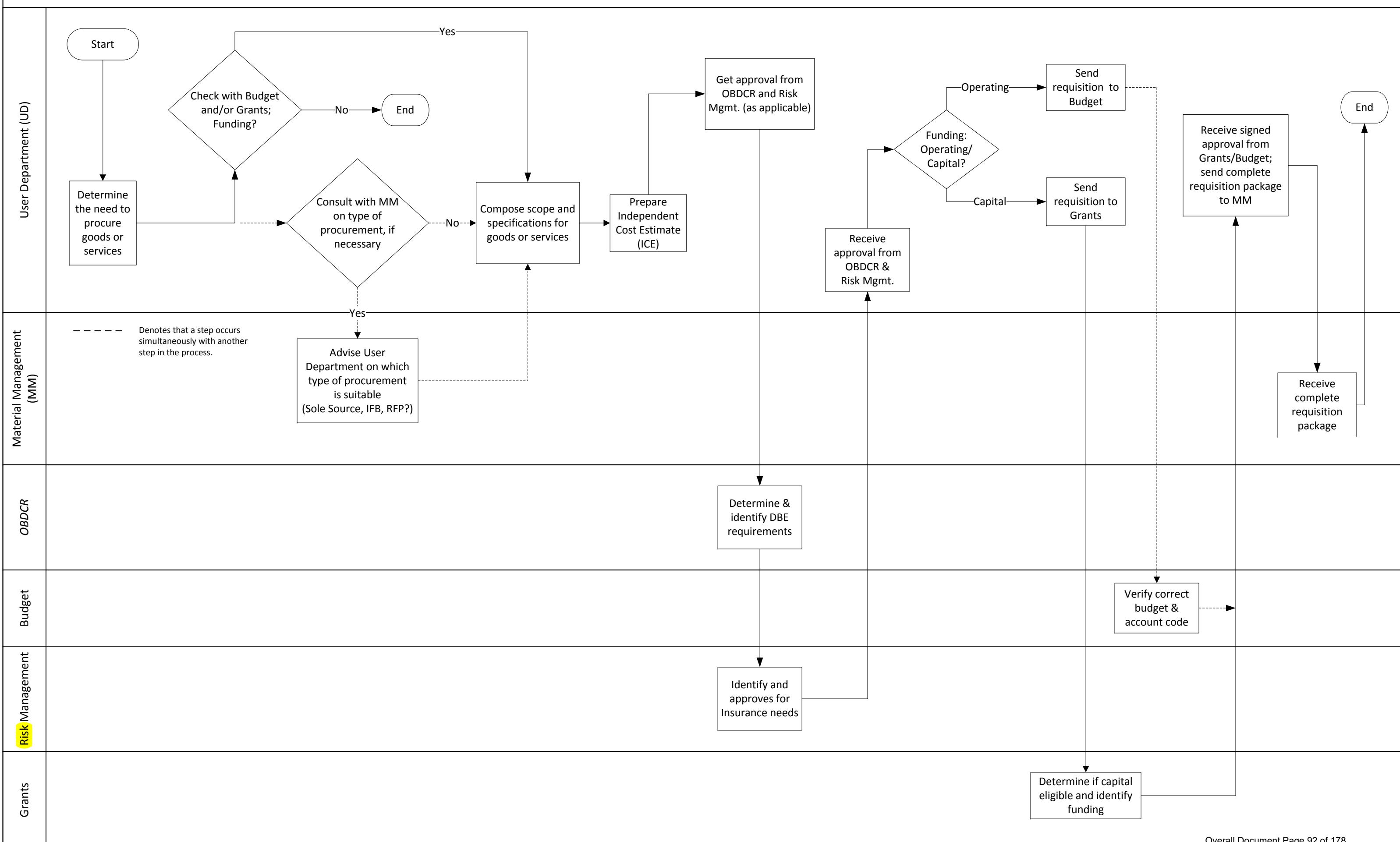
**5.0 Attachments**

**5.1 Appendix A: Metra Requisition Package Process through D365**

**Appendix B: Requisition Form – Quick Reference Card**

**Appendix C: Independent Cost Estimate Calculation Worksheets**

**Appendix D: Requisitioner's Checklist – For IFBs**





# **Requisition Form – Quick Reference Card**

For details, see: Metra's Procurement Process Workshop Manual

Enter all the information requested, wherever there's room, including here. (Or attach it.)

Use your Metra's  
Procurement Process  
Workshop booklet for  
detailed information.

**Box 5. Select the procurement type(s) that apply.**

Box 11(A-C). Suggest 3 vendors, if possible.

Box 13. Enumerate each item being requisitioned. (1/2/3)

**Accounting Distribution Code:**  
Verify that the codes you enter are correct.  
(For informals, list freight charges as a separate line item using Account Code 00XXXX-3810-5000.)

Box 15-16. For each line item, identify percent (of grant funds) or quantity as applicable.

Box 17. Enter Unit of Measure abbreviation from Materials System, or Workshop booklet.

risk, have the Executive Director sign.		responsible for those inspections.	
<p><b>REQUISITION</b></p> <p>USE TYPEWRITER OR BALLPOINT. IF BALLPOINT IS USED, PRESS FIRMLY.</p> <p>5. CHECK ALL APPLICABLE:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> STANDARD PURCHASE (P)</li> <li><input type="checkbox"/> SOLE SOURCE (S)</li> <li><input type="checkbox"/> CAPITAL FUNDED (U)</li> <li><input type="checkbox"/> PROFESSIONAL SERVICES (E)</li> <li><input type="checkbox"/> REPAIR &amp; RETURN (R)</li> <li><input type="checkbox"/> UNIT EXCHANGE (X)</li> <li><input type="checkbox"/> CONSTRUCTION (C)</li> <li><input type="checkbox"/> MASTER AGREEMENT (M)</li> <li><input type="checkbox"/> SALE (Q)</li> <li><input type="checkbox"/> AMENDMENT (A)</li> <li><input type="checkbox"/> CHANGE ORDER (O)</li> <li><input type="checkbox"/> BLANKET PURCHASE ORDER (B)</li> </ul> <p>BPO/BSD TYPE = <input type="checkbox"/> STOCK <input type="checkbox"/> NON-STOCK</p> <p>BPO/BSD EFFECTIVE DATE _____</p> <p>ESTIMATED NO. RELEASES _____</p> <p>NO. RELEASING SITES _____</p> <p><input type="checkbox"/> 9. EMERGENCY REQUISITION APPROVAL _____</p> <p>10. FINAL INSPECTION DEPARTMENT _____</p> <p>11. SUGGESTED SOURCES (NAME, ADDRESS AND TELEPHONE NUMBER):            A. _____ B. _____ C. _____</p> <p>12. PREVIOUS P.O. #/S.O. # _____</p> <p>13. ITEM            (ORGANIZATION) ACCOUNTING/DISTRIBUTION CODE            (ACCT. DISTRIB. CODE) (PROJECT #)</p> <p>15. %            16. QTY.            17. U/M</p> <p>18. METRA PART #            19. STATUS</p> <p>20. DESCRIPTION            21. EST. UNIT PRICE            22. EXTENSION            23. LOC.</p> <p>24. REQUISITIONING            DEPARTMENT: _____</p> <p>25. REQUISITION APPROVED: BUDGET CHECKED, &amp;            AUTHORITY TO EXPEND FUNDS/TO SELL GRANTED BY:            SIGNATURE/PRINTED NAME/DATE</p> <p>26. APPROVED FOR            PROCESSING            DIRECTOR OF PROCUREMENT/DATE            OR DIRECTOR OF PROFESSIONAL SERVICES/CONTRACTS            Leave blank.</p> <p>27. ESTIMATED            TOTALS:            PAGE 1 OF</p> <p>RC73 (7/92)            APPROVED (DEPT. MGR.)            PROCUREMENT</p>		<p>R 134309</p> <p>1. PROCUREMENT NO./SALE NO. _____ 2. DATE _____</p> <p>Leave blank.</p> <p>3. DELIVERY/PICK-UP REQUIRED BY _____ 4. BUYER _____</p> <p>Leave blank.</p> <p>6. LOCATION:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 2067 W. 123rd St. (01)            Attn: Storekeeper            Blue Island, IL 60406</li> <li><input type="checkbox"/> 127th &amp; Indiana Ave. (05)            Attn: Storekeeper            Chicago, IL 60628</li> <li><input type="checkbox"/> 2741 W. Grand Ave. (02)            Attn: Storekeeper            Chicago, IL 60612</li> <li><input type="checkbox"/> 547 W. Jackson Blvd. (06)            Attn: Admin. Services            12 Floor East            Chicago, IL 60661</li> <li><input type="checkbox"/> 14th St. East of Indiana (03)            Attn: Storekeeper            Chicago, IL 60605</li> <li><input type="checkbox"/> Other _____</li> <li><input type="checkbox"/> 147 W. 47th St. (04)            Attn: Storekeeper            Chicago, IL 60609</li> </ul>	

Box 24. Two people sign box 24. When one person serves both roles, affix the higher authority signature.  
**Print contact name/extension #.**

Box 25. Obtain the funding authorization signature. For:  
Capital funds - Grants signs.  
Operating funds - Budget signs.

Box 27. Sum up column 22.  
This requisition total must be  
within the approval limits set up  
by the Budget Authority.

Box 2. Enter today's date.

Box 3. Enter the desired delivery/start date. **Don't use ASAP.**

**Box 6.** Identify where and/or to whom the material should be delivered.

**Box 12.** Enter the most recent relevant PO #, if one exists.

Boxes 18 & 19. For purchases into inventory, enter inventory part # and status (N)ew or (W)aiting.

**Box 20.** Clearly describe each item, or attach specifications.

**Box 21.** Enter the estimated price for each unit

**Box 22.** Calculate the total price for each line item.  
(Box 16 \* Box 21)

Box 23. Specify the Storehouse Location code for split deliveries (see Box 6)

Date:	
Prepared By:	
Department:	
Requisition Number:	

N.B.—This is the unlocked (unprotected) version of the spreadsheet! To lock, "Review, Protect Sheet, password to unprotected worksheet"

### INDEPENDENT COST ESTIMATE CALCULATION WORKSHEET for Materials and Equipment

**As required for: (1) All Capital Purchases, (2) All Operating Purchases over \$250,000.00 and (3) All Construction, Demolition, Rehabilitation, Renovation and Building Maintenance Projects over \$40,000.00**

Converts Previous Purchases to Current Prices (PPI)

To develop a current equivalent price for a previously purchased item, enter the price for each Item Number in the column for the year it was last purchased.

Also complete Number of Items to calculate a Line Total and Grand Total.

Note: For Services/Labor use the Labor tab.

Materials and Equipment Item Description	2017	2018	2019	2020	2021	2022	Current Equivalent Price	Number of Items	Line Total	Future Cost Per Item (2023)	Future Cost Per Item (2024)	Future Cost Per Item (2025)	Future Cost Per Item (2026)
Item #1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Item #40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>GRAND TOTAL</b>									<b>\$0.00</b>				

		<b>For Procurement Use Only</b>						
For Purchase Agreements, indicate the number of years to escalate the contract (0 to 5 Years).		0	2023 Price Total	2024 Price Total	2025 Price Total	2026 Price Total	2027 Price Total	Total 5-Year Escalated Price
<b>Total Estimated Contract Amount (Including Escalation)</b>		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

The preceding assumes the PPI will remain constant at its current level (109% annually).

Signed by: \_\_\_\_\_

Date:	
Prepared By:	
Department:	
Requisition Number:	

N.B.--This is the unlocked (unprotected) version of the spreadsheet! To lock, "Review, Protect Sheet, password to unprotect worksheet"

### INDEPENDENT COST ESTIMATE CALCULATION WORKSHEET for Professional Services and Labor

**As required for: (1) All Capital Purchases, (2) All Operating Purchases over \$250,000.00 and (3) All Construction, Demolition, Rehabilitation, Renovation and Building Maintenance Projects over \$40,000.00**  
Converts Previous Purchases to Current Rates (CPI)

To develop a current equivalent price for a previously purchased item, enter the price for each Service in the column for the year it was last purchased.

Also complete Number of Hours to calculate a Line Total and Grand Total.

Note: For Materials/Equipment use the Materials tab.

Services and Labor Line Item Description	2015	2016	2017	2018	2019	2020	2021	2022	Current Equivalent Price	Number of Hours	Line Total
Item #1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Item #20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
<b>GRAND TOTAL</b>											<b>\$0.00</b>

For Procurement Use Only						
For Purchase Agreements, indicate the number of years to escalate the contract (0 to 5 Years).		2023 Price Total	2024 Price Total	2025 Price Total	2026 Price Total	2027 Price Total
Total Estimated Contract Amount (Including escalation, if any)	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

The preceding assumes the CPI will remain constant at its current level (103.6% annually).

Signed by: \_\_\_\_\_

# Requisitioner's Checklist – for IFBs

**For:** All capital purchases

All operating purchases over \$250,000\*

\*Or over \$40,000 for construction, demolition, rehabilitation, renovation and building maintenance projects

**Requisitioner:** Before submitting your Requisition in AX: use this checklist to attach all required documents – including your completed, signed checklist.

<b>Requisitioner</b>		<b>Phone #</b>	
<b>Requisitioning Department</b>		<b>PM &amp; Phone # if applicable</b>	

<b>Funding</b>	<input type="checkbox"/> FTA <input type="checkbox"/> MET/IDOT/RTA <input type="checkbox"/> Operating	<b>Purchase Agreements (PA) only:</b>	Previous \$ value \$
<b>Previous PA/PO #</b>			Remaining \$ value \$
			Expiration date

<b>Required Requisition Attachments</b>			
Check off the required attachments as you attach them to the Requisition. It will be returned if they are not included.			
Att. #1	<input type="checkbox"/>	Independent Cost Estimate (ICE)	Check both: <input type="checkbox"/> ICE is signed and dated <input type="checkbox"/> Appropriate supporting documentation is included (source information used to prepare the ICE - previous POs, published pricing, DOL escalation tools, internet research, etc.)
Att. #2	<input type="checkbox"/>	Scope of work/Descriptive information	Check one or more: <input type="checkbox"/> Salient characteristics/description <input type="checkbox"/> Metra specifications <input type="checkbox"/> Metra drawings (recommend one PDF file, plus for Professional Services: 12 printed copies; or for Procurement: 6 printed copies)
Att. #3	<input type="checkbox"/>	Current price list	

<b>Additional Information</b>			
Is the product subject to the requirements of the PTC Safety Plan Product Vendor List?			
<input type="checkbox"/> Yes	<input type="checkbox"/> No	If Yes, what is the product?	
Does potential exist for hazardous materials to be present at the jobsite?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	If Yes, have documents been submitted to Industrial Hygiene/Environmental Compliance for review? <input type="checkbox"/> Yes <input type="checkbox"/> No

## Requisitioner's Checklist – for IFBs

### Procurement Summary Language

Describe the procurement in detail, in layman's terms, for the Procurement Summary.  
Include: Who, What, When, Where and Why.

**Requisitioner:** This checklist is complete, and the three attachments, as required, have been attached to the Requisition, using AX's "Purchase requisition line" dropdown menu's Attachments command.

Please type your name here, &  
attach this to your Requisition: **X** \_\_\_\_\_



## Mechanical Department Quality Plan

**PROCEDURE TITLE: WARRANTY PROCEDURES**

**Mechanical Department Procedure #:MQPP-5.02**

### REVISION HISTORY

<b>DOCUMENT REVISION HISTORY</b>				
<b>REVISION DATE</b>	<b>REVISION NUMBER</b>	<b>SECTION NUMBER</b>	<b>REASON FOR REVISION</b>	<b>DESCRIPTION</b>
8/28/19	N/A	N/A	N/A	Procedure incorporated as part of the Quality Plan.



## Mechanical Department Quality Plan

**PROCEDURE TITLE: WARRANTY PROCEDURES**

**Mechanical Department Procedure #:MQPP-5.02**

### 1. PURPOSE

- 1.1. The purpose of this document is to establish procedures for ensuring the provisions for warranty are established, recorded, tracked, and claims are pursued by the Mechanical Department.
- 1.2. These goal is to establish and implement a robust warranty program that ensures that the cost of defects are borne properly by the providers of products and services and not by Metra.
- 1.3. Warranty terms should be specified in all contracts and purchase orders, based, where applicable, on break-even analyses of warranty costs versus likely repair cost savings.
- 1.4. Procedures must be put in place in order to flag all instances for items that might be covered by a warranty so it can be properly documented and warranty claims are recovered by Metra for all warranty-covered costs that are incurred.

### 2. SCOPE

- 2.1. This procedure applies to all Mechanical Department procurements of products and services.
- 2.2. This procedure also applies to Procurement Department documents that are required to specify warranty provisions and requirements.

Date: 8/28/19	Document No.: MQPP 5.02	Page: Page 2 of 17	Revision: First Issue
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## Mechanical Department Quality Plan

**PROCEDURE TITLE: WARRANTY PROCEDURES**

**Mechanical Department Procedure #:MQPP-5.02**

### 3. WARRANTY CLAUSE

- 3.1. Warranty clauses are required for all Mechanical Department procurements of products and services and may be included in Procurement, Technical Specifications, or Projects documents.
- 3.2. Metra's Procurement Terms and Conditions (included in procurement solicitations) specify that contractors warrant that all items delivered to Metra shall be free from defect of material and workmanship. In addition, items shall conform to all samples, specifications add/or drawings as applicable, and will fit for purpose for which purchased. Metra may return-any nonconforming or defective items to the Contractor(s) or require correction or replacement of the items at the time the defect is discovered, all at the contractor's risk and expense. Acceptance by Metra or payment shall not relieve the Contractor(s) of their responsibilities.
- 3.3. Contract, procurement, technical specifications, or projects documents may specify warranty clauses that are specific to the items procured.

### 4. WARRANTY TYPE

- 4.1. Unless otherwise provided for in the contract documents, a "zero-defects" warranty type shall be adopted. Contractor(s) are required to deliver products and services that conforms to all contractual requirements and are free of defects.

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### 5. WARRANTY PERIOD

- 5.1. Contract documents shall specify the period that the contractors' obligation begin and end and the remedy requirements for all discovered defects. This period may be a stated period of time, amount of usage, or the occurrence of a specified event.
- 5.2. The actual duration specified by Metra in the contract documents should consider factors such as the estimated useful life of the item and should align with established shelf and service life requirements. Warranty duration must be of enough length to determine that the requirements have been achieved.
- 5.3. Unless otherwise specified in the contract, procurement, technical specifications, or projects documents, the warranty period shall default to one (1) year from date of delivery or date of final acceptance by Metra, whichever is later.

### 6. LIQUIDATED DAMAGES

- 6.1. For rolling stock contracts, Metra is to include liquidated damages provisions.
- 6.2. The liquidated damages provisions are to be included to compensate Metra in the event of failure by a contractor to deliver rolling stock within the planned schedule as specified in the contract documents.
- 6.3. Payment of liquidated damages by a contractor (and acceptance thereof by Metra) does not constitute a waiver or settlement of any warranty or other claims for damages for such breaches (other than for delay in delivering acceptable rolling stock). The liquidated damages are solely for damages arising out of the delay in delivery of acceptable rolling stock, and do not compensate Metra for damages for

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## Mechanical Department Quality Plan

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breach of warranty or other breach to which Metra may be entitled to in addition to the liquidated damages, whether before or after termination of a contract by Metra.

- 6.4. In any instance in which a deficiency causes a rolling stock unit to become unavailable for service, and a contractor fails to complete a warranty correction to such deficiency within a time sufficient to enable the unit to be tested and returned to service within the contractually specified period, the contractor may be required to pay to Metra as liquidated damages additional sums.
- 6.5. Metra may specify in the contract documents that there shall be no cap or maximum on the amount of liquidated damages.

### 7. METRA'S WARRANTY NOTICE AND CLAIM

- 7.1. Metra will provide contractors written notice of breach of any warranty provided for by the contract documents. This includes without limitation, notice of a deficiency within a reasonable time after Metra observes and verifies any failure, malfunction, or condition of, any rolling stock, equipment, work, component or part, that the failure, malfunction or condition arises from a deficiency or other breach of warranty.
- 7.2. Metra may file claims for any deficiency that is consistent with the notice provisions in the contract documents. Metra shall submit to the contractors a claim in writing for such costs and expenses.
- 7.3. The warranty claims shall identify the deficiency and the correction to which such costs and expenses are related, and shall provide such other information necessary

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## Mechanical Department Quality Plan

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to document the costs and expenses incurred by Metra and their relationship to the deficiency and the correction.

- 7.4. After the Contractor's receipt of Metra warranty claim, the contractor shall reimburse Metra in a timely manner for all such costs and expenses within time period specified in the contract documents.
- 7.5. Should Metra determine in its sole discretion to invoke its right to liquidated damages pursuant to the contract documents, Metra shall submit a warranty claim within a reasonable time subsequent to the conclusion of the corrected deficiency.
- 7.6. In the event that Metra incurs any cost or expense in the inspection, testing, analysis, diagnosis or correction of any deficiency, and if Metra in its sole discretion determines to seek reimbursement therefore from a contractor pursuant to the contract document provisions, Metra shall within a reasonable period of time identify the deficiency and the correction giving rise to the liquidated damages and providing such information necessary to establish Metra's entitlement to Liquidated Damages.

### **8. CORRECTIVE ACTION REQUIREMENTS**

- 8.1. Contractor(s), at their sole cost, and without cost or expense to Metra, shall commence, using qualified personnel, appropriate action within the time period by Metra to correct the deficiency.

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- 8.2. Corrective action shall include without limitation, adjustment, repair, replacement, reengineering and redesign as appropriate to fully and completely address and remedy the deficiency or other problem in each affected rolling stock, equipment, work, component or part, so that the item shall perform as specified by the contract, and to ensure that the deficiency will not recur.
- 8.3. Contractor(s) shall promptly and diligently pursue all corrections to Metra's complete, satisfactory conclusion.
- 8.4. All corrections shall comply with all contract requirements and shall not result in any rolling stock, equipment, work, component or part failing to comply with any requirement of any provision of a contract.
- 8.5. All corrections shall employ and require only parts that perform comparably to that originally intended by the contract, and shall be of cost comparable to the cost of the deficient part prior to correction.
- 8.6. Contractor(s) shall perform, at its sole cost, any tests that Metra may reasonably require to verify that any correction made will correct the deficiency and that the correction will comply with all requirements of the contract.
- 8.7. All corrections shall be without cost or expense to Metra. All costs and expenses of any correction shall be at the Contractor's sole cost. Contractor(s) shall also bear all costs and expenses of removal, replacement and reinstallation and testing of other equipment, components, work and parts necessary to gain access to the deficiency or to accommodate the correction.

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- 8.8. Contractor(s) shall also bear all transportation costs for or associated with any deficiency or correction.
- 8.9. Contractor(s) shall provide, at its sole expense and at no cost or expense to Metra, all facilities and equipment necessary to carry out the investigations, analyses and diagnoses needed to determine the cause and extent of the deficiency or other breach of warranty, and to complete all correction thereof and all associated work.
- 8.10. Contractor(s) shall promptly provide to Metra, without cost or expense to Metra, all updated parts manuals and maintenance manuals that include all information related to any correction.
- 8.11. Contractor(s) shall reimburse Metra, as provided for in the contract documents, for all Metra costs and expenses reasonably incurred in the investigation, analysis, diagnosis or correction of any deficiency.
- 8.12. Contractor(s) shall be solely liable for any and all injury, loss or damage to any person, or to any rolling, equipment, work, component or part, or other Metra property, caused by any work performed to make any correction.
- 8.13. In addition to correction of any deficiency, Contractor(s) , at their sole cost, shall correct without cost or expense to Metra any other rolling stock, equipment, component, work or part that was caused to be damaged or adversely affected by a deficiency.

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- 8.14. All corrected components and parts used, and repairs made, to correct deficiencies shall be subject to acceptance by Metra and shall be subject to the same requirements as are set forth in the Contract for the original components
- 8.15. If a correction hereunder has required the Contractor(s) to reengineer or redesign a component, the Contractor(s) shall, without cost to Metra and at Contractor's sole cost, replace all Metra owned spare parts comprising that component with the corrected items or detail parts.
- 8.16. Upon Metra's Notice to the Contractor(s) they shall promptly, but in any event not later than the period specified in the Contract documents after such notice, unless Metra agrees to a longer interval, commence and thereafter prosecute with due diligence and using qualified personnel, all activities necessary to investigate, analyze and diagnose the cause and extent of the deficiency and the proper correction thereof. Contractor(s) shall promptly provide a written report to Metra describing the cause and extent of the deficiency and the Contractor's proposed correction thereof.
- 8.17. Contractor(s) shall submit for Metra's approval and, following Metra approval, shall promptly implement and satisfactorily complete Metra approved corrections of all affected components, at the Contractor's sole cost and at no cost or expense to Metra.

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## Mechanical Department Quality Plan

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### 9. FLEET DEFICIENCY

- 9.1. A Fleet Deficiency may exist when a warranty repair or redesign to similar components, equipment or materials is required that exceed a percentage (specified in the contractual documents. Upon Metra's Notice to the Contractor(s) that a Fleet Deficiency exists, Contractor(s) shall promptly, but in any event not later than the period specified in the Contract documents after such notice, unless Metra agrees to a longer interval, commence and thereafter prosecute with due diligence and using qualified personnel, all activities necessary to investigate, analyze and diagnose the cause and extent of the Fleet Deficiency and the proper correction thereof.
- 9.2. Contractor(s) shall promptly provide a written report to Metra describing the cause and extent of the Fleet Deficiency and the Contractor's proposed correction thereof.
- 9.3. Contractor(s) shall submit for Metra's approval and, following Metra approval, shall promptly implement and satisfactorily complete Metra approved corrections of all affected components, at the Contractor's sole cost and at no cost or expense to Metra.
- 9.4. Contractor(s) shall make the correction to all equivalent components in the fleet, not just those in which a failure or malfunction has occurred, including without limitation, all components for which any Warranty period has expired, and to all equivalent Metra-owned spare parts.

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- 9.5. The Fleet Deficiency remedy provided for in this paragraph is in addition to, and shall not be construed as a limitation of, any other rights or remedies provided for by this Article or any other provision of the Contract or the law.

### **10. TIMELINESS**

- 10.1. Time is of the essence in the corrections of all deficiencies to be undertaken under all applicable warranties.
- 10.2. Unless otherwise directed in Metra's Notice to Contractor(s) of a deficiency, Contractor(s) shall commence correction of the deficiency at the time specified by Metra, but in any event not later than the period specified in the Contract documents, unless Metra agrees to a longer interval.
- 10.3. To ensure timely corrections, Contractor(s) shall make provisions to have available all necessary facilities and special equipment, and shall use such qualified engineers and product and system specialists as are necessary, including diversion of such persons from the Contractor(s) 's other operations or from the operations of their subcontractor(s) and suppliers.
- 10.4. Contractor(s) shall also use additional shifts and work on weekends and holidays, as necessary, to complete timely corrections in accordance with the contract documents.

### **11. PROHIBITION OF USE OF METRA FACILITIES**

- 11.1. Metra facilities may not be used for repair work by Contractor(s), unless authorized by Metra.

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### 12. USE OF METRA-OWNED SPARE PARTS

- 12.1. At the sole discretion of Metra, as determined on a case-by-case basis, Metra owned spare parts may be utilized by the Contractor(s) for correction purposes.
- 12.2. Contractor(s) must replace each borrowed part with an equivalent (like-for-like) part within thirty (30) calendar days. Consequently a new part must be replaced with new, a unit exchange parts (UTEX) replaced with UTEX or new.
- 12.3. All costs associated with replacing the spare parts shall be borne by the Contractor(s).

### 13. REPAIRS BY METRA

- 13.1. At Metra's sole discretion and option, Metra may investigate, analyze, diagnose and perform the redesign, replacement, or repair of any deficiency, as the contractor's agent, and Contractor shall pay Metra for such work as provide for in the contract documents.
- 13.2. The Contractor(s) shall, if required by Metra, supply components, materials, or equipment within the time period specified in the contract documents after Metra's request in each case.

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13.3. As provide for in the contract documents, Contractor(s) may be required to pay Metra the cost of the warranty work for:

- 13.3.1. Outside engineering fees.
- 13.3.2. Labor supplied by Metra by multiplying the number of man-hours of Metra labor actually supplied to correct the defect by the wage rate and percent shop overhead.
- 13.3.3. The cost of moving the equipment if such action is necessary, all applicable freight charges, and Metra's material additives in effect at the time on components, materials, supplies, or equipment furnished by Contractor(s) .

### **14. NO WAIVER**

14.1. No inspection, test, acceptance of, or payment to the Contractor(s) for, any rolling stock, equipment, component, work or part, or for any other purpose shall relieve the Contractor(s) from any duty under, or be deemed to be a waiver of any Warranty, or other right or remedy pursuant to, the contract documents or the law.

### **15. WARRANTY TRACKING**

15.1. In order to ensure the effectiveness of the warranty process it is critical that warranted items are traced from contract delivery through contract completion and closeout. Therefore warranty tracking tools must be utilized to achieve this goal.

15.1.1. The IBM MAXIMO Enterprise Asset Management Software (MAXIMO) is utilized by the Mechanical Department to track warranty for rolling stock, equipment, and serialized components. MAXIMO is used to flag, record, and document all

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instances for items that might be covered by a warranty so claims can be pursued by the Mechanical Department in a timely manner.

- 15.1.2. Warranty for non-serialized components are tracked through project specific warranty databases or spreadsheets (e.g. Defective Material Reports (DMRs) files). These project files also list the warranty for serialized components.

However warranties for serialized component must be tracked in MAXIMO and all information, records, documents must be added and updated for these items in MAXIMO.

### **16. ROLES AND RESPONSIBILITIES:**

- 16.1. All Mechanical Department employees are required to:

- 16.1.1. Follow the warranty procedures detailed in this document.
- 16.1.2. Ensure that warranty provisions are included in the procurement and contract documents when procuring products and services.

- 16.2. *Warranty Administrator (WA)*. The WA is responsible for the management, tracking, and administration of the Mechanical Department's warranty program. This position is responsible for the warranty recovery and component tracking program, monitoring the recovery process, and acting as liaison between the Mechanical and Procurement Departments throughout the warranty period, and tracking trends.

- 16.3. *Program/Project Managers (PMs)*. PMs have overall responsibility for administration and tracking of warranty for their projects. Responsibilities include filing Metra's warranty claims, participating in warranty reviews, tracking defects trends, and managing and tracking of the documentation and deliverables. It is the responsibility

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of the *PMs* to ensure that warranty for both serialized and non- serialized are properly tracked and maintained for their projects.

16.4. *District Management (DMs)*.

- 16.4.1. DMs (Directors, Superintendents, and General Foreman) are responsible for ensuring the Mechanical Department warranty procedures are implemented at their districts. This includes the review and assessment of daily defects and bad order work orders to verify if defective items are under warranty. If items are under warranty DMs they are required to ensure that the Department's warranty procedures are followed.
- 16.4.2. DMs are also responsible for supporting the Storehouses and Shop personnel and ensuring that required warranty forms and documentation are completed, submitted and properly logged in Maximo and warranty items are shipped and returned as necessary.

16.5. *Mechanical Department Shop Foremen (SF)*

- 16.5.1. SFs have the day-to-day responsibilities for reviewing daily defects, bad order work orders, and to verify if defective items are under warranty.
- 16.5.2. If a potential warranty claim exists, SF are responsible for the completion of electronic Maximo Work Component orders, Problem Material Forms, and Bad Order Tags as required to support component warranty claim for defective components.
- 16.5.3. The SF are responsible for the transmission of electronic warranty claim documentation to Warranty Systems Administrator and submission of defective

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## Mechanical Department Quality Plan

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components, along with a copy of the warranty claim supporting documentation to the appropriate Mechanical District Storehouses.

- 16.5.4. When a component is replaced, the SF is responsible for ensuring the timely completion of electronic documentation required to maintain updated configuration data for the rolling stock units in MAXIMO.

### 16.6. *Quality Personnel (QP)*

- 16.7. QPs are responsible for ensuring the Mechanical Department warranty procedures are followed during their inspection and audit activities and communicating the requirements to the Department personnel.
- 16.8. QPs are responsible for identifying nonconforming items during their inspection activities and maintaining records of all nonconformity reports and their resolutions.

### 17. **REFERENCE DOCUMENTS**

- 17.1. Metra Mechanical Department Quality Plan (MQP)
- 17.2. MAXAX-DE-11 Data Entry for Maximo Component Work Order Job Aid

### 18. **DEFINITIONS**

- 18.1. Rolling stock unit: Diesel locomotive, EMU, passenger cab car or trailer, or freight car.
- 18.2. UTEX (Unit Exchange): Is a process by which an item is returned and exchanged with a rebuilt unit replacement in kind.
- 18.3. Repair & Return: Is a Metra process by which an item is returned to for repair, rebuild, and the original core is returned to Metra.

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## Mechanical Department Quality Plan

**PROCEDURE TITLE: WARRANTY PROCEDURES**

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### 19. RECORDS MAINTAINED

19.1. All warranty documentation are to be maintained as quality records.

**[End of Procedure]**

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## Mechanical Department Quality Plan

**PROCEDURE TITLE: PRODUCT IDENTIFICATION AND TRACEABILITY**

**Mechanical Department MQPP Procedure # MQPP-06.01**

### REVISION HISTORY

DOCUMENT REVISION HISTORY				
REVISION DATE	REVISION NUMBER	SECTION NUMBER	REASON FOR REVISION	DESCRIPTION
5/5/16	N/A	N/A	N/A	NEW PROCEDURE

# Mechanical Department Quality Plan

**PROCEDURE TITLE: PRODUCT IDENTIFICATION AND TRACEABILITY**

**Mechanical Department MQPP Procedure # MQPP-06.01**

## 1. SCOPE

- 1.1. This section establishes requirements for identifying and controlling product to prevent the use of incorrect or defective material and assigns responsibilities to ensure that only correct and accepted materials, parts, and components are used or installed. The requirements of this section also apply to third party contracts per contractual agreements, performing work activities affecting quality associated with capital and current projects.

## 2. PROCEDURE

- 2.1. All parts shall be physically identified and control. Where physical identification is impossible, other appropriate means, such as physical separation into lots.
- 2.2. Inspector shall verify and document that items are identified properly.
- 2.3. Identification for receiving, shipping and/or inventory shall include minimum of:
  - 2.3.1. Item Description
  - 2.3.2. Item Number of Metra and Supplier.
  - 2.3.3. Supplier name and contact number
  - 2.3.4. Serial Number if applicable for specific part.
  - 2.3.5. Purchase Order Number.
  - 2.3.6. Quantity
  - 2.3.7. Date
  - 2.3.8. Visual Inspection for Damage
  - 2.3.9. Any other identifier deemed by purchase order and/or program and/or contract.
- 2.4. All items stored shall, minimum of
  - 2.4.1. Protection from damage, deterioration, and loss.
  - 2.4.2. Inspection and maintenance during storage and handling.

## Mechanical Department Quality Plan

**PROCEDURE TITLE: PRODUCT IDENTIFICATION AND TRACEABILITY**

**Mechanical Department MQPP Procedure # MQPP-06.01**

- 2.4.3. Utilization of special storage and handling facilities ad required.
- 2.4.4. Labeling with expiration date for item that have shelf life.
- 2.5. Supplier shall establish procedures for control of materials, parts, components, equipment, etc.
- 2.6. Metra has right to request information from supplier for:
  - 2.6.1. Material Certifications
  - 2.6.2. Test Reports
  - 2.6.3. Process used to make material and products.
  - 2.6.4. Product manufacturing records for traceability to raw material.
  - 2.6.5. Subcontractor Information.
  - 2.6.6. Right to conduct supplier facility audits.

**Mechanical Department Quality Plan****PROCEDURE TITLE: MATERIAL CONTROL****Mechanical Department MQPP Procedure # MQPP-06.02****REVISION HISTORY****DOCUMENT REVISION HISTORY**

REVISION DATE	REVISION NUMBER	SECTION NUMBER	REASON FOR REVISION	DESCRIPTION
5/5/16	N/A	N/A	N/A	NEW PROCEDURE

**Mechanical Department Quality Management Plan****PROCEDURE TITLE: MATERIAL CONTROL****Mechanical Department MQPP Procedure # MQPP-06.02****1.0 PURPOSE**

- 1.1 The purpose of this document is to establish the procedure for the control of capital material as it relates to the Metra Mechanical Department overhaul and rebuild programs.

**2.0 SCOPE**

- 2.1 This procedure applies to all Mechanical Department employees.

**3.0 PROCEDURE****4.1 Acceptance – Upon Transfer of Authority**

- 4.1.1 Review all procured parts or equipment upon receipt at the specified locations

- 4.1.1.1 Count and verify part numbers are correct and record received date

- 4.1.1.1.1 Sign and date material packing list and give to appropriate Materials personnel

- 4.1.1.2 Perform Stage 1 visual inspection on all shipments

- 4.1.1.3 Perform Stage 2 inspection if required

- 4.1.1.3.1 May include, but not limited to, Quality Control inspections, Test fitting the material, etc.

- 4.1.2 Identify all defective or non-conforming material

- 4.1.2.1 Initiate a project material problem form for defective or non-conforming material

**4.2 Defective or Non-Conforming Material**

- 4.2.1 Create a Defective Material Report (DMR)

- 4.2.1.1 The disposition and acceptance of defective or non-conforming items may be accomplished by:

- 4.2.1.1.1 Reworking and/or re-testing: This shall be done to the part to conform with the original drawing, procedure and/or specification

- 4.2.1.1.2 Repairing the defective item by restoring to a condition that the capability of an item to function reliably and safely is unimpaired, even though that item still does not conform to the original requirement

- 4.2.1.1.3 Use as-is when it can be determined that the item is acceptable for its intended use

- 4.2.1.1.4 Reject/Scrap for possible use on alternate applications

**4.3 Return Material Authorization (RMA)**

- 4.3.1.1 If material needs to be returned to the vendor, request a return material authorization RMA number, obtain a shipping code and ship material to vendor for repair or replacement

- 4.3.1.2 Maintain an accurate database of RMA records

## Mechanical Department Quality Management Plan

**PROCEDURE TITLE: MATERIAL CONTROL**

**Mechanical Department MQPP Procedure # MQPP-06.02**

- 4.3.2 Physically separate all acceptable material – This shall be done by the Metra assigned part number or the vendor issued part number.

### 5.0 ATTACHMENTS

- 5.1 Appendix A: Defective Material Report (DMR)

## Mechanical Department Quality Plan

PROCEDURE TITLE: INSPECTION AND TESTING

Mechanical Department MQPP Procedure # MQPP-8.01

### REVISION HISTORY

DOCUMENT REVISION HISTORY				
REVISION DATE	REVISION NUMBER	SECTION NUMBER	REASON FOR REVISION	DESCRIPTION
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## Mechanical Department Quality Plan

**PROCEDURE TITLE: INSPECTION AND TESTING**

**Mechanical Department MQPP Procedure # MQPP-8.01**

### **1. PURPOSE**

- 1.1. This section establishes requirements and assigns responsibilities for planning and performing inspections and testing of items affecting quality during materials receipt, in progress work and final installation, to provide assurance that the final accepted item conforms to the specified requirements. This is performed when required by a project quality plan, purchase order, or upon request by a responsible authority.

### **2. PROCEDURE**

#### **2.1. FORCE ACCOUNT PROJECTS**

##### **2.1.1. *Inspection***

- 2.1.1.1. Material inspections are performed in accordance with drawing and/or the Mechanical Department Specification M-13-010 (Specification for General Requirements, Tolerance and Welding Requirements) (See Appendix "A"), any applicable FRA regulations. All vendor inspections, tests, welding documentation, and/or Metra inspections shall be submitted to the Quality prior to usage and/or installation on project(s) and/or program(s). If material is nonconformance, the Quality Manager and/or Project Quality Control Specialist shall track issue on Material and Service Problem form for each project(s) and/or program(s). Nonconforming material will be tagged, labeled and secured to ensure that nonconformance part(s) is not inadvertently used or installed per Element 11.0.

## Mechanical Department Quality Plan

**PROCEDURE TITLE: INSPECTION AND TESTING**

**Mechanical Department MQPP Procedure # MQPP-8.01**

- 2.1.1.2. Initial inspection can be performed by the receiving personnel, which can be the receiving storehouse personnel. Initial inspection process identifies and visually inspects the received item for conformance and nonconformance to the purchasing documents.
- 2.1.1.3. Rehab Project(s) and/or program(s) materials may possibly come in a bundle of all the same product(s). If the product is nonconformance, the Lead Carman for that location must be informed and shall fill out a Material Problem Form (See Appendix "B"), in accordance with Element 9.0. The Project Quality Control Specialist shall have the duty of handling the Material and Service Problem Form as a quality record, in accordance with Element 12.0.
- 2.1.1.4. Secondary inspection subjects the items to a more technical and thorough inspection where measuring and test equipment may be used to confirm the acceptability of an item. This may mean making sure the items conform to any relevant drawings and/or specifications. Inspection shall be performed by the Lead Carman and/or the Project Quality Control Specialist. Furthermore, the Project Quality Control Specialist shall perform inspection to verify the inspection process. A Mechanical Department Quality Control Inspection form shall be filled out for this inspection. (See Appendix "C")
- 2.1.1.5. An inspector will inspect material per statistical techniques per Appendix D. However, Metra's Mechanical Department has the right to perform a complete 100% inspection of all the material received. Whenever an inspection is completed, the inspector shall fill out an inspection form. This will verify that the inspection was performed and it will give the results of the inspection. Inspection form shall be controlled as a permanent record, in

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: INSPECTION AND TESTING**

**Mechanical Department MQPP Procedure # MQPP-8.01**

accordance with Element 12.0. The inspector will fill out a non-conformance report if the product does not comply, in accordance with Element 9.0. The Project Quality Control Specialist will have the duty of handling the non-conformance report.

**2.1.2. *Documents***

2.1.2.1. At any time, a Material Problem Form (MPF) can be started by an employee of Metra, who has concerns on any material and/or product. The form shall be filled out correctly and as accurately, with evidence of concern, and send it to Quality Manager via electronic communication.

2.1.2.2. MSP number shall be as follow;

2.1.2.2.1. First three will be letter, abbreviation of Material Problem Form (MPF), follow by a dash, follow by two digit year of the date issue occurred, follow by dash, follow by digits in increment from 01. Example: MPF-15-01.

2.1.2.3. The Project Quality Control Specialist in the Mechanical Department shall audit Hold Points, Test Paper Work, Material History Books, FRA Required Forms and a part(s) to complete unit to ensure compliance of FTA, FRA rules and regulations and the Metra policies and procedures.

**2.1.3. *Complete Units***

2.1.3.1. When the rehabilitation of a car or locomotive is complete, prior to its release for service, it will undergo a final inspection. Prior to inspection, a Production Representative shall send an inspection request form to the Quality Manager (Appendix "E"). The Inspection Request

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: INSPECTION AND TESTING**

**Mechanical Department MQPP Procedure # MQPP-8.01**

Form shall be filled out entirely before requesting of inspection. The Project Quality Control Specialist shall schedule inspection by proving the time and date of the inspection. The inspection shall determine whether the car/locomotive is suitable to be put into service. (Rehabilitation Inspection Form and Checklist Appendix "F").

- 2.1.3.2. During unit inspection, a Project Quality Support Specialist will inspect proper workmanship, installation, any accuracy of testing, FRA required paperwork, hold points, installation sign off records, open material issues and etc. The Project Quality Control Specialist may inspection items that are outside of the scope of project(s) and/or program(s) that inherent to quality of unit.
- 2.1.4. *As part of purchasing products or services*
  - 2.1.4.1. Metra's Mechanical Department may request inspection of purchased products and/or services.
  - 2.1.4.2. Metra's Mechanical Department has the right to request a First Article Inspections (FAI) of any product(s) and/or service(s) that may be purchased/purchasing from the supplier.
  - 2.1.4.3. Vendor Source Inspections
    - 2.1.4.3.1. Metra shall have right to request of the company's facilities and records. This inspection may include an on-site assessment as well as a review of their quality records.
  - 2.1.4.4. Accepted Material
    - 2.1.4.4.1. If the received material passes the required inspections, it is accepted and the material is then placed in the appropriate material storage location to await use on Metra equipment.

## Mechanical Department Quality Plan

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### 2.2. *OUTSOURCED CAR & LOCOMOTIVE PROJECTS*

- 2.2.1. Metra reserves the right of source inspection at the Contractor's or any subcontractor's place(s) of manufacture or fabrication. Metra shall designate a Project Manager, who is responsible for all inspection activities and quality audits at such facilities. The Project Manager shall participate in design review and pre-production meetings with the Contractor.
- 2.2.2. No less than thirty (30) calendar days prior to the beginning of the car/locomotive manufacture, Metra's Project Manager and Quality Representative shall meet with the Contractor's quality assurance manager(s) and Production manager(s) and conduct a pre-production meeting. In this meeting, shall review the inspection procedures and finalize inspection checklists.
- 2.2.3. Metra's Project Manager shall be authorized to release the cars/locomotives for delivery and shall be authorized to issue the Certificate of Fitness for Delivery.
- 2.2.4. Upon oral notice to the Contractor's quality assurance manager(s), Metra's Project Manager and Quality Representative shall have access to the Contractor's quality assurance files related to the contract. These files shall include drawings, assembly procedures, material standards, parts lists, inspection processing reports, and record of defects. Metra will also designate one or more resident inspectors for the purpose of inspecting the work of the

## Mechanical Department Quality Plan

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contractor or any of its subcontractors. These inspectors will perform under the direction of Metra's Project Manager.

2.2.5. Consultants

2.2.5.1. Metra reserves the right to acquire and utilize technical and management services from various sources, including outside consultants. This work shall be under the direction of Metra's Program Manager and may be performed on a continuing or periodic basis (i.e., during design reviews, initial project startup, special training, and on-construction site).

Metra will allow the Contractor to require consultants and their employees to sign appropriate nondisclosure agreements, subject to the approval of Metra.

2.2.6. Outsourced car or locomotive material (spare components) may not come in bundles, but instead come one or two pieces at a time, or many different pieces in the same shipment. The receiving personnel must be careful when conducting an inspection of this type. They must identify all the different pieces and make sure they are not damaged. If the product(s) do not pass the inspection, the Project Manager or Project Quality Control Specialist must be informed and a Material and Service Problem Form must be filled out, in accordance with Element 9.0.

2.3. Statistical Methods

2.3.1. Scope

2.3.2. When required or directed by the Mechanical Department, statistical techniques are used in sampling of new products to verify that their characteristics pass Metra standards.

## Mechanical Department Quality Plan

**PROCEDURE TITLE: INSPECTION AND TESTING**

**Mechanical Department MQPP Procedure # MQPP-8.01**

- 2.3.3. The Mechanical Department will use ANSI/ASQC Standard Z1.4-1993 to determine if a given batch of products will be accepted or rejected. Appendix "D" is an example of the statistical tables that may be handed out to an employee. The first table in Appendix "D" shows what sample size to use given a batch size. The second table in Appendix "D" is Table II-A in the ANSI/ASQC Standard mentioned above. This table is the one that will most likely be handed out because it shows single sampling plans for normal inspections.
- 2.3.4. First given a batch size, an employee has to decide what the sampling size should be. Using Table I in Appendix "D", an employee should assume that Metra will use the sample size code letter as specified in General Inspection Level II for the corresponding lot or batch size, unless notified by the Quality Assurance Specialist as otherwise. Now that an employee has the sample size code letter, they need to go to Table II-A of Appendix "D" to find the correct sample size. The sample size code letters are listed in the left most column of Table II-A and the sample size for each sample size code letter is listed in the column directly to the right of the code letter column. After finding the correct sample size, an employee must decide what will be the acceptance or rejection limits. For Metra purposes, since most of our samples will be relatively small, only the rejection number (Re) will be used, unless otherwise specified by the Quality Assurance Specialist. The last number needed to find a rejection number for a given sample size is the Acceptable Quality Level or AQL. Unless otherwise specified, the AQL to use will be 1.5. If in a given sample set, the inspector finds as many or more nonconforming products than the given rejection number, than the inspector should consider the whole batch to be nonconforming product. The batch should then be handled in accordance with Section 9 of this document.

## Mechanical Department Quality Plan

**PROCEDURE TITLE: INSPECTION AND TESTING**

**Mechanical Department MQPP Procedure # MQPP-8.01**

### 3. ATTACHMENTS

- 3.1. **Appendix A: M-13-010 Specification For General Tolerance And Welding Requirements**
- 3.2. **Appendix B: Material Problem Form**
- 3.3. **Appendix C: Inspection Form**
- 3.4. **Appendix D: Statistical Methods**
- 3.5. **Appendix E: Inspection Request Form**
- 3.6. **Appendix F: Inspection Form and Checklist**

# APPENDIX A



## Mechanical Department

**SPECIFICATION FOR  
GENERAL TOLERANCE  
AND  
WELDING REQUIREMENTS  
(THIS SPECIFICATION SHALL NOT BE USED FOR TRUCK PARTS)**

**SPECIFICATION No. M-13-010**

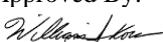
**DATE: October 2, 2013**

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## RECORD OF REVISIONS

REVISION	DESCRIPTION	APPROVED BY	DATE
-	First Release of this specification		10/2/13

**NOTE:** This document is to be considered “uncontrolled” when printed as a hardcopy from the network. The revision level must be verified prior to use.

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## General Requirements

### **1. Material to be used:**

Only the material specified in the Metra drawing shall be used. Any deviation must be approved by Metra prior to use.

### **2. Disposition for Problems, Questions, and Discrepancy:**

When problems, questions, and/or discrepancies occur between this documentation, drawing(s), etc., the vendor must inform Metra and the work should be performed in accordance with the instruction for disposition from Metra. Any deviation from the technical drawings or specifications will lead to rejection.

### **3. Inspections of Material By Vendor:**

Prior to shipment to Metra, the vendor must inspect the parts and confirm that they conform to Metra's drawings and specifications including:

- A) There are No Sharp Edges: No Sharp Edges are permitted (for all parts, any location).
- B) For welded parts:
  - Welding must be inspected by CWI Inspector and documentation must be submitted to indicate this. Any deviation from this requirement must be approved by Metra.
  - Discoloration should be removed and clean welds for acceptable finish.

An Inspection Report must be provided to Metra prior to shipment.

### **4. Quality Audit:**

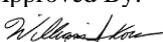
Authorized representatives of Metra shall have access, at all reasonable times, to those parts of the plants of the vendor and his subcontractors concerned with supplying material and parts to Metra, for the purpose of inspecting documents, materials, workmanship, and conformity to Metra Specifications during the progress of manufacturing and/or after delivery of shipments to Metra.

### **5. Disposition of Non-Conformed Items:**

When the non-conformance is found after delivery, Metra will notify the vendor for disposition. If re-work is performed, vendor must submit Failure Analysis Report (FAR) and corrective action plan. The vendor must comply with a reasonable turnaround time as determined by Metra.

### **6. Deviation from the Requirements:**

The vendor must submit a written request for approval to Metra detailing the requirement they are proposing to deviate from and their reasoning and justification for requesting the deviation. The vendor may not deviate from any of the requirements unless Metra has granted the vendor written approval. Metra has the sole right to approve or reject the vendor's deviation request.

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## General tolerance on dimensions without individual indications on the drawing

### 1. Scope and Purpose

This document defines the dimensional tolerances without individual indications on the drawing. According to the extent of each dimension of metal fabrications and non-metallic fabrications, the dimensional tolerance to be complied with, are detailed in this section.

(These tolerances are based on JIS B 0405, 403 and ISO 2768)

### 2. Extent of dimensional tolerance

#### A. General tolerances (included the machining allowance)

General tolerances apply to the products by metal removal and forming from sheet metal, welding.  
It defines the dimensions as follows.

- 1) Over 0.02" up to 157.48" Liner dimensions
- 2) Permissible deviation of Angular dimensions
- 3) Allowance of Chamfer

These tolerances are referred in Table A-1, A-2, A-2, A-3

#### B. Radius of bending on formed parts by press working

It defines the bending radius of the parts formed by press working.

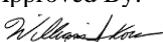
These tolerances (**Minimum radius**) are referred in Table B-1, B-2, B-3.

**Maximum radius to be adequate with the equivalent to the thickness of sheet.**

#### C. Gauge (thickness) of sheet metal

In case the drawing is in the metric scale, refer to conversion table, Table C-1, C-2, C-3.

Select the material thickness by choosing the applicable gauge of metal.

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## General tolerance on dimensions without individual indications on the drawing (Continued)

### 3. Tolerances

#### A. General Tolerance

**Table A-1 Tolerance of Linear dimensions Over 0.02" up to 157.48"**

Dimensions				Tolerance		
(Inches)		(mm)		(Inches)		(mm)
Over	Up to	Over	Up to	Permissive deviation		
0.020"	~ 0.118"	0.5	~ 3	± 0.008"	±	0.2
0.118"	~ 0.236"	3	~ 6	± 0.012"	±	0.3
0.236"	~ 1.181"	6	~ 30	± 0.020"	±	0.5
1.181"	~ 4.724"	30	~ 120	± 0.031"	±	0.8
4.724"	~ 15.748"	120	~ 400	± 0.047"	±	1.2
15.748"	~ 39.370"	400	~ 1000	± 0.079"	±	2
39.370"	~ 78.740"	1000	~ 2000	± 0.118"	±	3
78.740"	~ 157.480"	2000	~ 4000	± 0.157"	±	4

Source: ISO 2768-1:1989 (E) Tolerance class: coarse

**Table A-2 Permissible deviations of Angular dimensions**

Dimension for Length of shorter side				Tolerance (degrees)	
(Inches)		(mm)		Tolerance (degrees)	
Over	Up to	Over	Up to	Permissible deviation	
Under 0.394"		Under 10		±	1.50°
0.394"	~ 1.969"	10	~ 50	±	1.00°
1.969"	~ 4.724"	50	~ 120	±	0.50°
4.274"	~ 15.748"	120	~ 400	±	0.25°
Over 15.748"		Over 400		±	0.167°

Source: ISO 2768-1:1989 (E) Tolerance class: coarse

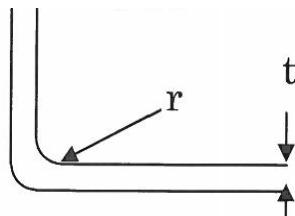
**Table A-3 Allowance of Chamfer**

Dimensions				Tolerance		
(Inches)		(mm)		(Inches)		(mm)
Over	Up to	Over	Up to	Permissive deviation		
0.020"	~ 0.118"	0.5	~ 3	± 0.016"	±	0.4
0.118"	~ 0.236"	3	~ 6	± 0.0394"	±	1
Over 0.236"		Over 6		± 0.0787"	±	2

- The diameter of holes for bolt to be complied with general tolerance "Table A-1".
- It is vendor's responsibility to ensure the hole size is checked and determined to be correct size before threading.

**General tolerance on dimensions without individual indications on the drawing  
(Continued)**

**B. Minimum Radius of bending by press working**



**Table B-1 Stainless steel Minimum radius of bending (Inch)**

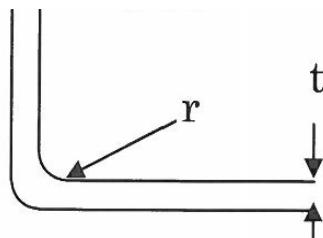
Thickness (t) (Gauge)		S.ST.301-DLT S.ST. 301L S.ST.301-LT S.ST. 304	S.ST.301L-1/8H S.ST.301L-ST S.ST.301M-ST	S.ST.301L-1/4H S.ST.301L-MT S.ST.301M-MT	S.ST.301L-1/2H S.ST.301L-HT S.ST.301M-HT
19	1.0	0.042	0.084	0.105	0.126
18	1.2	0.048	0.096	0.120	0.144
16	1.5	0.059	0.119	0.148	0.177
14	2.0	0.075	0.150	0.1875	0.225
13	2.3	0.090	0.180	0.263	0.315
12	2.5	0.105	0.211	0.263	0.315
11	3.0	0.120	0.240	0.300	0.360
10	3.2	0.135	0.270	0.338	0.405
8	4.0	0.165	0.330	0.413	0.495
7	4.5	0.187	0.375	0.468	0.561
1/4"	6.0	0.250	0.500	0.625	0.750

**Table B-2 Carbon steel Minimum radius of bending (Inch)**

Thickness (t) (Gauge)		Std. No ASTM A242 <SPAH> <SPAC>	Std. No ASTM A36, A569, A366 <SS400, SPH, SPC>	< > JIS STANDARD Material Symbol
Under 16		Minimum r = t		Minimum r = t
14	2.0	0.113	0.075	
13	2.3	0.135	0.090	
10	3.2	0.203	0.135	
3/16"	4.5	0.270	0.180	
1/4"	6.0	0.375	0.250	
3/8"	9.0	0.650	0.375	
1/2"	12.0	1.00	0.500	
5/8"	16.0	1.25		

**General tolerance on dimensions without individual indications on the drawing  
(Continued)**

**B. Minimum Radius of bending by press working**



**Table B-3 Aluminum      Minimum radius of bending      (Inch)**

Thickness (t) (Inches)	A5005 A5052 A5056 A5083 A6061	A5083-H32	A7N01
0.032	0.8	0.032	
0.040	1.0	0.050	
0.050	1.2		
0.063	1.5 1.6	0.063	0.190
0.080	2.0	0.080	0.240
0.090	2.3	0.090	
0.100	2.5	0.100	
0.125 (0.120)	3.0	0.125 (0.120)	0.375
0.125	3.2	0.125	0.313
0.160	4.0	0.240	0.400
0.188	4.5	0.282	0.470
0.190	5.0	0.285	0.475
0.250	6.0	0.500	0.625
0.313 (0.375)	8.0	0.626 (0.750)	0.940
0.500	10.0	1.25	1.50
0.500	12.0	1.25	1.50

## Conversion Table (Metric $\leftrightarrow$ Gauge/Inch)

### C. Conversion Table for Gauge (Thickness)

**Table C-1 Stainless Steel**

Gauge	Thickness (Inches)	t (mm)
19	0.0420	1.0
18	0.0480	1.2
16	0.0595	1.5
14	0.0751	2.0
13	0.0900	2.3
12	0.1054	2.5
11	0.1200	3.0
10	0.1350	3.2
8	0.1650	4.0
7	0.1874	4.5/5.0
1/4"	0.25	6.0

**Table C-2 Carbon Steel**

Gauge	Thickness (Inches)	t (mm)
20	0.036	0.8
18	0.048	1.2
16	0.06	1.5/1.6
14	0.0747	2
13	0.0897	2.3
10	0.1345	3.2
3/16"	0.1793	4.5
1/4"	0.250	6
3/8"	0.375	9
1/2"	0.500	12
5/8"	0.625	16

**Table C-3 Aluminum**

Thickness in Inches	t (mm)
0.032	0.8
0.040 / 0.050	1.0 / 1.2
0.063	1.5 / 1.6
0.080	2.0
0.090	2.3
0.100	2.5
0.125 (0.120 A5052)	3.0
0.125	3.2
0.160	4.0
0.188	4.5
0.190	5.0
0.250	6.0
0.313 (0.375)	8.0
0.500	10.0
0.500	12.0

## Requirement for Welding Parts

**Only an AWS certified welder shall perform the welding work**

### **A. Welder Certifications and Documentation**

Prior to welding work, the following documentation should be submitted and approved by a CWI and documentation must indicate that vendor is qualified to perform the work.

1. AWS Welding Procedure Specification (WPS)
2. AWS Procedure Qualification Record (PQR) -Except those welds Pre-qualified by AWS 15.1
3. AWS Welder, Welding, Operator, or Track Welder Qualification Record  
for:

AWS D15.1/D15.1M:2012 (or current revision) RAILROAD WELDING SPECIFICATION  
FOR CARS AND LOCOMOTIVES

AWS D1.6/D1.6M:2007 (or current revision) STRUCTURAL WELDING CODE STAINLESS STEEL  
AWS D1.1/D1.1M:2010 (or current revision) STRUCTURAL WELDING CODE-STEEL

and/or applicable AWS Specification.

An independent CWI must verify the certifications and documentation and submit a letter confirming that the welder the vendor will use is qualified to perform the work.

### **B. Inspection**

Welding must be inspected by CWI Inspector and documentation must be submitted to indicate this and must be included with each shipment of welded parts.

### **C. Shipping**

A detailed Inspection Report should be provided by the vendor for each shipment to Metra.

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## Welding Visual Inspection Criteria

### **1. Scope and Purpose**

This document defines the visual inspection criteria of welding defects without individual indications on the drawing.

The standard for spot welding (Resistance welding) is based on AWS C1.1M/C1.1:2000

### **2. Extent of application on criteria**

These criteria define metal fabrications for Aluminum and Stainless Steel, Carbon Steel.

- A. Arc welding for Aluminum and Aluminum alloy
- B. MIG or TIG welding for Stainless Steel
- C. Arc welding for Steel and Stainless Steel
- D. Semi-automatic gas shielded arc welding
- E. Spot welding for stainless steel

### **3. Qualification Test**

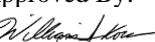
Prior to the first article, the following report shall be submitted.

#### **A. Fusion weld**

1. Daily Inspection Report for Welding Machine
2. Qualification test report
  - Material certification / Filler Material / Gas / Surface / Preparation / Weld machine
  - Welding Procedure (Speed / Current / Joint detail / Sheet thickness / Number of layer)
  - Welder's name and WPS qualification attachment
3. Macro test Photograph (Test sample to be held for visual inspection at FAI)
4. If requested or necessary, the results of Bent test or Break test and so on.

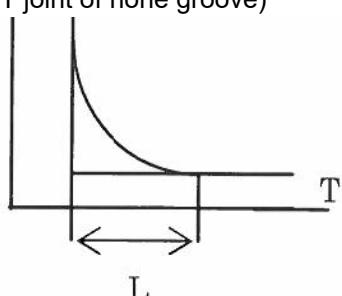
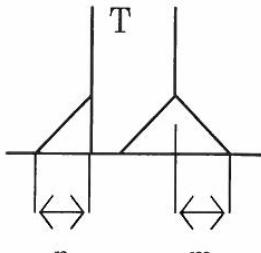
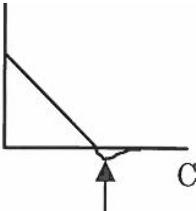
#### **B. Spot weld (Resistance weld)**

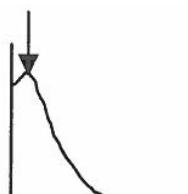
1. Daily inspection report for Spot weld machine
2. Qualification test report
  - Material certification / Filler Material / Gas / Preparation / Spot Weld machine
  - Procedure of weld (Time / Current, Sheet Thickness, Nugget Diameter)
3. Macro test Photograph (Test sample to be held for visual inspection at FAI)
4. Test Results of shear test

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#### 4. Inspection Criteria (Except for Truck Frame and Truck Parts)

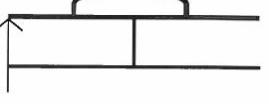
##### A. Fillet welded joint

No.	Defect of welding	Group A (Aluminum)	Group B, C, D (Stainless steel or Carbon steel)												
1	Crack	Not allowed													
2	Leg on the welding (T joint of none groove)	$L \geq 1.0 T$  The length on leg of weld to be 100% or more to thickness of thin plate.	$L \geq 0.8 T$ The length on leg of weld to be 80% or more to thickness of thin plate.												
3	Leg on the welding (Single bezel groove or J type groove)	$T$   $m \geq$   $n \geq$ <table border="1"> <tr> <td>0.250"</td> <td>0.20"</td> <td>0.20"</td> </tr> <tr> <td>0.313"</td> <td>0.20"</td> <td>0.24"</td> </tr> <tr> <td>0.375"</td> <td>0.20"</td> <td>0.28"</td> </tr> <tr> <td>0.500"</td> <td>0.20"</td> <td>0.315"</td> </tr> </table>  The length of leg 'm', 'n' to be more than the above	0.250"	0.20"	0.20"	0.313"	0.20"	0.24"	0.375"	0.20"	0.28"	0.500"	0.20"	0.315"	$m, n \geq 0.25 T$ The length on leg of weld to be 25% or more to thickness of plate which is made the groove.
0.250"	0.20"	0.20"													
0.313"	0.20"	0.24"													
0.375"	0.20"	0.28"													
0.500"	0.20"	0.315"													
4	Roughness on the bead	The difference of roughness to be <b>0.08"</b> or less in the range of <b>1"</b> length													
5	Undercut	1) In the range of 2" length from both edge of weld <b>Not allowed</b>  2) Except for the above range (T: thickness) $C < 0.1T$ and $C < 0.02"$													
6	Overlap	<b>Overlap to be 0.04" or less.</b>													



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## **B. Butt joint welding**

No.	Defect of welding	Group A (Aluminum)		Group B, C, D (Stainless steel or Carbon steel)	
1	Crack	<b>Not allowed</b>			
2	The height of excess weld metal  	Thickness	H	Gauge	H
		Under 0.25"	$\leq 0.08"$	Under 11	$\leq 0.08"$
		0.25"~0.60"	1/3 T"	11~1/4	$\leq 0.12"$
3	Undercut  	1) In the range of 2" length from both edge of weld			
		<b>Not allowed</b>			
		2) Except for the above range (T: thickness)  $C < 0.1T$ and $C < 0.02"$			
4	Overlap  	Overlap to be <b>0.04" or less.</b>			
5	The width of weld bead	The difference on width of weld bead to be <b>0.08" or less</b> in the range of <b>1" length</b>			

#### **C. Defect of Pit (Surface pore) (All welding)**

- 1) In the range of 2" length from both edges of weld Not allowed

2) Except for the above range

In the area of 1/2" X 1/2", the defects to be less than 4 points. (Refer to Table A)

If G finish indicates on the drawing, the defects to be less than 2 points.

## Table

## Table A Allowance of Pit

Allowances of pit	
Size of pit	Quantity of pit
Under 0.04"	4
0.04" ~ 0.08"	2
0.08" ~ 0.16"	1

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**D. All other defects such as insufficient weld, porosity, incomplete penetration, lack of fusion, etc., will not be accepted.**

## **E. Spot weld (Resistance Weld) for Stainless Steel**

### **1. Minimum Nugget Diameter and Minimum Shear Strength**

Spot welding to meet with the characteristic as follows.

Gauge	Sheet Thickness		Nugget Diameter Inch (mm)	Minimum Shear Strength KN (LB)		
				Ultimate Tensile Strength of Base Metal		
				480 MPa Up to 620 MPa	620 MPa Up to 1.03 GPa	1.03 GPa and Higher
19	0.0420	1.0	0.165 (4.2)	4.9 (1100)	6.0 (1360)	6.9 (1550)
18	0.0480	1.2	0.189 (4.8)	6.5 (1450)	7.6 (1700)	8.9 (2000)
17	0.0551	1.4	0.205 (5.2)	7.6 (1700)	8.9 (2000)	10.9 (2450)
16	0.0595	1.5	0.221 (5.6)	8.7 (1950)	10.7 (2400)	12.9 (2900)
14	0.0751	2.0	0.268 (6.8)	12.0 (2700)	16.1 (3400)	17.8 (4000)
13	0.0900	2.3	0.285 (7.3)	15.8 (3550)	18.7 (4200)	23.6 (5300)
12	0.1054	2.5	0.291 (7.4)	18.7 (4200)	22.2 (5000)	28.5 (6400)
11	0.1200	3.0	0.299 (7.6)	22.2 (5000)	26.7 (6000)	33.8 (7600)
10	0.1350	3.2	0.315 (8.0)	22.2 over	26.7 over	33.8 over
9	0.1378	3.5	0.366 (9.3)	22.2 over	26.7 over	33.8 over
8	0.1650	4.0	0.44 (11.2)		44.5 (10000)	
7	0.1874	4.5 5.0	0.47 (12.0)		54.7 (12300)	
1/4"	0.25	6.0	0.60 (15.2)		75.6 (17000)	

## **F. Discoloration must be removed and the welds cleaned for acceptable finish.**

END

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# APPENDIX B

# Project Material Problem Form

Control No. MPF \_\_\_\_\_

Date: _____	Car Number _____	Code      Cause 1 Metra Damage 2 Metra Lost 3 Warrenty, B/O 4 Metra Request 5 Shipping 6 Other
Your Name: _____	Project: _____	
Vendor: _____	Station: _____	
Part Number: _____	Qauntity: _____	
Part Description: _____	B/O Tag #: _____	
Serial Number: _____	Pictures Taken <input type="checkbox"/>	

Description of Problem / Issue:

<b>Materials Team</b>					
Has the part been replaced? (circle)					
Yes	No	Station: _____	Date: _____		
Initials of Materials Person: _____					

# APPENDIX C

# Metra - Mechanical Department

Appendix B

QA/QC

- First Article
- First Article Audit
- Material Inspection

Inspection Report # : \_\_\_\_\_

Project #: \_\_\_\_\_

 Capital Operating

Part #: \_\_\_\_\_ Serial # / Lot #: \_\_\_\_\_

Description: \_\_\_\_\_ Drawing: \_\_\_\_\_

Purchase Order / Work Order Number: \_\_\_\_\_ Revision: \_\_\_\_\_

Supplier: \_\_\_\_\_ Reference: \_\_\_\_\_

Qty Received: \_\_\_\_\_ Date Received: \_\_\_\_\_ Qty Inspected: \_\_\_\_\_

Item	Dimension or Specification - IN	Min	Max	Actual	Within	Out of
					Spec	Spec
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

- First Article Approved** This is Authorization to Proceed
- First Article Rejected** Correct Defects & Resubmit Article
- Inspection Passed** Material Accepted
- Inspection Failed** Material Rejected

Remarks &amp; Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Inspector Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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# APPENDIX D

(See 9.2 and 9.3)

**TABLE I—Sample size code letters**

Lot or batch size	Special inspection levels				General inspection levels			
	S-1	S-2	S-3	S-4	I	II	III	
2	to 8	A	A	A	A	A	A	B
9	to 15	A	A	A	A	B	B	C
16	to 25	A	A	B	B	C	C	D
26	to 50	A	B	B	C	C	D	E
51	to 90	B	B	C	C	C	E	F
91	to 150	B	B	C	D	D	F	G
151	to 280	B	C	D	E	E	G	H
281	to 500	B	C	D	E	F	H	J
501	to 1200	C	C	E	F	G	J	K
1201	to 3200	C	D	E	G	H	K	L
3201	to 10000	C	D	F	G	J	L	M
10001	to 35000	C	D	F	H	K	M	N
35001	to 150000	D	E	G	J	L	N	P
150001	to 500000	D	E	G	J	M	P	Q
500001 and over		D	E	H	K	N	Q	R

**CODE LETTERS****A P P E N D I X J**

(See 9.4 and 9.5)

*Table II-A—Single sampling plans for normal inspection (Master table)*

A P P E N D I X

		Acceptable Quality Levels (normal inspection)																									
Sample size code letter	Sample size	0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
A	2	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
B	3	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
C	5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
D	8	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
E	13	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
F	20	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
G	32	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
H	50	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
J	80	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
K	125	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
L	200	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
M	315	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
N	500	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
P	800	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Q	1250	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
R	2000	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

▼ = Use first sampling plan below arrow. If sample size equals, or exceeds, lot or batch size, do 100 percent inspection.

▲ = Use first sampling plan above arrow.

Ac = Acceptance number.

Re = Rejection number.

J-2

### SINGLE NORMAL PLANS

# APPENDIX E

**Metra - Mechanical Department**

Appendix B

**Inspection Request Form****To:** \_\_\_\_\_**From:** \_\_\_\_\_**Type of Inspection Requested:** \_\_\_\_\_**Unit Number:** \_\_\_\_\_**Inspection Date Requested:** \_\_\_\_\_**Project Name:** \_\_\_\_\_**Inspection Location:** \_\_\_\_\_**Project #:** \_\_\_\_\_**Open Items List**

**Requestor has confirmed all work and associated documentation has been completed and the unit is ready for inspection except as noted above.**

**Requested By (Signature):****Date:**

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# APPENDIX F



## **INSPECTION REPORT**

PAGE \_\_\_\_\_ OF \_\_\_\_\_

UNIT NO. \_\_\_\_\_ INSPECTED AT \_\_\_\_\_ TIME \_\_\_\_\_ DATE \_\_\_\_\_

REASON FOR INSPECTION \_\_\_\_\_ PROJECT #\_\_\_\_\_

---

REV 071218

## NIPPON REHAB FINAL INSPECTION GUIDE

CAR NO:

DATE:

	<u>Final Car Inspection</u>	Completed	Defect
2.0	Carbody		
3.0	Truck Systems		
3.1	Truck and Suspension		
3.2	Journal Bearing		
4.0	Cab Equipment		
4.1	Master Controller, Event Recorder		
4.2	Lighting, Heating		
5.0	Electrical Systems - Batteries, Battery Charger		
6.0	Brake System - Air Valves, Handbrake		
7.0	Coupler System - Coupler, Draft Gears		
8.0	Door System		
9.0	HVAC System		
10.0	Lighting System - Interior, Exterior		
11.0	Communications System		
11.1	Radio		
11.2	TMIS, PA/IC, LED Signs		
12.0	Wheelchair Lift		
13.0	Toilet System		
14.0	Passenger Seating		
15.0	Miscellaneous Systems		
15.1	Decals/ Signage		
15.2	Windows		
16.0	Safety Appliances		
17.0	Car Book Documents		

QA Signature:

# NIPPON REHAB FINAL INSPECTION GUIDE

## Final Car Inspection Defects Car:

Section:      Defect:

## Notes:

## Mechanical Department Quality Plan

**PROCEDURE TITLE: INSPECTION AND MEASURING TEST EQUIPMENT**

**Mechanical Department MQPP Procedure # MQPP-9.01**

### REVISION HISTORY

DOCUMENT REVISION HISTORY				
REVISION DATE	REVISION NUMBER	SECTION NUMBER	REASON FOR REVISION	DESCRIPTION
5/5/16	N/A	N/A	N/A	NEW PROCEDURE

# **Mechanical Department Quality Plan**

**PROCEDURE TITLE: INSPECTION AND MEASURING TEST EQUIPMENT**

**Mechanical Department MQPP Procedure # MQPP-9.01**

## **1. PURPOSE**

- 1.1. To implement a policy for the calibration program, assign responsibilities, and establish standard operating procedures for the maintenance of Precision Measuring Equipment (PME). To ensure all PME are properly maintained and calibrated in a timely manner.
- 1.2. The PME fall into two groups:
  - 1.2.1. PME calibrated at vendor – These are PME that are critical for regulatory inspections, are master PME, or can't be calibrated in-house.
  - 1.2.2. PME calibrated in-house – These are PME that are calibrated in-house using master PME (e.g. air gauges).

## **2. TERMS AND DEFINITIONS**

- 2.1. Accuracy – The closeness of agreement between an observed value and an accepted reference value.
- 2.2. Active PME – Serviceable equipment in use.
- 2.3. Calibration – Method of comparing PME with measurement standards of known accuracy, for the purpose of detecting and adjusting deviations from the standards.
- 2.4. Calibration Certificate – Document that presents calibration results and other information relevant to calibration.
- 2.5. Calibration Coordinator – Employee assigned to oversee Calibration Program.
- 2.6. Calibration Notification – A notification generated in the Daily Bad Order Tools and Meters Report that a PME is due for calibration.

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: INSPECTION AND MEASURING TEST EQUIPMENT**

**Mechanical Department MQPP Procedure # MQPP-9.01**

2.7. Deleted PME – Defective equipment that is unserviceable and permanently out of service, has to be scrapped.

2.8. Inactive PME – Serviceable equipment not in use.

2.9. Interval – Frequency of calibration in a year.

### **3. PROCEDURE**

3.1. District Site Administrator will maintain and update the Calibration information in Maximo Calibration Data System.

3.1.1. Ensure all vendor calibrated PME are included in the Maximo Calibration Data System and are properly maintained and calibrated as recommended by the manufacturer.

3.1.2. Ensure all vendor calibrated PME are sent out for calibration are properly tracked and accounted for through the Maximo Calibration Data System.

3.1.3. Insure that calibration records for PME calibrated in-house are maintained at each field location.

3.1.4. Assure that the tool inventories are kept up to date.

3.1.5. Maintenance and calibration information must be entered into the calibration database.

3.1.6. Create the Calibration Maintenance Plan and Master List in Bad Order Tools and Meters database, based on the calibration schedule and vendor calibrated PME are inventory.

3.1.6.1. Vendor calibrated PME are established in the Bad Order Tools and Meters database with associated task list. Notifications to have the vendor calibrated PME calibrated are created designated intervals for each district. Vendor calibrated PME will come up on the database list to be calibrated before they are due.

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: INSPECTION AND MEASURING TEST EQUIPMENT**

**Mechanical Department MQPP Procedure # MQPP-9.01**

- 3.1.6.2. Update the Calibration Maintenance Plan and Master List in Bad Order Tools and Meters database to reflect addition and deletion of vendor calibrated PME, and any changes in PME status (active, inactive, or deleted).
- 3.1.7. Notify the Mechanical System Administrator of any addition or deletion of PME to the program as changes occur.
- 3.1.8. Train the employees to be aware of the program and their responsibilities, and to use only PME that is properly calibrated and labeled.
- 3.1.9. Ensure each PME is properly identified with a unique Serial Number (SN).
- 3.1.10. Maintain the vendor calibrated PME Issue Log to reflect the description of the PME, it's SN, model number, the name of the shop to which a specific PME has been assigned and the employee to which the PME has been assigned(if applicable).
- 3.1.11. Decide when a vendor calibrated PME is ready to be sent out for calibration. The Site Administrator shall make this determination by checking the PME's calibration due date and speaking with employees that work with the PME.
- 3.1.12. Collect all vendor calibrated PME that are due for calibration as listed in the notification, and ensure equipment's probe, AC adapter, manual (if available) and other accessories are complete and available for calibration.
- 3.1.13. Sign the notification to acknowledge receipt and screen each vendor calibrated PME's general condition upon return from calibration.
- 3.1.14. Approve field hours noted by the Vendor on the notification. Review invoices and provide input to the District director on program expenses and other budgetary matters.

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: INSPECTION AND MEASURING TEST EQUIPMENT**

**Mechanical Department MQPP Procedure # MQPP-9.01**

- 3.1.15. Properly identify and quarantine all deleted, inactive and any uncalibrated PME to prevent usage unless it is brought back to calibrated status.
- 3.1.16. File a copy of the Calibration Certificate for each vendor calibrated PME in the Maximo data system and original copy in the Calibration Master folder.
- 3.1.17. Site Administrator will send information to the Mechanical Department System Administrator for updating Maximo Data system of new tool arrivals and removal of tools.
- 3.1.17.1. Site Administrator shall provide applicable information of new tool, which includes but not limited to, Manufacturer, Serial Number, Model Number, Calibration Frequency, Location, Status, in use Date and etc., to the Mechanical Department System Administrator.
- 3.1.18. Site Administrator shall regularly verify the Calibration Data in Maximo Data System of Bad Order Tools and Meters to assure the following information is correct:
  - 3.1.18.1. Manufacturer, Serial Number, Model Number, Frequency, Location, Status (active, inactive, or deleted), Calibration Date, Calibration Due Date,
- 3.1.19. The Site Administrator acknowledges receipt of the vendor calibrated PME, and screens the PME's general condition upon return from calibration.
- 3.1.20. The Site Administrator inspects each PME for completeness of accessories and appropriate decals.
- 3.1.21. The Site Administrator updates Maximo Data System with the completed Calibration Certificates and Date. Shall file the original documents in its file.
- 3.2. District shall coordinate vendor and the District's calibration schedule.

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: INSPECTION AND MEASURING TEST EQUIPMENT**

**Mechanical Department MQPP Procedure # MQPP-9.01**

- 3.2.1. Ensure vendor calibrated PME with limited calibration are properly tagged so that only functions that pass calibration will be used.
- 3.2.2. Retain calibration records for a minimum of three (3) calibration cycles, for traceability and trend analysis purposes.
- 3.2.3. Determine proper calibration intervals or frequencies for all PME based on manufacturer's recommendation, usage and wear, adjustment frequency and out-of-tolerance condition or trend. The following guideline shall be used to ensure calibration frequency is within a respectable confidence level.
  - 3.2.3.1. Decrease Interval: When inspection records indicate that the PME requires frequent adjustments, the interval should be shortened and the pertinent data shall be evaluated to determine their impact on out-of-tolerance conditions.
  - 3.2.3.2. Increase Interval: If the results of the previous accuracy of the PME will not be adversely affected, the interval maybe lengthened.
- 3.3. Project Quality Control Specialist.
  - 3.3.1. Project Quality Control Specialist shall send out a monthly Tool and Meters Calibration Report of vendor calibrated PME that are overdue and vendor calibrated PME that are due for the following month to all three of the districts. This monthly report will be communicated electronically to all three District Directors.
  - 3.3.2. Calibration results are monitored and reviewed to ensure program compliance.

## Mechanical Department Quality Plan

**PROCEDURE TITLE: INSPECTION AND MEASURING TEST EQUIPMENT**

**Mechanical Department MQPP Procedure # MQPP-9.01**

- 3.3.3. Inspect vendor for capability, and compliance with the calibration standards traceable to the National Institute of Standards and Technology (NIST) or other nationally recognized standards.
- 3.3.4. Shall handle any revision made to the calibration program by updating the Metra Mechanical Department Calibration Program document and making all districts and proper personnel aware of the revision.
- 3.4. Vendor shall:
  - 3.4.1. Perform calibration in accordance with procedures and tolerances traceable to reference standards maintained by NIST or other nationally recognized standards
  - 3.4.2. Prepare a written quote for approval of any vendor calibrated PME repairs.
  - 3.4.3. Affix calibration decal showing the last calibration date, the next calibration due date and calibrated by. This information must also be applied to the calibration certificate furnished to Metra.
  - 3.4.4. Upon completion of calibration, issue a calibration certificate for each vendor calibrated PME to document compliance with applicable standards.
  - 3.4.5. Calibration Certificate shall contain:
    - 3.4.5.1. Name of manufacturer, Model Number, Serial Number, Date Calibrated, Next calibration due date, Name, phone number, and address of calibration vendor.
  - 3.4.6. Ensure the Calibration Certificate reflects the specific amount of adjustments made for historical record and trend purposes.
    - 3.4.6.1. In-tolerance, adjustment to optimum value, if applicable.

## Mechanical Department Quality Plan

**PROCEDURE TITLE: INSPECTION AND MEASURING TEST EQUIPMENT**

**Mechanical Department MQPP Procedure # MQPP-9.01**

- 3.4.6.2. Out-of-tolerance, adjustment value to bring within tolerance.
- 3.4.7. Tag, both failed PME and PME with limited calibration, so that only functions that pass calibration will be used. Provide specific instruction on PME's limited calibration capability.
- 3.4.8. Notify the District Director if repair is needed on a vendor calibrated PME that will exceed price quoted for the calibration. The District Director's approval should be given in writing before any repair of a vendor calibrated PME will begin.
- 3.4.9. Ensure expeditious return of PME upon completion of calibration and/or repair in accordance with the contract requirement.
- 3.4.10. Ensure timely submission of invoice for payment, and appropriate notification number is indicated on the invoice to facilitate traceability of actual work performed.
- 3.5. For historical and trend analysis purposes, the original calibration records shall be maintained at each field location for a minimum of three (3) calibration cycles.

## Mechanical Department Quality Plan

PROCEDURE TITLE: NONCONFORMANCE

Mechanical Department MQPP Procedure # MQPP-11.01

### REVISION HISTORY

DOCUMENT REVISION HISTORY				
REVISION DATE	REVISION NUMBER	SECTION NUMBER	REASON FOR REVISION	DESCRIPTION
5/5/16	N/A	N/A	N/A	NEW PROCEDURE

## Mechanical Department Quality Plan

**PROCEDURE TITLE: NONCONFORMANCE**

**Mechanical Department MQPP Procedure # MQPP-11.01**

### **1. SCOPE**

- 1.1. The purpose of this section is to provide for a system and instructions, and to assign responsibilities for identifying, documenting and evaluating a nonconforming product, and disposition for a nonconforming product.

### **2. PROCEDURE**

#### **2.1. PROGRAM IMPLEMENTATION**

##### **2.1.1. Identification and Documentation**

- 2.1.1.1. The Lead Carman or Project Quality Control Specialist personnel are responsible for identifying nonconforming products during their inspection activities. Foremen or the Lead Carman are responsible for identifying nonconforming products that are found during production. All personnel are encouraged to watch for and identify nonconforming products regardless of their other responsibilities.

- 2.1.1.2. When a nonconformity is identified, it is documented on a Material and Service Problem Form, which is the equivalent of a nonconforming report (example of this form is Appendix "A"). This report shall contain the identification of the product (manufacturer, model number, and serial number), a description of the nonconformity, and any applicable cause for the nonconformity. Foremen, the Lead Carmen, or Project Quality Control Specialist personnel are authorized to initiate a nonconformance report. Other personnel shall report any observed nonconformity to their foremen or the Lead Carmen.

- 2.1.1.3. After a nonconformity is reported, the product shall either be marked as bad-order or have some kind of rejection tag affixed to the product. It will be the responsibility of the designated field

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: NONCONFORMANCE**

**Mechanical Department MQPP Procedure # MQPP-11.01**

materiel person to verify that non-conforming product is tagged or segregated. If it is a received product, it should be physically segregated into a designated rejected materials area for disposition.

- 2.1.1.4. The Project Quality Control Specialist will be in charge of tracking Material and Service Problem Forms. The Project Quality Control Specialist will keep a database of all Nonconformity reports and their resolutions. The Material and Service Problem Forms will be kept as quality records.
- 2.1.2. Reworked material shall be inspected using a Material Inspection Form. (An example of this form is in Appendix "B").
- 2.1.3. Nonconformity Review and Disposition
  - 2.1.3.1. The disposition and acceptance of the nonconforming material may be accomplished by:
    - 2.1.3.1.1. 'Reworking' to complete or correct to the original requirement of a drawing, procedure, or specification. The Mechanical Department engineering group shall furnish a description of the rework required to the party responsible for performing the rework. This description shall be contained in an Engineering Change Notice (ECN) (Appendix "C").
    - 2.1.3.1.2. 'Repairing' the defective item, by restoring to a condition such that the capability of an item to function reliably and safely is unimpaired, even though that material still does not conform to the original requirement. 'Use-as-is' without any repair or rework, when it can be established that the material is satisfactory for its intended use.
    - 2.1.3.1.3. Returned to vendor for credit.
    - 2.1.3.1.4. 'Scrapped', the product shall either be removed from the premises or disposed of according to environmental laws or the product shall be saved for possible use in alternate applications.

## **Mechanical Department Quality Plan**

**PROCEDURE TITLE: NONCONFORMANCE**

**Mechanical Department MQPP Procedure # MQPP-11.01**

- 2.1.3.2. The decision on whether to rework, repair, use-as-is, return to vendor for credit, or scrap a nonconforming product by the Material Review Board (MRB), or shall be made handling with vendor without calling a MRB at the discretion of the Senior Director - Capital.
- 2.1.3.2.1. The MRB will consist of representatives from the quality, engineering, and production departments. An MRB form will be used to track these activities. (An example of this form is in Appendix "D").
- 2.1.3.3. Material Review Board – Procedure
- 2.1.3.3.1. It is the responsibility of the MRB to perform product evaluations of all nonconformance material at least monthly. However, an MRB may be called earlier for critical material.
- 2.1.3.4. An Engineering Change Notice (ECN) will be initiated by the Mechanical Department Engineering for material that deviates from the required specifications or requirements, but can safely be used. This ECN will change the actual requirements of the material. An ECN form will be used to track these activities.
- 2.1.3.4.1. Materials will maintain their non-conformance status until an ECN is approved. Items that will not be reworked or repaired until an ECN is approved by the Senior Director - Capital (or designated individual).
- 2.1.3.4.2. The MRB may decide that material that cannot be reworked or that will be too expensive to rework shall be scrapped.
- 2.1.3.4.3. The MRB may also decide that the nonconformance of a material does not affect its functionality or aesthetics. Therefore, the material may be deemed use-as-is by the MRB.
- 2.1.4. Reinspection

## Mechanical Department Quality Plan

**PROCEDURE TITLE: NONCONFORMANCE**

**Mechanical Department MQPP Procedure # MQPP-11.01**

- 2.1.5. Reworked products are inspected again to verify that they comply with the new requirements that were specified in the ECN. This inspection will be performed by the Lead Carman under the supervision of the Project Quality Control Specialist or performed directly by the Project Quality Control Specialist. The inspection will be documented using a Material inspection Form. (An example of this form is in Appendix "B").

### **3. ATTACHMENTS**

- 3.1. **Appendix A: Material Problem Form**
- 3.2. **Appendix B: Material Inspection Form**
- 3.3. **Appendix C: Engineering Change Notice (ECN)**
- 3.4. **Appendix D: Material Review Board (MRB)**

# APPENDIX A

# Project Material Problem Form

Control No. MPF \_\_\_\_\_

Date: _____	Car Number _____	Code      Cause 1 Metra Damage 2 Metra Lost 3 Warrenty, B/O 4 Metra Request 5 Shipping 6 Other
Your Name: _____	Project: _____	
Vendor: _____	Station: _____	
Part Number: _____	Qauntity: _____	
Part Description: _____	B/O Tag #: _____	
Serial Number: _____	Pictures Taken <input type="checkbox"/>	

Description of Problem / Issue:

<b>Materials Team</b>					
Has the part been replaced? (circle)					
Yes	No	Station: _____	Date: _____		
Initials of Materials Person: _____					

# APPENDIX B

# Metra - Mechanical Department

Appendix B

QA/QC

- First Article
- First Article Audit
- Material Inspection

Inspection Report # : \_\_\_\_\_

Project #: \_\_\_\_\_

 Capital Operating

Part #: \_\_\_\_\_ Serial # / Lot #: \_\_\_\_\_

Description: \_\_\_\_\_ Drawing: \_\_\_\_\_

Purchase Order / Work Order Number: \_\_\_\_\_ Revision: \_\_\_\_\_

Supplier: \_\_\_\_\_ Reference: \_\_\_\_\_

Qty Received: \_\_\_\_\_ Date Received: \_\_\_\_\_ Qty Inspected: \_\_\_\_\_

Item	Dimension or Specification - IN	Min	Max	Actual	Within	Out of
					Spec	Spec
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

- First Article Approved** This is Authorization to Proceed
- First Article Rejected** Correct Defects & Resubmit Article
- Inspection Passed** Material Accepted
- Inspection Failed** Material Rejected

Remarks &amp; Comments:

---

---

Inspector Signature: \_\_\_\_\_

Date: \_\_\_\_\_

rev30707

# APPENDIX C

ECN number:	—	ECN--	Next ECN Number:
Drawing number:	Note: Do not use any letters, only numbers for drawing numbers. For non-Metra ECNs, please contact management to determine how to proceed.		
Current DWG Rev:			
To Revision:	<input checked="" type="checkbox"/> Metra Drawing?		
# of Sheets:			
Sheet Number that changes:	Name:	Date:	Comments:
Prepared by:	Review 1		
Prepared by Date:			
Closing Approved by:			
Closing Approved by Date:	Review 2		
Current Requisition Open?	Please Select		
Description of Change:			
Reason for Change:			
Effectivity:			

[Add Another ECN](#)[Save and Exit](#)

# APPENDIX D

# Metra - Mechanical Department

Appendix B

## Material Review Board

MRB Report No. : \_\_\_\_\_

### MRB is in Response to the following:

- Material & Service Problem - No. \_\_\_\_\_  
 Material Inspection Report - No. \_\_\_\_\_

Project #: \_\_\_\_\_

Capital

Operating

Part #:

Serial # / Lot #:

Description:

Drawing:

Purchase Order / Work Order Number:

Revision:

Supplier:

Reference:

Qty Received:

Date Received:

Qty Inspected:

### Corrective Action

- |                          |                         |  |
|--------------------------|-------------------------|--|
| <input type="checkbox"/> | <b>Use As Is</b>        | This is Authorization to use material as is.             |
| <input type="checkbox"/> | <b>Rework</b>           | This is Authorization to rework material in-house.       |
| <input type="checkbox"/> | <b>Repair</b>           | This is Authorization to repair material in-house.       |
| <input type="checkbox"/> | <b>Return to Vendor</b> | Material to be sent to vendor for replacement or credit. |
| <input type="checkbox"/> | <b>Scrap</b>            | This is Authorization to scrap material.                 |

### Description of Problem and Corrective Action

Remarks & Comments:

### MRB Members:

Engineer Signature: \_\_\_\_\_

QA/QC Signature: \_\_\_\_\_

Project Manager Signature: \_\_\_\_\_

Engineering Manager Signature: \_\_\_\_\_

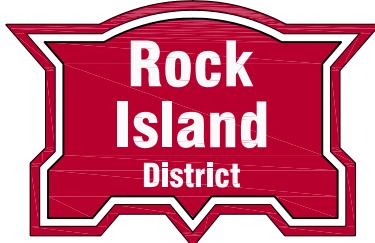
Date: \_\_\_\_\_

rev.080514

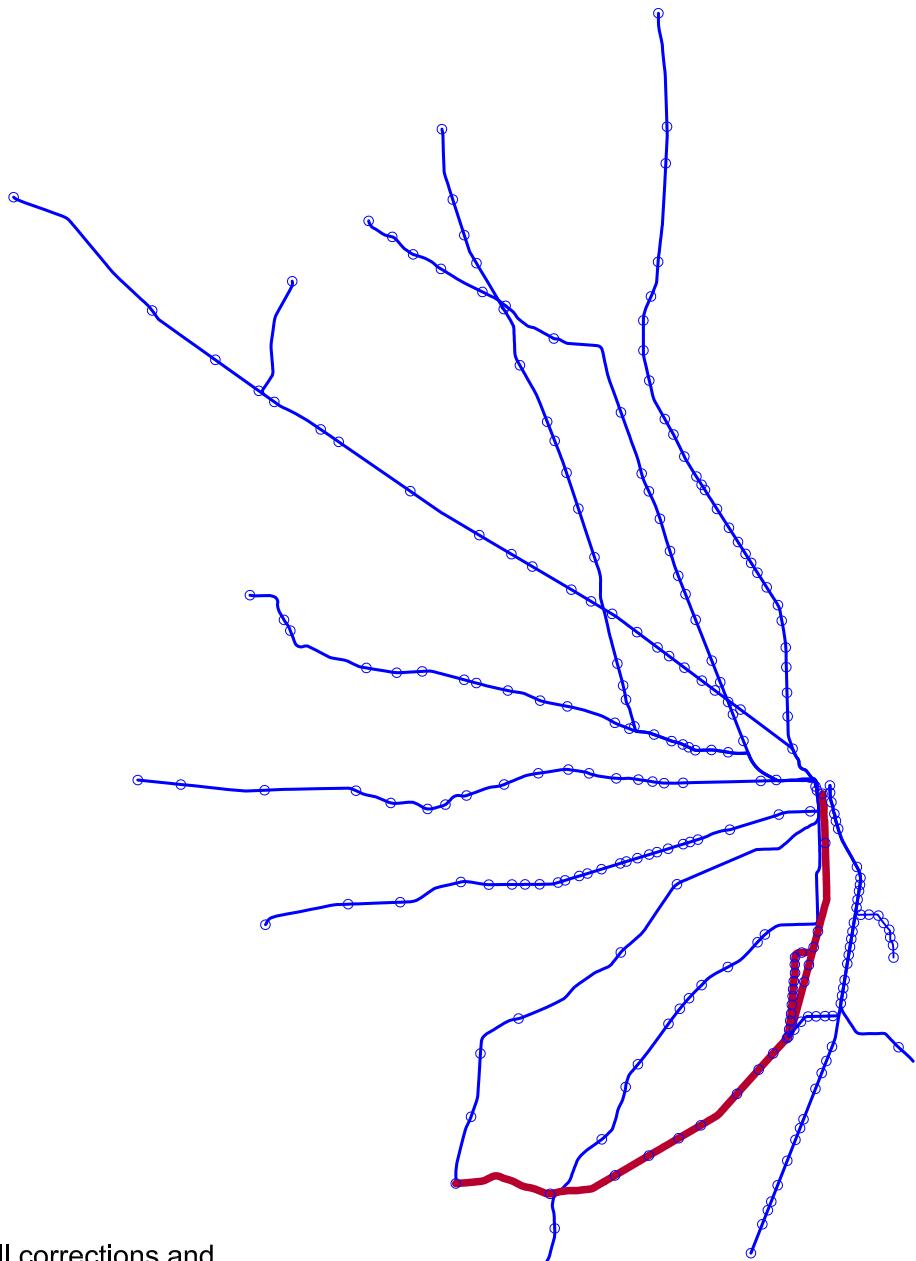


## Joliet to Chicago – Monday through Friday

	ZONES	STATIONS	400	600	402	404	602	406	604	408	606	302	608	410	610	412	612	414	614	416	616	506	508	510	512	514	516	418	618	420	620	422	524	528	428	530				
●	H	JOLIET	LV:	4:28	—	5:03	5:25	—	5:51	—	6:16	—	—	6:40	—	7:04	—	7:23	—	7:40	—	8:21	9:21	10:21	11:21	12:21	1:21	2:21	—	3:21	—	4:20	5:15	7:11	8:30	9:45				
●	G	New Lenox	4:37	—	5:12	5:35	—	6:01	—	6:26	—	—	6:50	—	7:14	—	7:33	—	7:50	—	8:30	9:30	10:30	11:30	12:30	1:30	2:30	—	3:30	—	4:29	5:24	7:20	8:39	9:54					
●	F	Mokena - Front St.	4:43	—	5:18	5:41	—	6:07	—	6:32	—	—	6:56	—	7:20	—	7:39	—	7:56	—	8:36	9:36	10:36	11:36	12:36	1:36	2:36	—	3:36	—	4:35	5:30	7:26	8:45	10:00					
●	F	Mokena - Hickory Creek	4:47	—	5:22	5:45	—	6:12	—	6:37	—	—	7:01	—	7:25	—	7:44	—	8:00	—	8:41	9:40	10:40	11:40	12:40	1:40	2:40	—	3:40	—	4:39	5:34	7:30	8:49	10:04					
○	E	Tinley Park-80th Ave.	4:51	—	5:26	5:49	—	6:17	—	6:42	—	6:49	—	7:06	—	7:30	—	7:49	—	8:04	—	8:44	9:44	10:44	11:44	12:44	1:44	2:44	—	3:44	—	4:43	5:38	7:34	8:53	10:08				
●	E	Tinley Park	4:54	—	5:29	5:53	—	6:21	—	—	6:53	—	7:10	—	7:34	—	7:53	—	8:08	—	8:47	9:47	10:47	11:47	12:47	1:47	2:47	—	3:47	—	4:46	5:41	7:37	8:56	10:11					
●	E	Oak Forest	4:59	—	5:34	5:59	—	6:27	—	—	6:58	—	7:16	—	7:40	—	7:59	—	8:13	—	8:52	9:52	10:52	11:52	12:52	1:52	2:52	—	3:52	—	4:51	5:46	7:42	9:01	10:16					
●	D	Midlothian	5:03	—	5:38	6:03	—	6:31	—	—	7:02	—	7:20	—	7:44	—	8:03	—	8:17	—	8:56	9:56	10:56	11:56	12:56	1:56	2:56	—	3:56	—	4:55	5:50	7:46	9:05	10:20					
●	D	Robbins	5:06	—	5:41	6:06	—	6:34	—	—	7:05	—	—	—	—	—	—	—	—	—	8:20	—	8:59	9:59	10:59	11:59	12:59	1:59	2:59	—	3:58	—	5:52	7:48	9:07	f10:22				
●	D	Blue Island-Vermont St.	5:10	5:20	5:45	6:10	5:58	6:38	6:31	6:56	6:44	7:09	7:04	7:26	7:25	7:50	7:40	7:58	8:24	8:13	9:02	10:04	11:03	12:03	1:03	2:03	3:02	3:26	4:02	4:25	5:00	5:56	7:52	9:11	10:26					
D	Prairie St.		5:22				6:00		6:33		6:46		7:06		7:27		7:42		8:00		8:15	9:04	10:06	11:05	12:05	1:05	2:05	3:28	4:26	5:55	7:54	f10:28								
C	123rd St.		5:24				6:02		6:35		6:48		7:08		7:29		7:44		8:02		8:17	9:06	10:08	11:07	12:07	1:07	2:07	3:30	4:28	6:00	7:56	f10:30								
○	C	119th St.	5:26				6:04		6:37		6:50		7:10		7:31		7:46		8:04		8:19	9:08	10:10	11:09	12:09	1:09	2:09	3:32	4:30	6:02	7:58	f10:32								
○	C	115th St.-Morgan Park	5:28				6:06		6:39		6:52		7:12		7:33		7:48		8:06		8:21	9:10	10:12	11:11	12:11	1:11	2:11	3:34	4:32	6:04	8:00	f10:34								
●	C	111th St.-Morgan Park	5:30				6:08		6:41		6:54		7:14		7:35		7:50		8:08		8:23	9:12	10:14	11:13	12:13	1:13	2:13	3:36	4:34	6:06	8:02	f10:36								
○	C	107th St.-Beverly Hills	5:32				6:10		6:43		6:56		7:16		7:37		7:52		8:10		8:25	9:14	10:16	11:15	12:15	1:15	2:15	3:38	4:36	6:08	8:04	f10:38								
●	C	103rd St.-Beverly Hills	5:34				6:13		6:46		6:59		7:19		7:40		7:55		8:13		8:27	9:16	10:18	11:17	12:17	1:17	2:17	3:40	4:38	6:10	8:06	f10:40								
●	C	99th St.-Beverly Hills	5:36				6:15		6:48		7:01		7:21		7:42		7:57		8:15		8:29	9:18	10:20	11:19	12:19	1:19	2:19	3:42	4:40	6:12	8:08	f10:42								
○	C	95th St.-Beverly Hills	5:39				6:17		6:50		7:03		7:23		7:44		7:59		8:17		8:31	9:20	10:22	11:21	12:21	1:21	2:21	3:44	4:42	6:14	8:10	f10:44								
○	C	91st St.-Beverly Hills	5:41				6:19		6:52		7:05		7:25		7:46		8:01		8:20		8:33	9:22	10:24	11:23	12:23	1:23	2:23	3:46	4:44	6:16	8:12	f10:46								
●	C	Brainard	5:43	—	6:21	—	6:54	—	7:07	—	7:27	—	7:48	—	8:03	—	8:22	—	8:35	9:24	10:26	11:25	12:25	1:25	2:25	3:48	4:46	6:18	8:14	f10:48										
●	C	103rd St.-Washington Hts.	—	5:51	6:15	—	6:43	—	—	7:15	—	7:31	—	—	—	—	—	—	—	—	8:30	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
○	C	95th St.-Longwood	—	5:54	6:18	—	6:46	—	—	7:18	—	7:34	—	—	—	—	—	—	—	—	8:33	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
B	Gresham	—	5:47	—	6:24	—	6:57	—	7:11	—	7:18	—	7:26	—	—	—	—	—	—	7:59	8:05	—	—	8:44	8:48	9:36	10:38	11:37	12:37	1:37	2:37	3:15	3:59	4:18	4:58	5:15	6:30	8:26	9:27	f11:00
A	35th St./"Lou" Jones	5:25	—	6:05	—	6:32	6:57	—	7:11	—	7:18	—	7:26	—	—	—	—	—	—	7:59	8:05	—	—	8:44	8:48	9:36	10:38	11:37	12:37	1:37	2:37	3:15	3:59	4:18	4:58	5:15	6:30	8:26	9:27	f11:00
A	CHICAGO (LaSalle St.) AR:	5:38	6:0																																					



## TRACK CHART

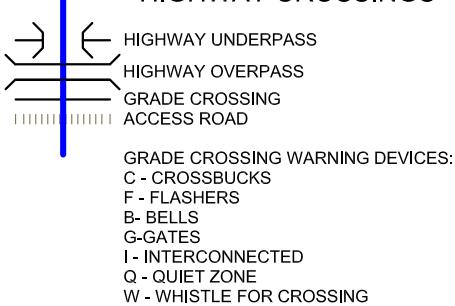


Forward all corrections and  
changes to: [tpitzen@metrarr.com](mailto:tpitzen@metrarr.com)

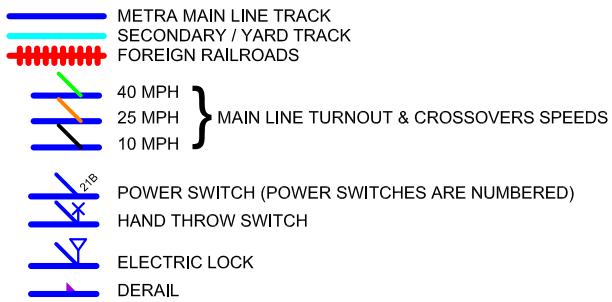
# LEGEND

APPENDIX C

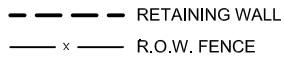
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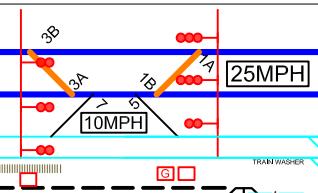
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## TOPOGRAPHY



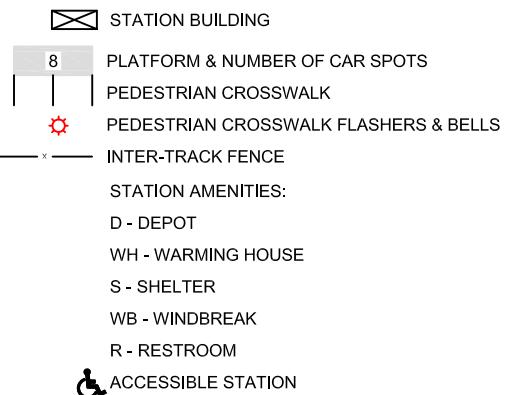
CROSSOVER SPEED



## SIGNAL



## STATIONS



## MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

79/30

## ROADWAY WORKER PROTECTION

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

ROCK ISLAND TERMINAL DISPATCHER (AAR CHANNEL 82)  
(312) 322-2854

7/8"

DEGREE OF CURVATURE

1°15'

2"

0°34'

1 1/8"

0°23'

1'03"

CURVE SUPERELEVATION

3"

0°54'

1 1/8"

0°23'

-1.94

PERCENT OF GRADE

-0.41

-0.21

## TRACK ALIGNMENT

## TRACK PROFILE

OH

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GAS

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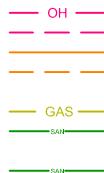
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LA SALLE STREET STATION

D, R ⚡

TOPS #000

STATION CODE 6000

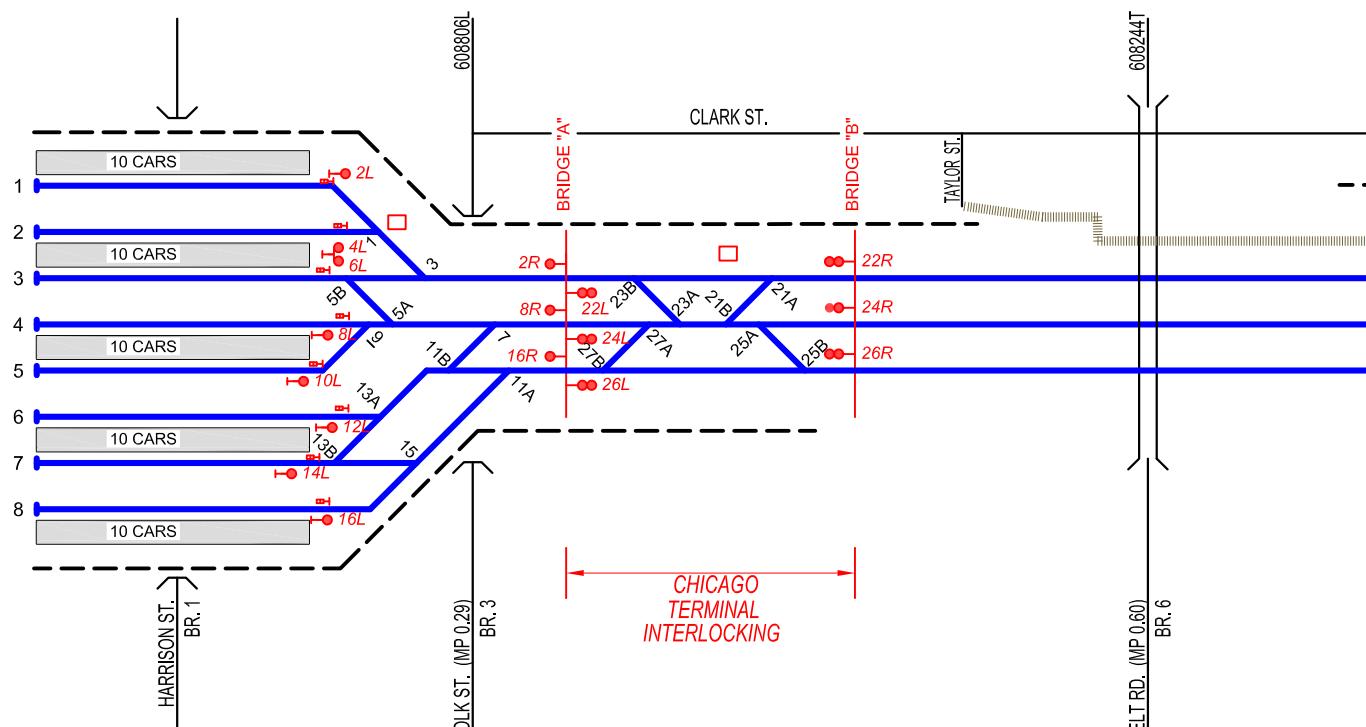
414 S. LA SALLE STREET

AGENT HOURS: 6:15AM - 9PM (M-F)

11AM - 7:30PM SAT.

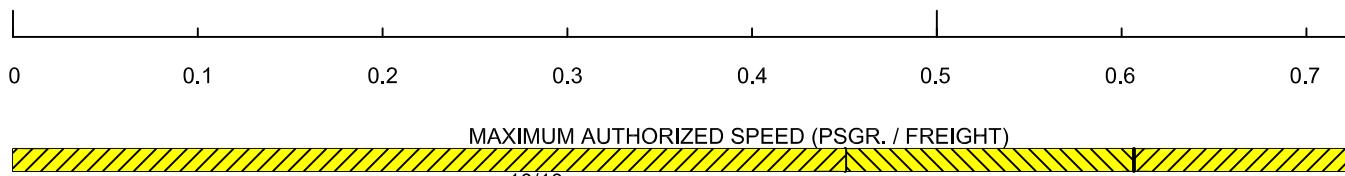
ADA ACCESSIBLE

APPENDIX C



SIGNAL BRIDGE A  
TOPS #004

SIGNAL BRIDGE B  
TOPS #006

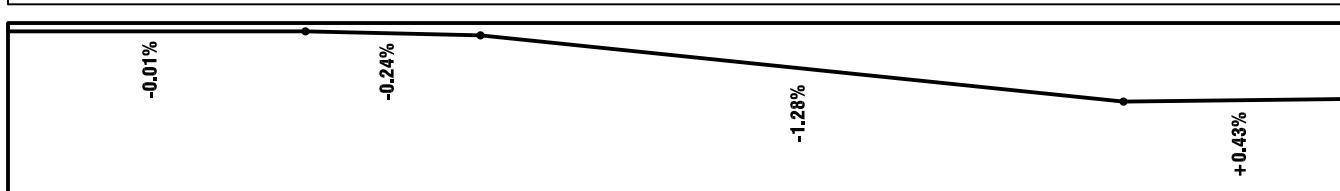
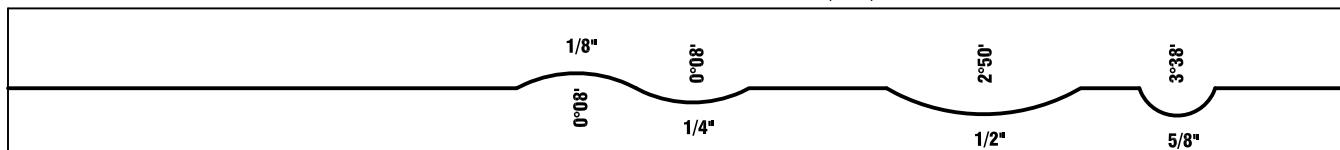


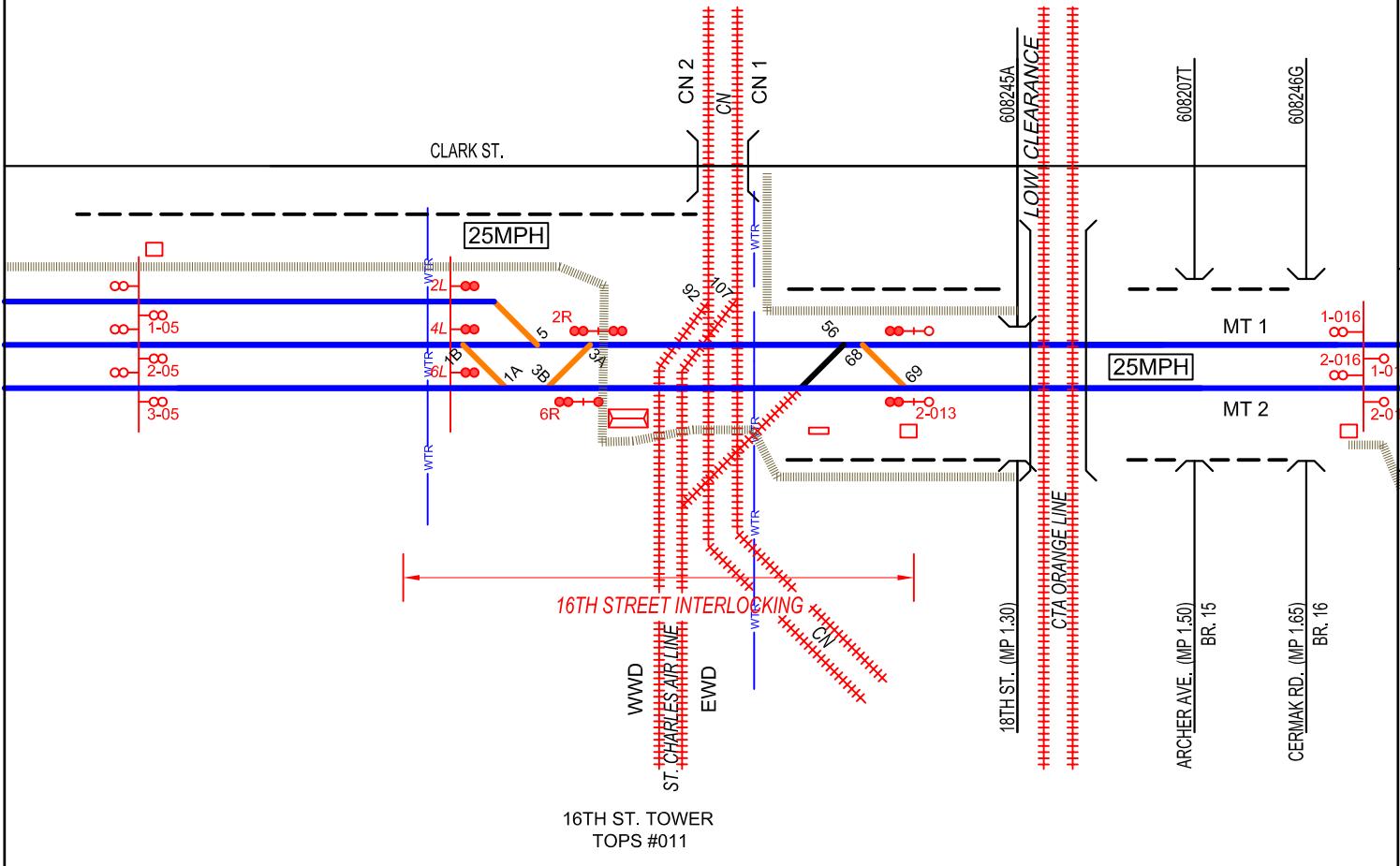
ROADWAY WORKER PROTECTION

FOUL TIME  
LOOKOUT  
**NO ITD**

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

ROCK ISLAND TERMINAL DISPATCHER (AAR CHANNEL 82)  
(312) 322-2854





0.7                  0.8                  0.9                  1                  1.1                  1.2                  1.3                  1.4                  1.5

30/10 20/10 50/30

## ROADWAY WORKER PROTECTION

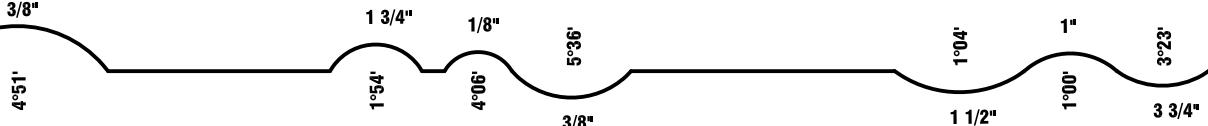
TIME TRACK AND TIME  
D FORM B, D  
UT LOOKOUT  
ITD

**FOUL TIME  
LOOKOUT  
*NO ITD***

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

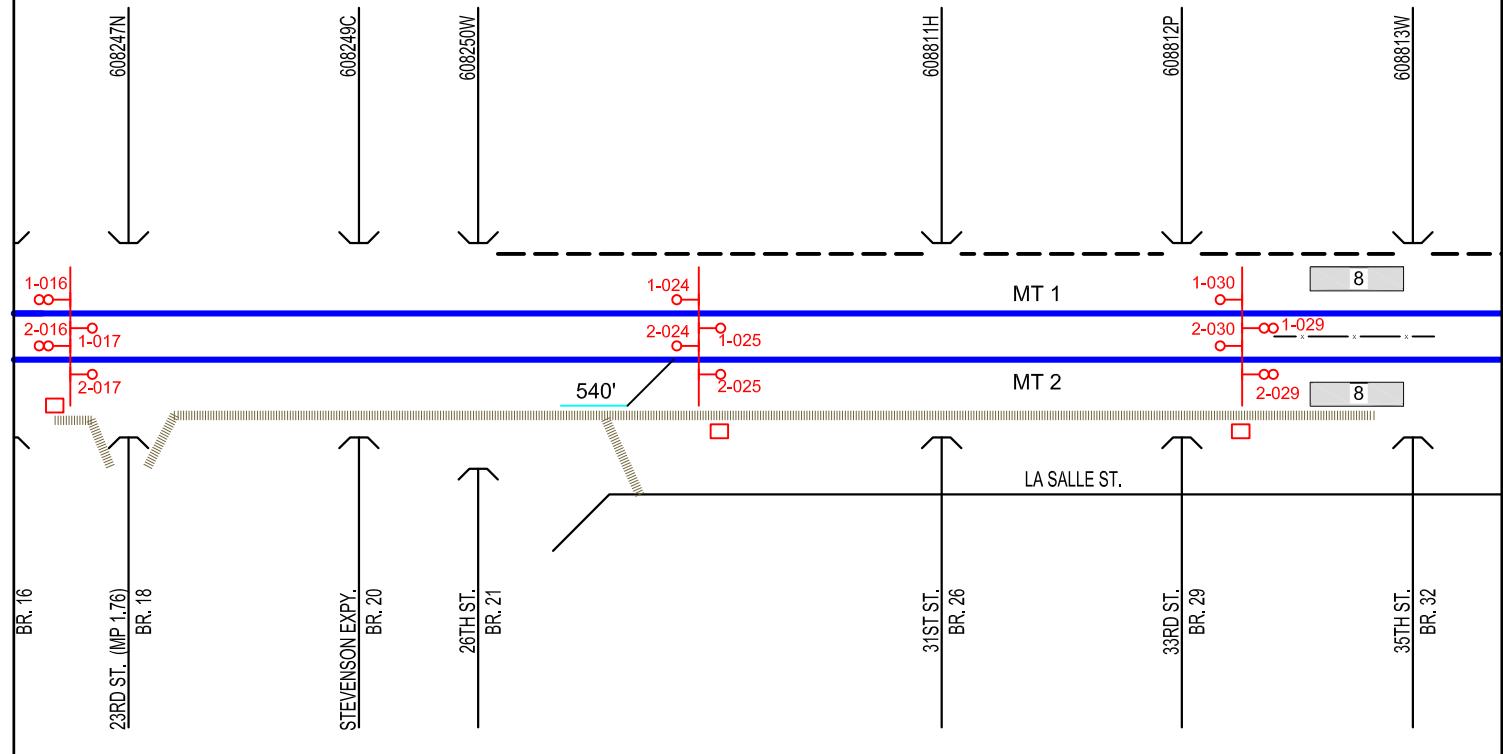
16TH ST. TOWER OPERATOR  
(312) 322-8958

ROCK ISLAND TERMINAL DISPATCHER (AA)  
← (312) 322-2854



+0.52%

APPENDIX G  
**35TH STREET STATION**  
**S &**  
**106 W. 35TH STREET**  
**NO AGENT**  
**TOPS #031**  
**STATION CODE 6031**  
**ZONE A**



2

2.5

3

MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

70/30

79/30

ROADWAY WORKER PROTECTION

TRACK AND TIME  
 FORM B, D  
 LOOKOUT  
 ITD

HER (AAR CHANNEL 82)

4

→ ROCK ISLAND TERMINAL DISPATCHER (AAR CHANNEL 82) →

(312) 322-2854

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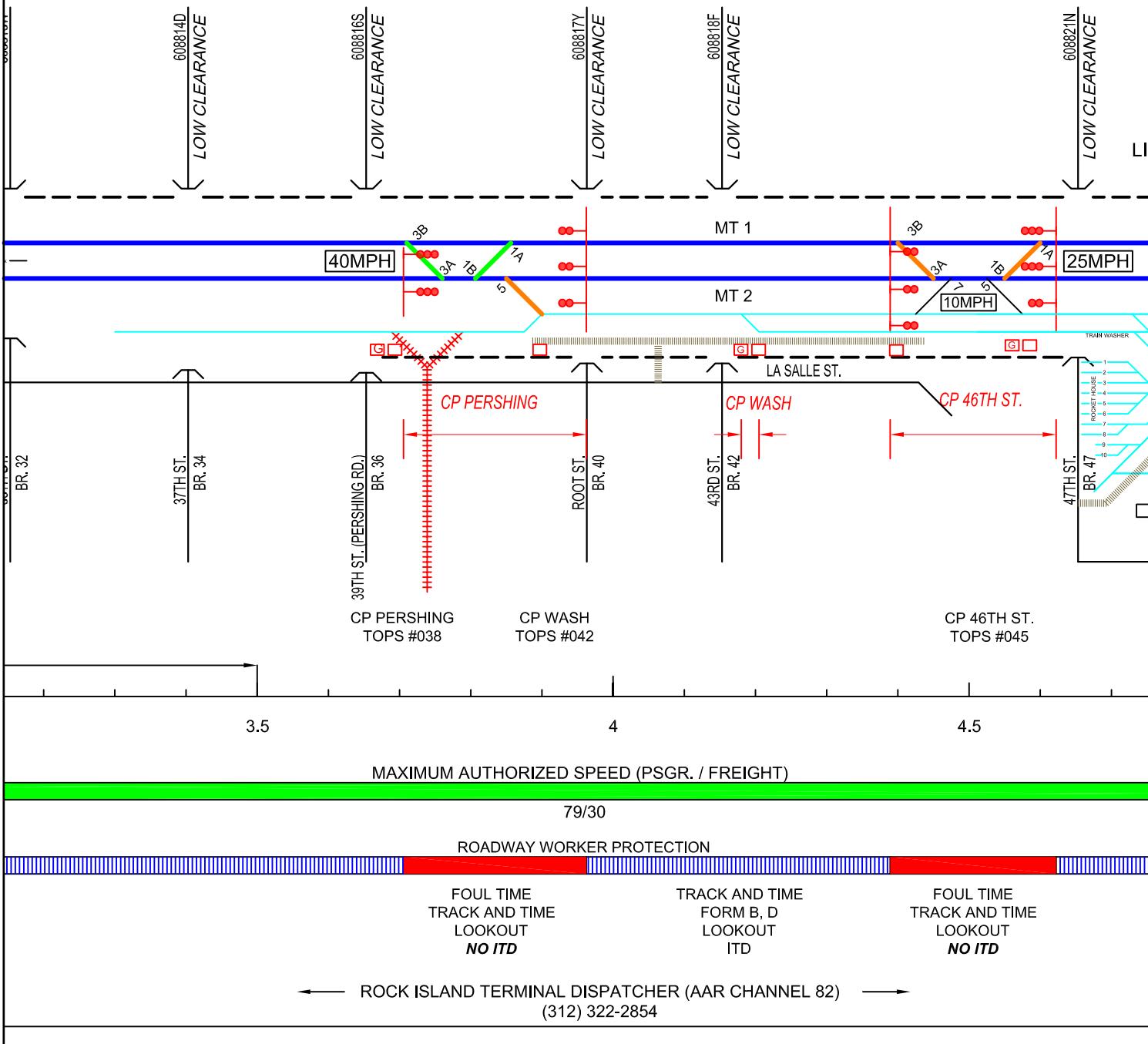
287

288

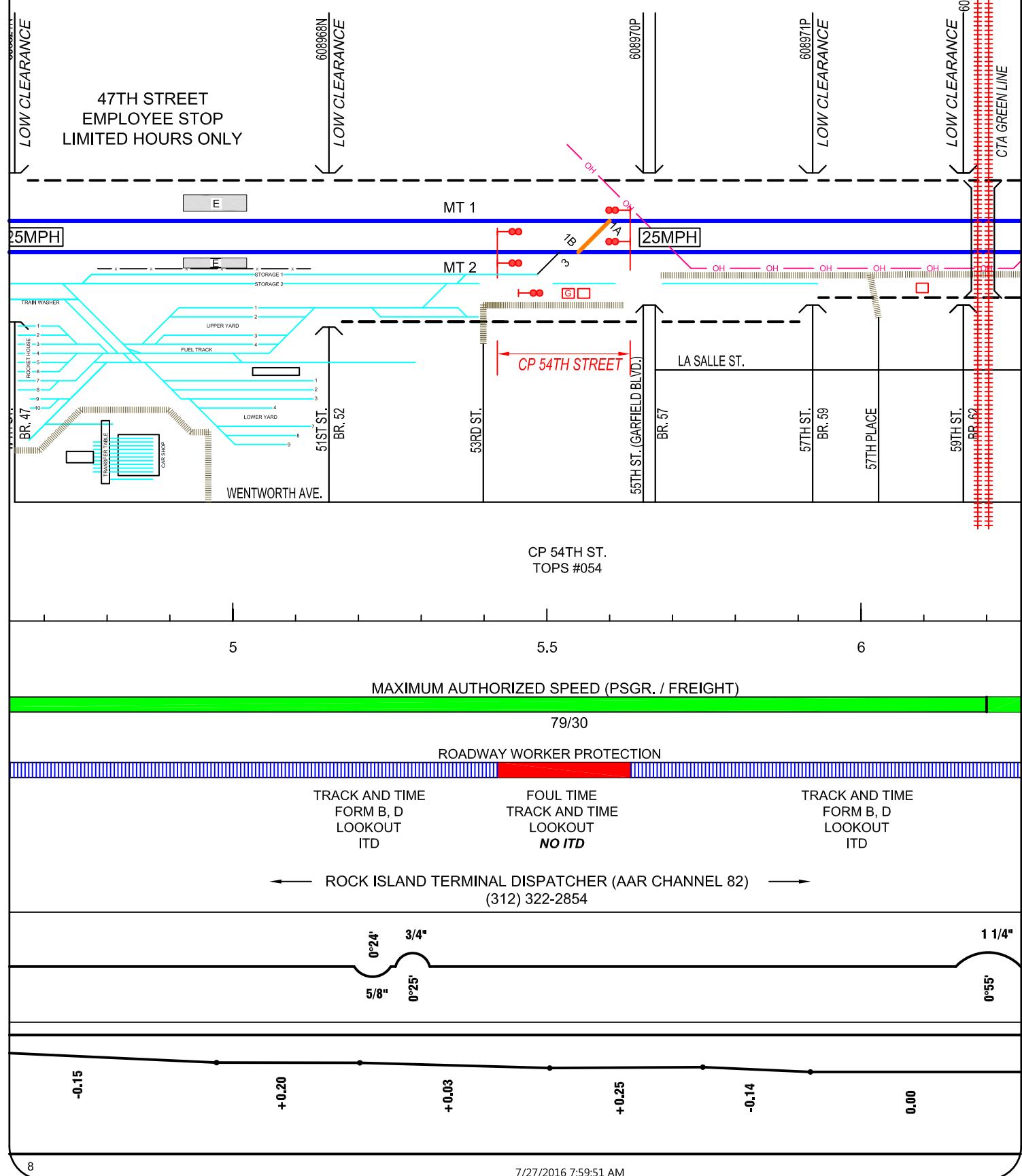
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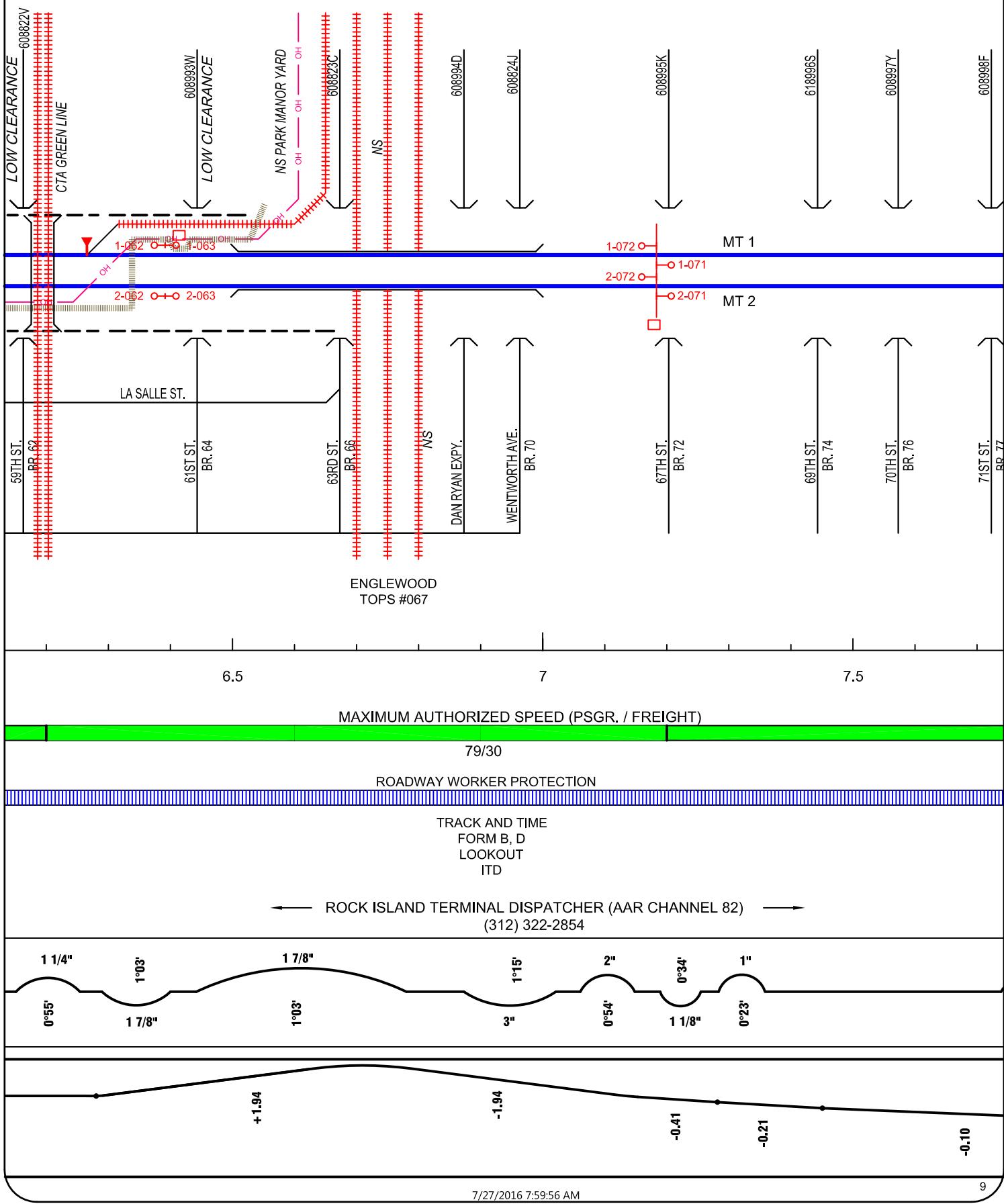
290

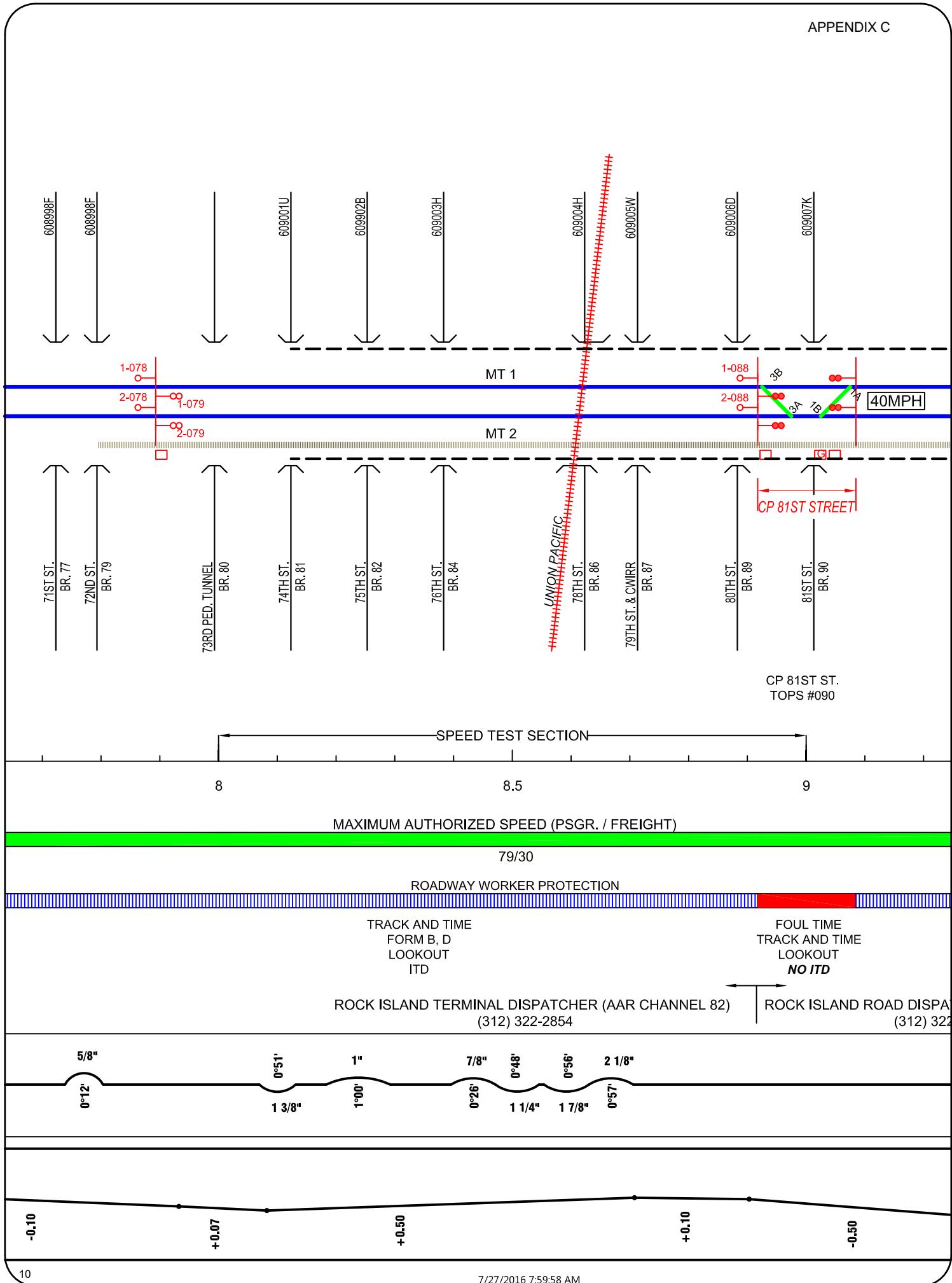
291



-0.27      -0.08      +0.12      0.00      +0.07

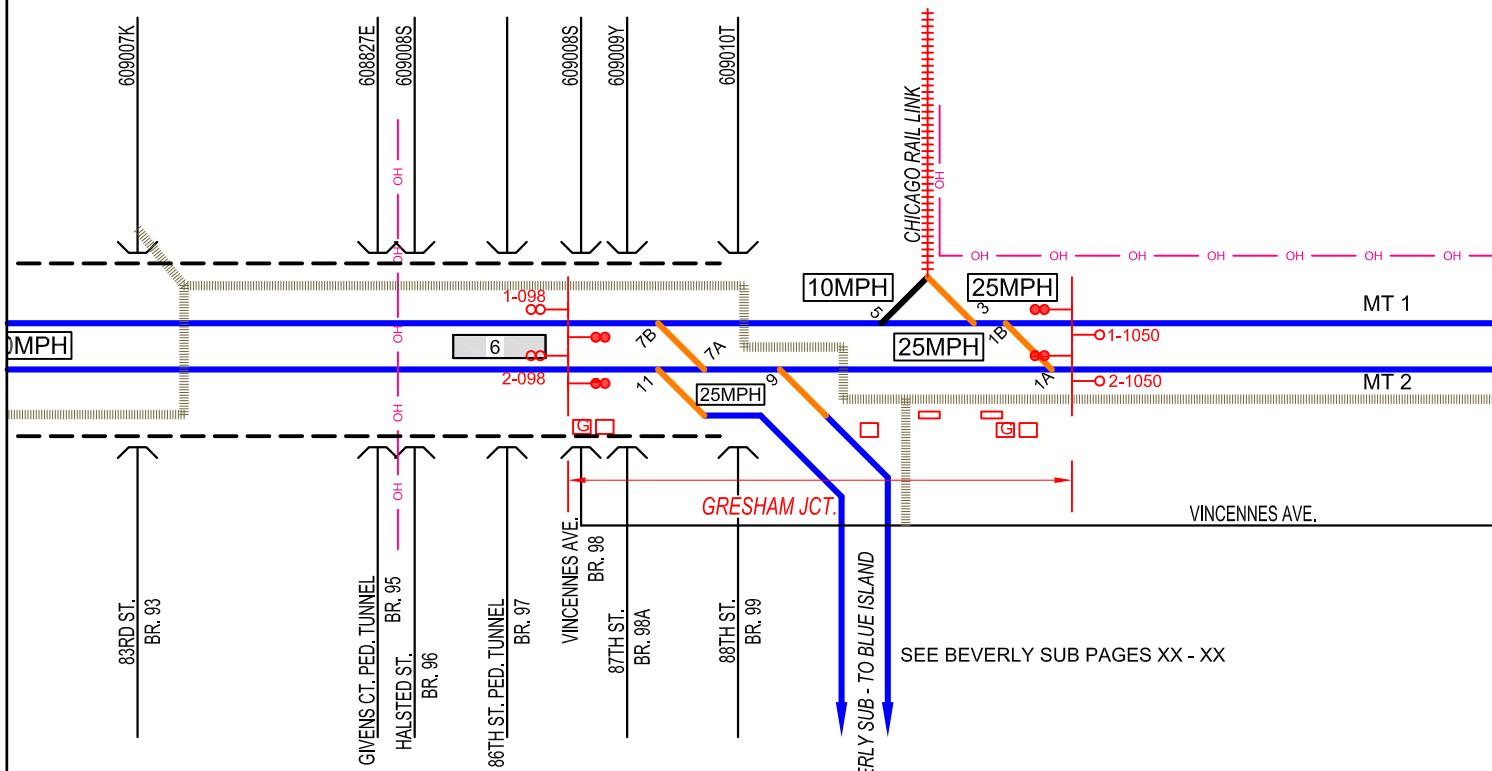






GRESHAM STATION  
S  
820 W. 87TH STREET  
NO AGENT  
TOPS #098  
STATION CODE 6098  
ZONE B

## APPENDIX C



**MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)**

79/30

## ROADWAY WORKER PROTECTION

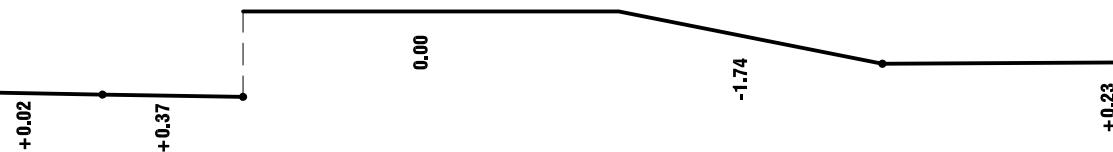
TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

**FOUL TIME  
LOOKOUT  
*NO ITD***

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

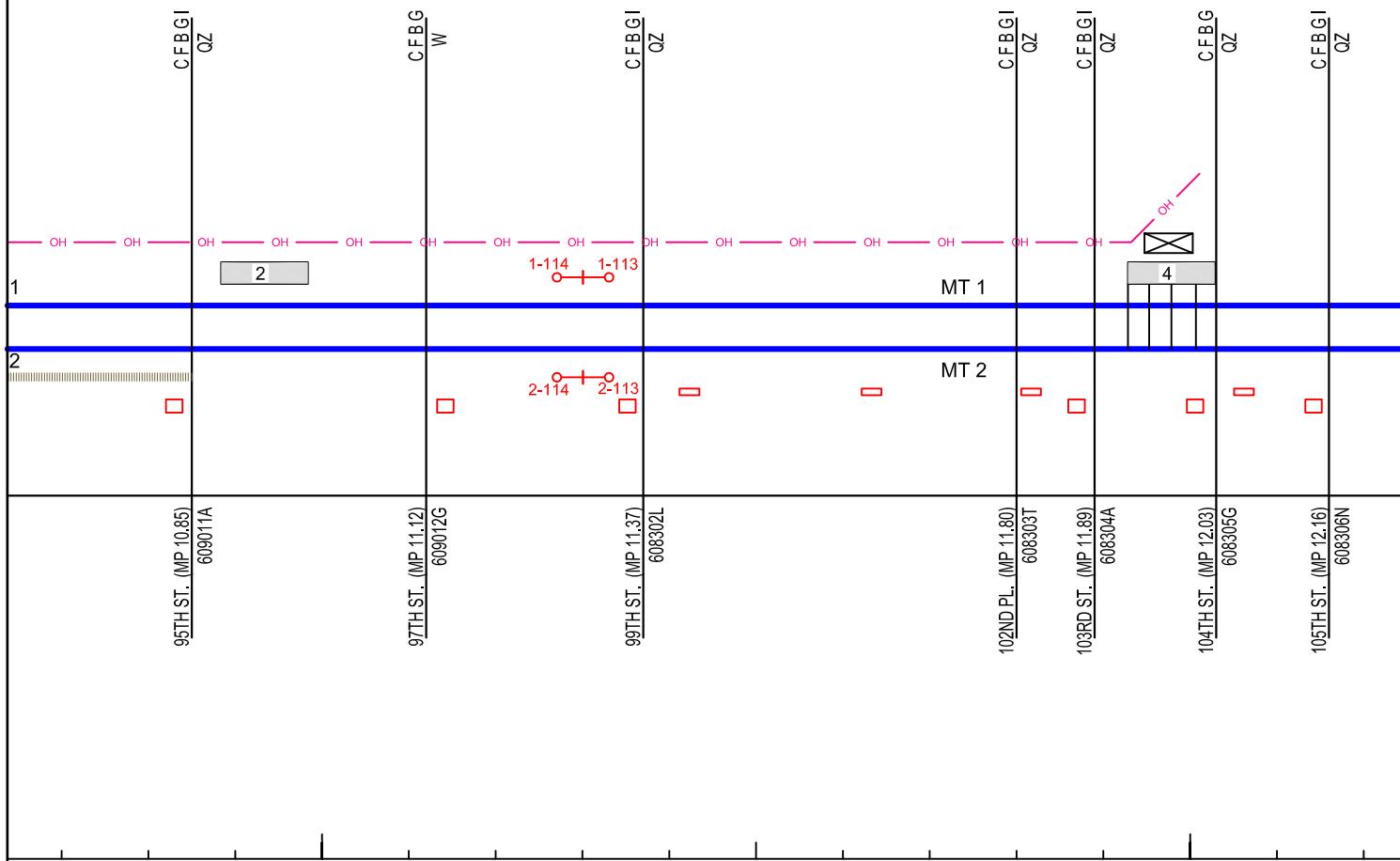
AD DISPATCHER (AAR CHANNEL 82)  
(312) 322-2856

← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →  
(312) 322-2856



95TH - LONGWOOD STATION  
 S &  
 9501 S. VINCENNES  
 NO AGENT  
 TOPS #109  
 STATION CODE 6109  
 ZONE C

103RD STREET - WASHINGTON HEIGHTS STATION  
 WH &  
 10335 S. VINCENNES  
 NO AGENT  
 WAITING ROOM HOURS: 6AM - 10PM  
 TOPS #120  
 STATION CODE 6120  
 ZONE C



11

11.5

12

MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

79/30

ROADWAY WORKER PROTECTION

TRACK AND TIME  
 FORM B, D  
 LOOKOUT  
 ITD

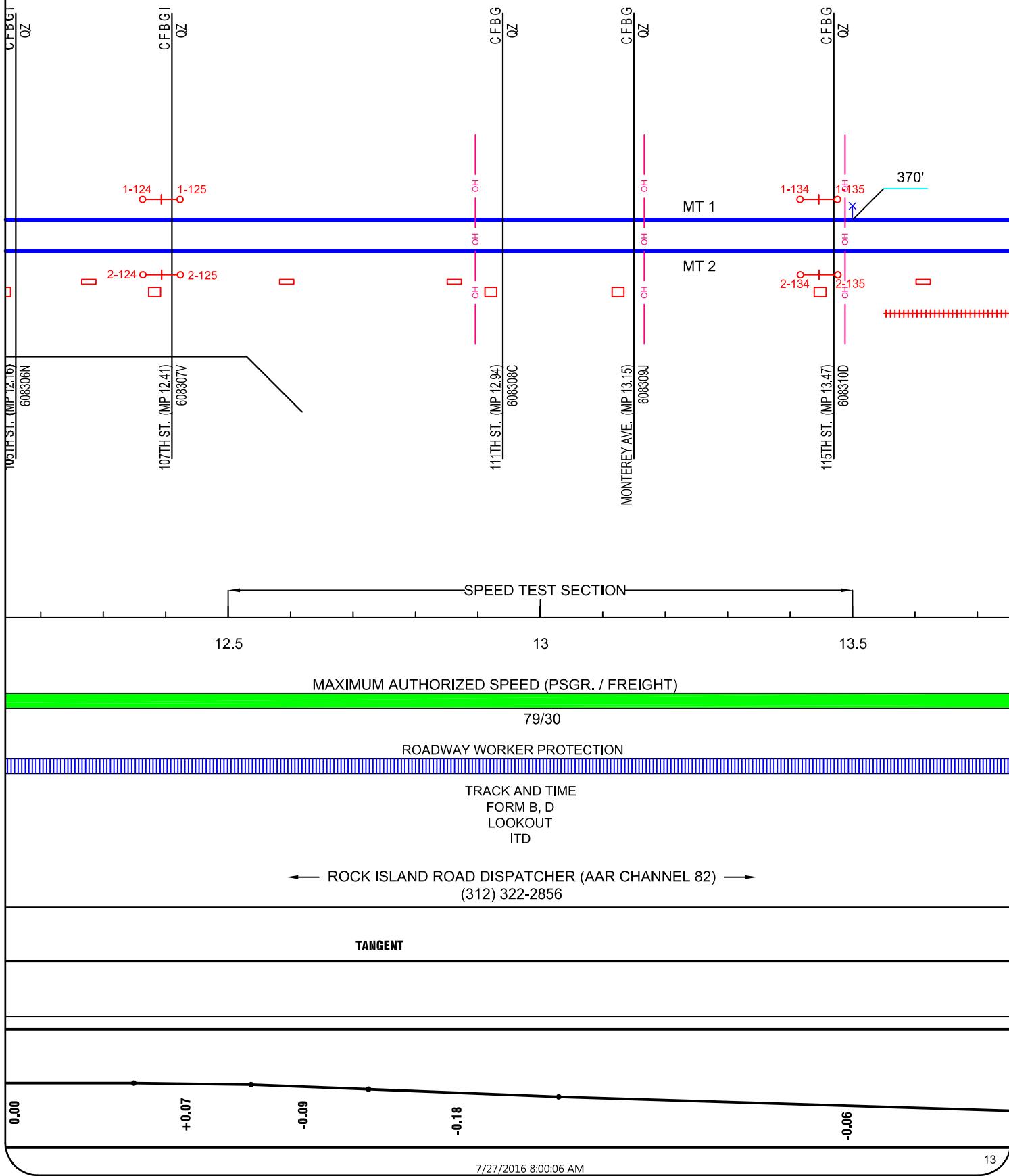
← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →  
 (312) 322-2856

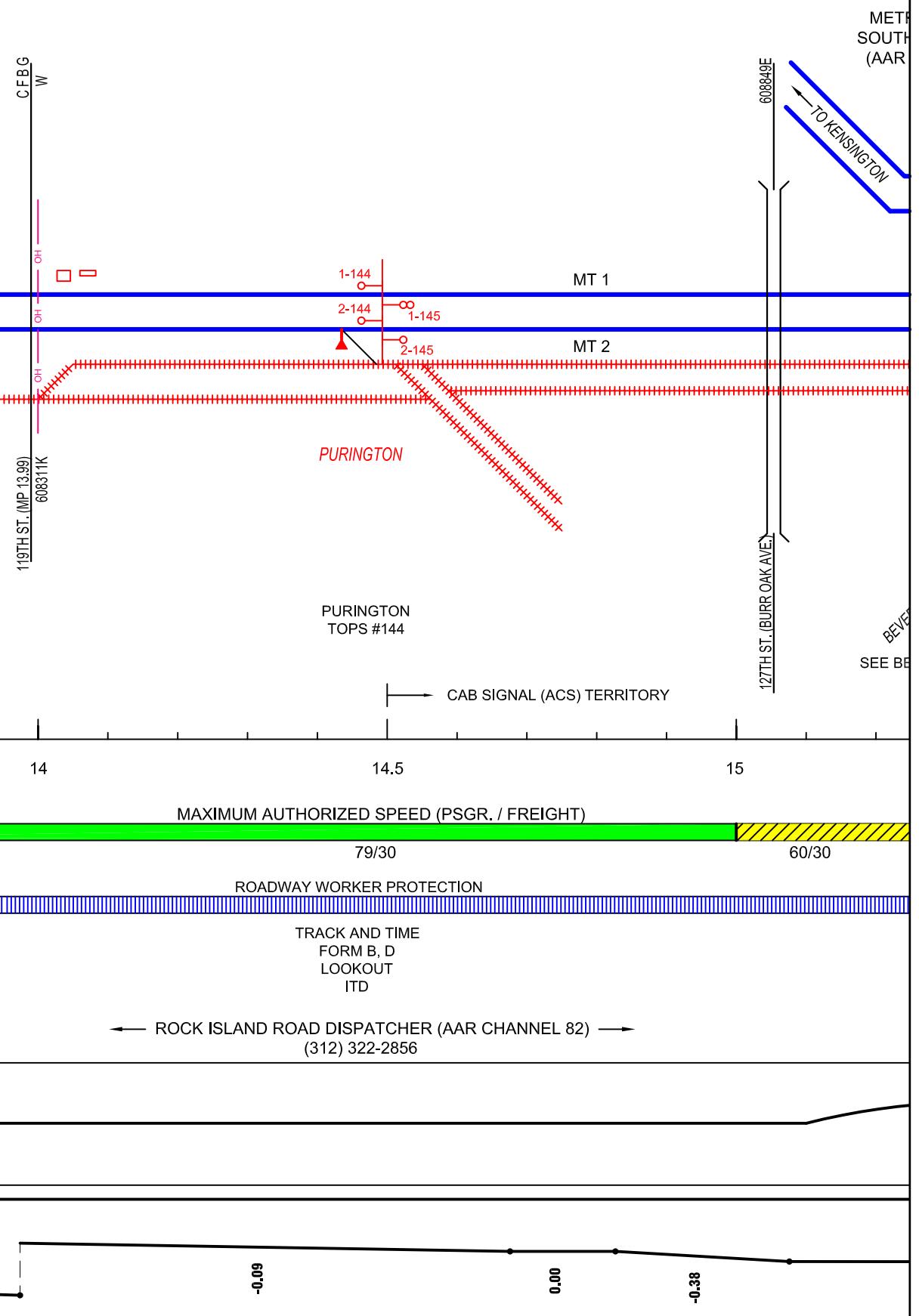
TANGENT

+0.18

+0.27

0.00







ROBBINS STATION

W&

13980 S. KEDZIE

NO AGENT

WAITING ROOM HOURS: 24 HRS

TOP #172

STATION CODE 6172

ZONE D

APPENDIX C

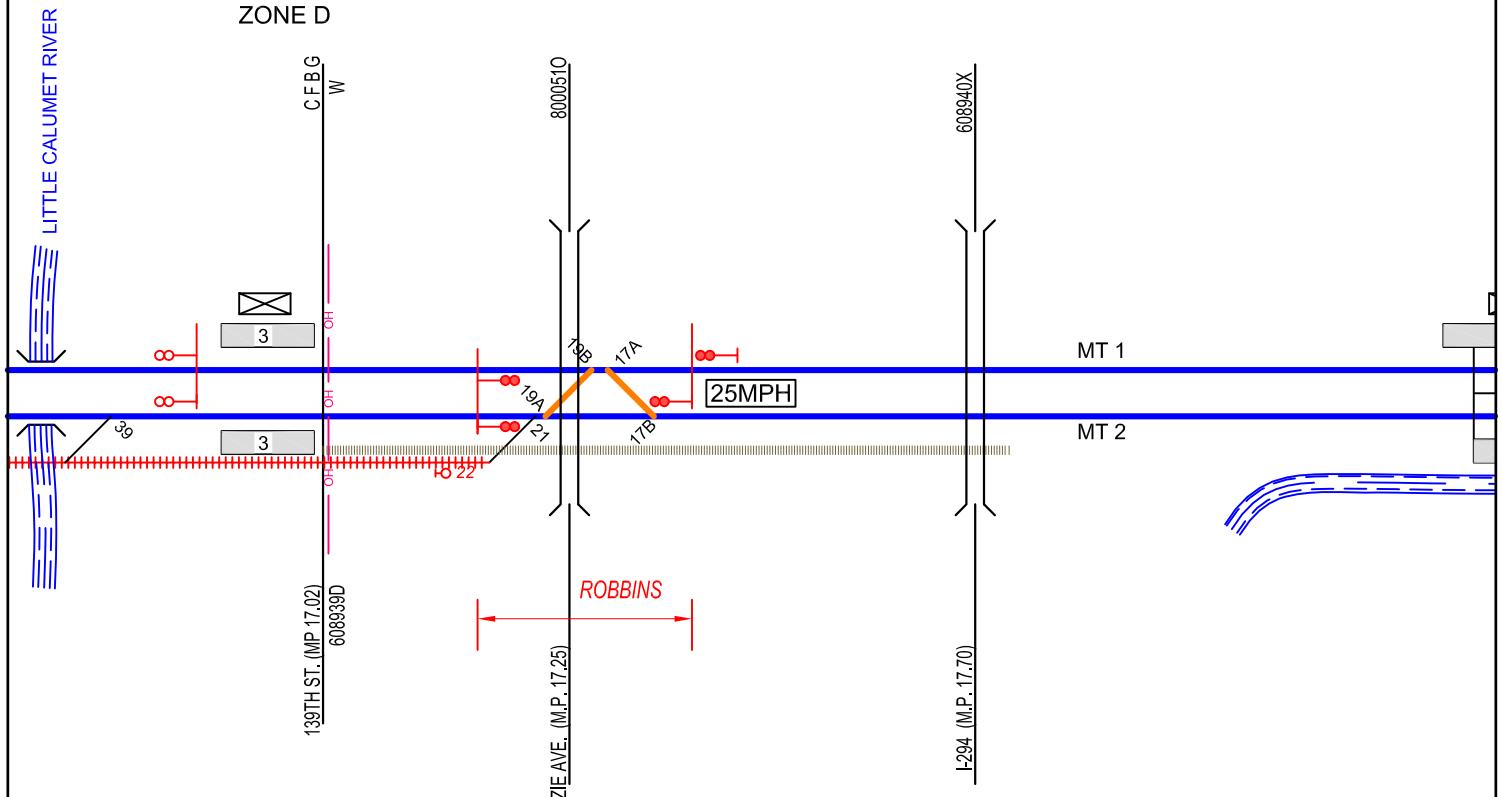
M

37

AGENT

WA

S



CAB SIGNAL (ACS) TERRITORY

17

17.5

18

MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

79/30

ROADWAY WORKER PROTECTION

FOUL TIME  
LOOKOUT  
**NO ITD**

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

BLUE ISLAND TOWER

← (708) 388-7434 →

→ ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →

(312) 322-2856

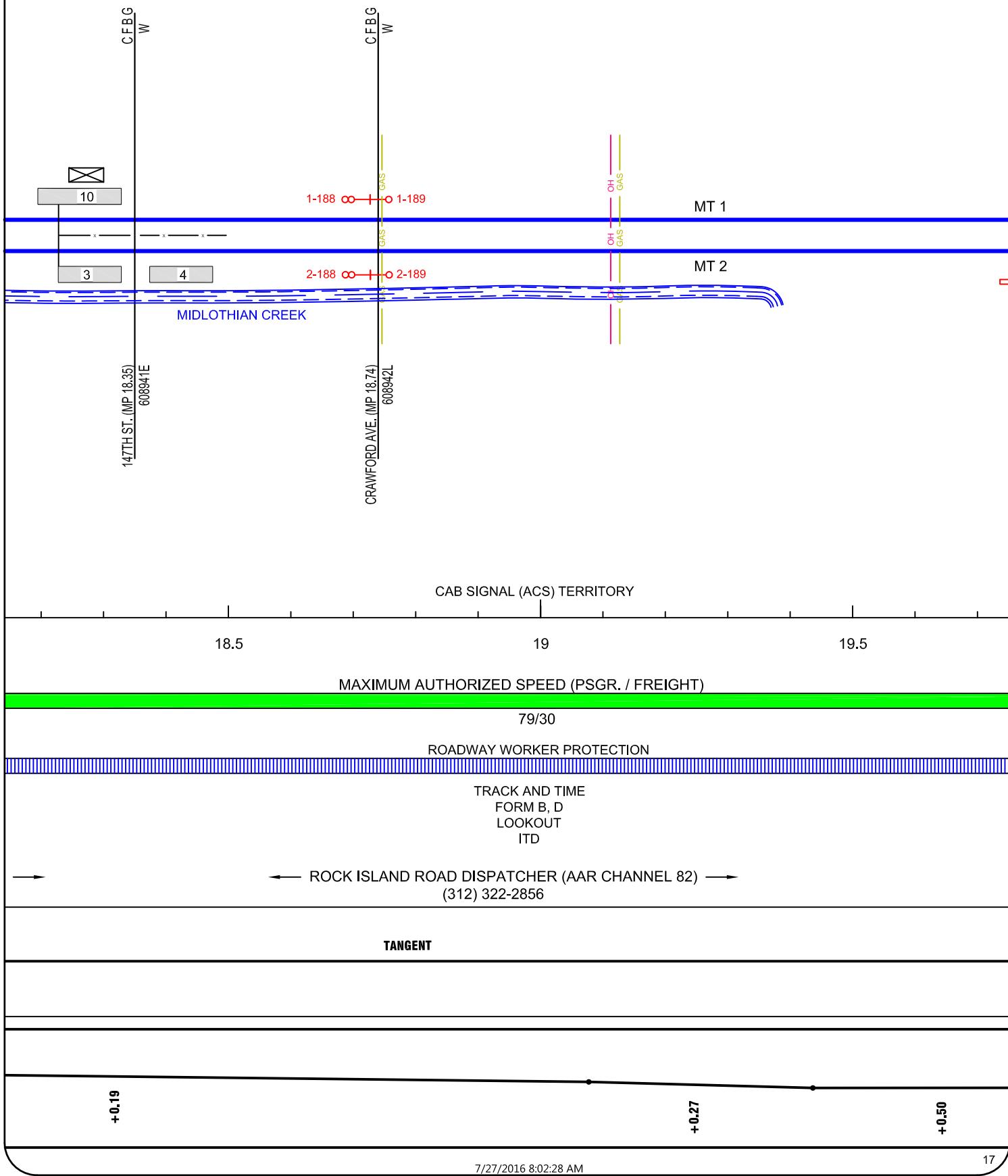
-0.51

+0.38

+0.21

MIDLOTHIAN STATION  
**D**  
 3750 W. 147TH STREET  
 AGENT HOURS: 5:15AM - 1:15PM  
 WAITING ROOM HOURS:  
 TOPS # 184  
 STATION CODE 6184  
 ZONE D

APPENDIX C



OAK FOREST STATION

D &

4850 W. 159TH STREET

AGENT HOURS: 5:15AM - 12:55PM

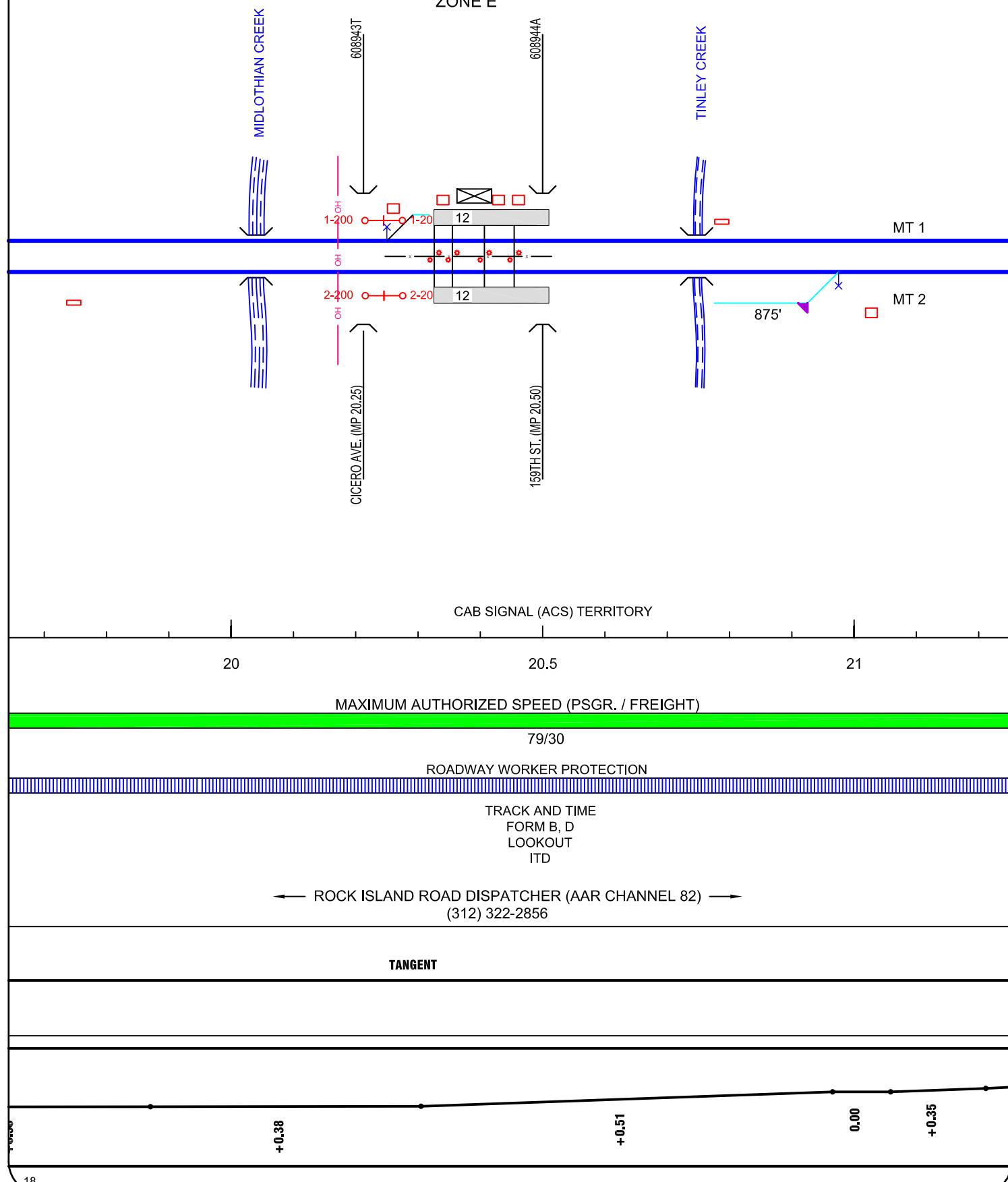
WAITING ROOM HOURS: 5:30AM - 1:15PM

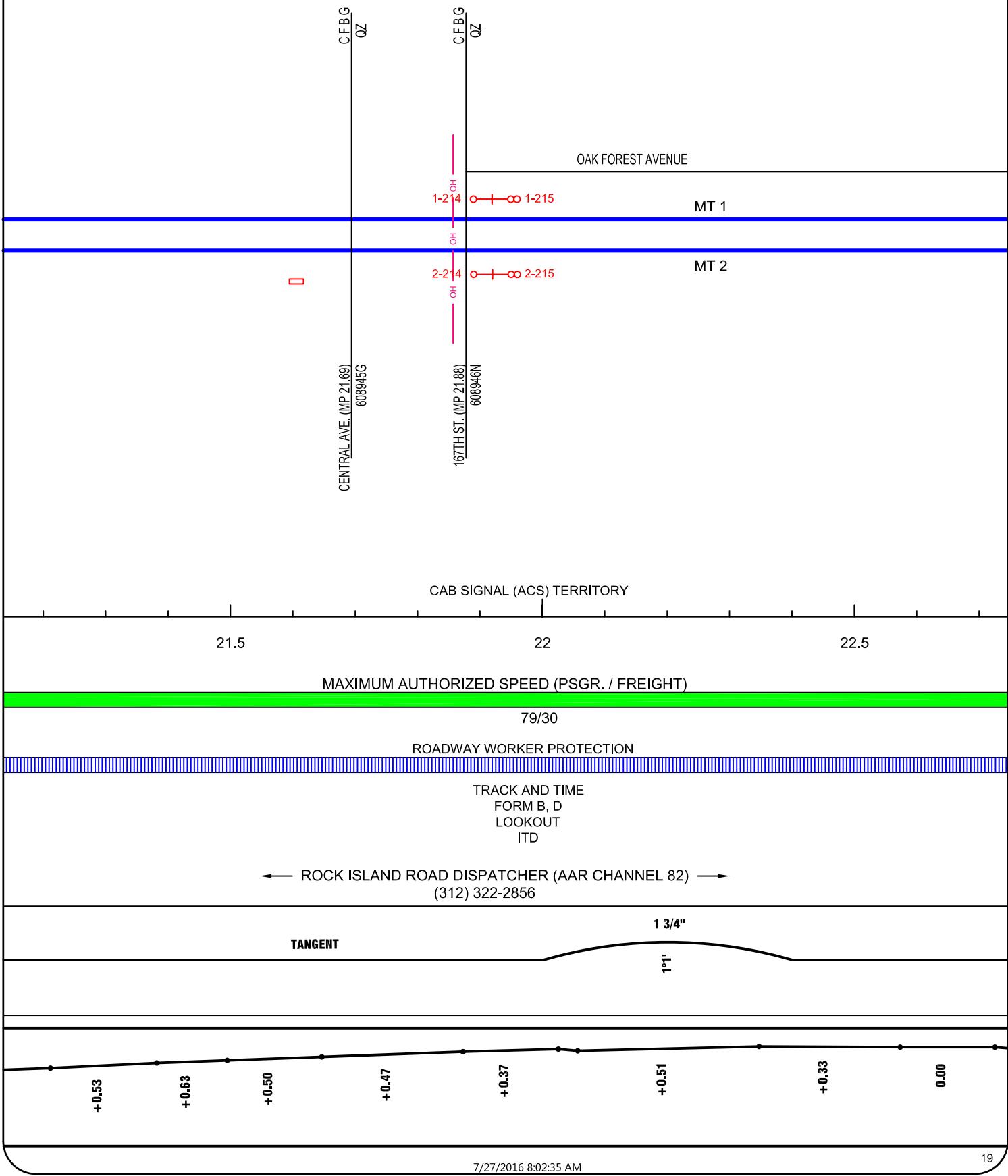
TOPS #204

STATION CODE 6204

ZONE E

APPENDIX C





## TINLEY PARK STATION

APPENDIX C

D

17381 S. OAK PARK AVENUE

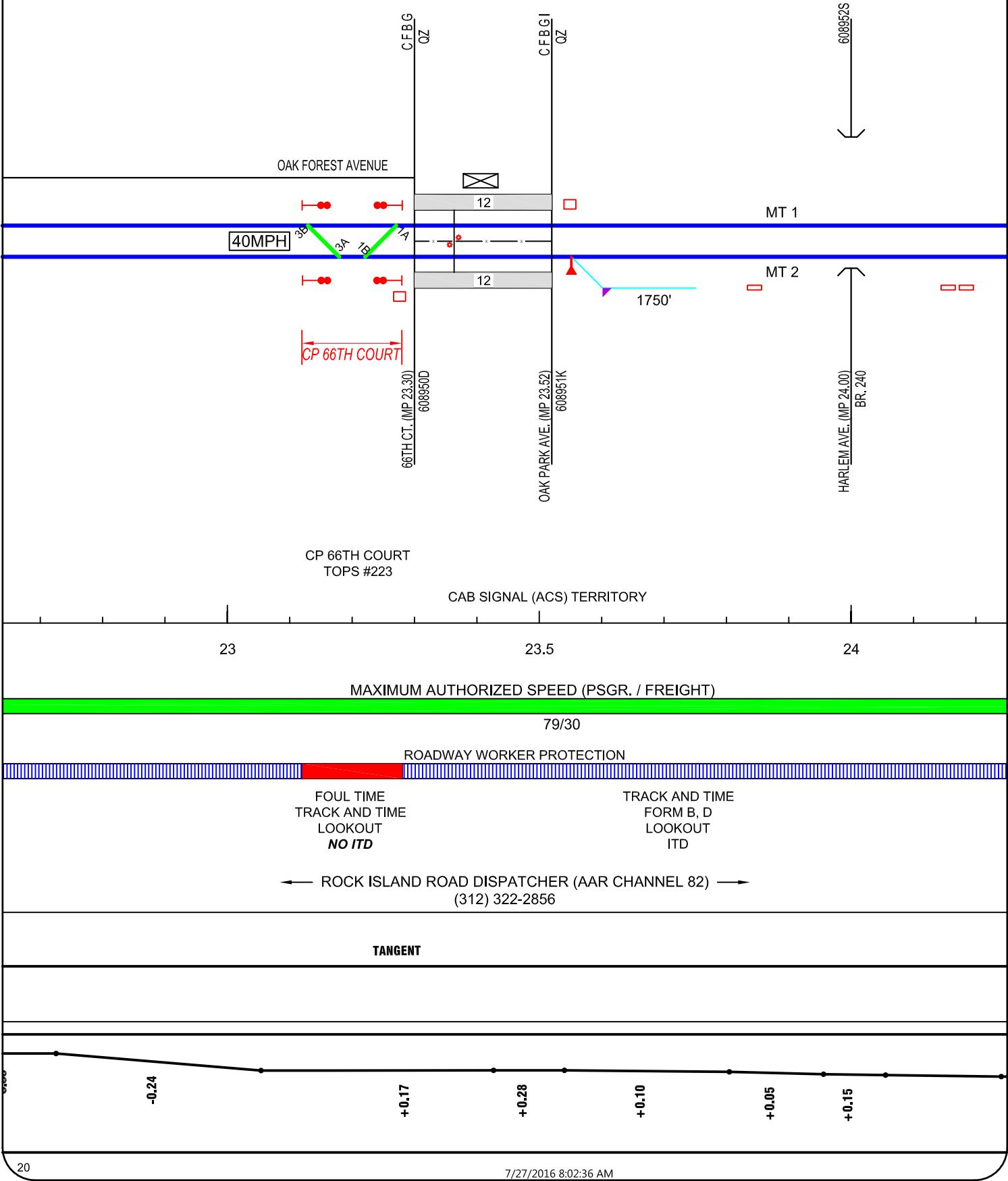
AGENT HOURS: 5:15AM - 12:55PM

WAITING ROOM HOURS: 5:00AM - 1:15PM

TOPS #235

STATION CODE 6235

ZONE E



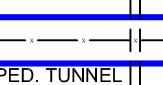
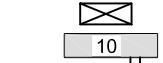
## TINLEY PARK - 80TH AVENUE

APPENDIX C

D &  
 18001 S. 80TH AVENUE  
 AGENT HOURS: 5:15AM - 12:40PM  
 WAITING ROOM HOURS: 4AM - 4PM  
 TOPS# 251  
 STATION CODE 6251  
 ZONE E

C F B G  
W80TH AVE. (MP 25.19)  
608963Y

1-248 ↔ 1-249



MT 1

2-248 ↔ 2-249



PED. TUNNEL



MT 2

CAB SIGNAL (ACS) TERRITORY

24.5

25

25.5

MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

79/30

ROADWAY WORKER PROTECTION

TRACK AND TIME  
 FORM B, D  
 LOOKOUT  
 ITD

← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →  
 (312) 322-2856

TANGENT

+0.28

+0.15

0.00

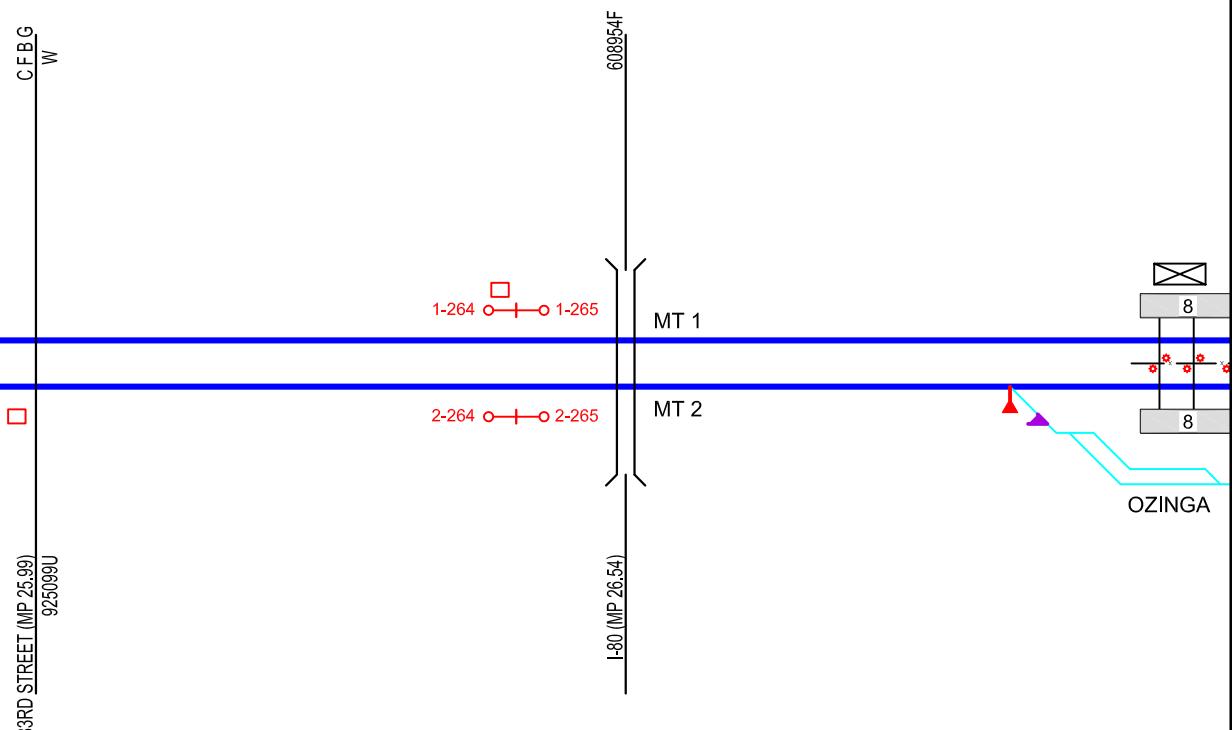
0.10

0.00

+0.07

-0.03

HICKORY CREEK STATION C  
WH &  
9430 HICKORY CREEK DRIVE  
NO AGENT  
WAITING ROOM HOURS:  
TOPS# 275  
STATION CODE 6275  
ZONE E



CAB SIGNAL (ACS) TERRITORY

26

26.5

27

MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

79/30

ROADWAY WORKER PROTECTION

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →  
(312) 322-2856

TANGENT

+0.08

+0.18

+0.32

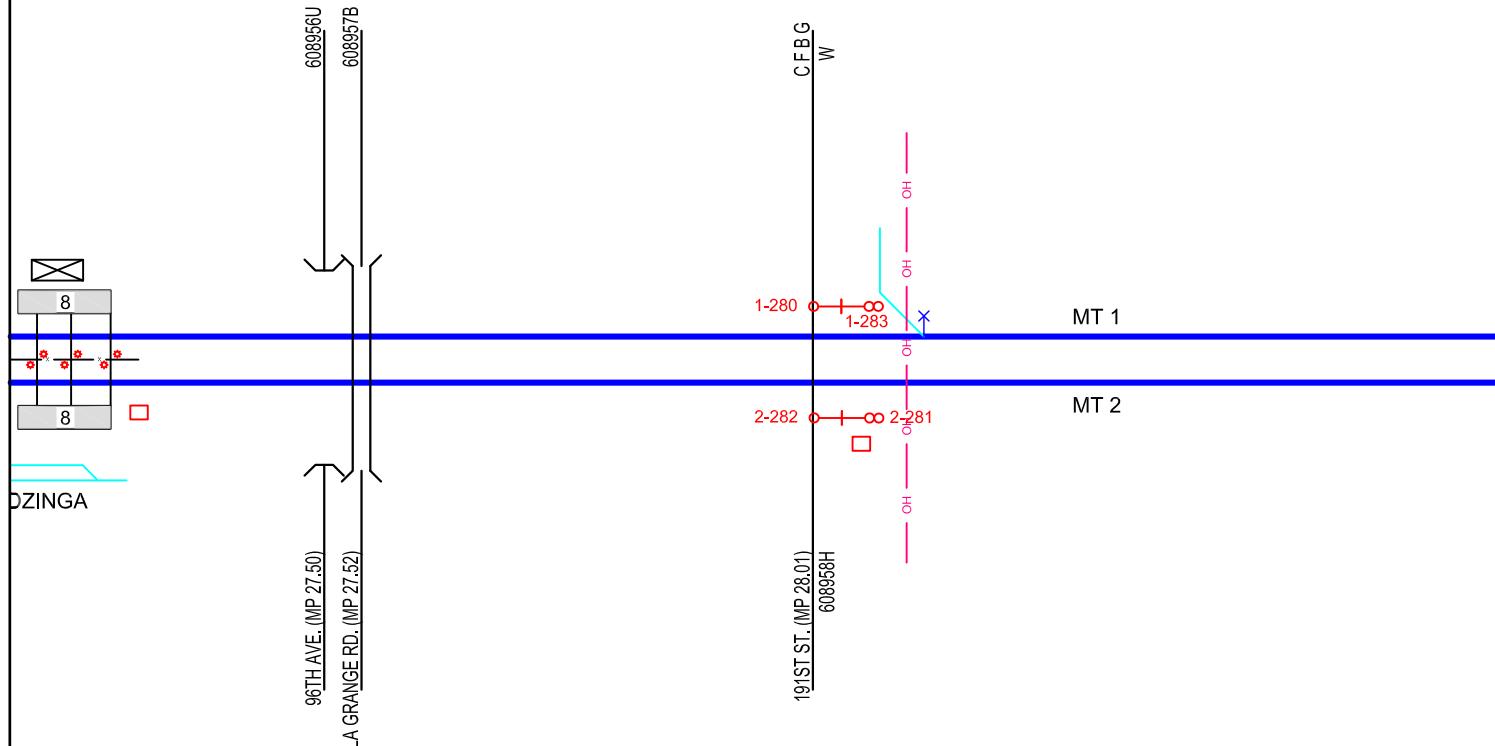
+0.21

0.00

-0.24

HICKORY CREEK STATION  
 WH &  
 9430 HICKORY CREEK DRIVE  
 NO AGENT  
 WAITING ROOM HOURS:  
 TOPS# 275  
 STATION CODE 6275  
 ZONE E

APPENDIX C



CAB SIGNAL (ACS) TERRITORY

SPEED TEST SECTION

27.5

28

28.5

MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

79/30

ROADWAY WORKER PROTECTION

TRACK AND TIME  
 FORM B, D  
 LOOKOUT  
 ITD

← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →  
 (312) 322-2856

TANGENT

-0.24

-0.51

-0.23

+0.15

+0.42

+0.57

## MOKENA STATION

D, R &amp;

APPENDIX C

11040 MC GOVENY STREET

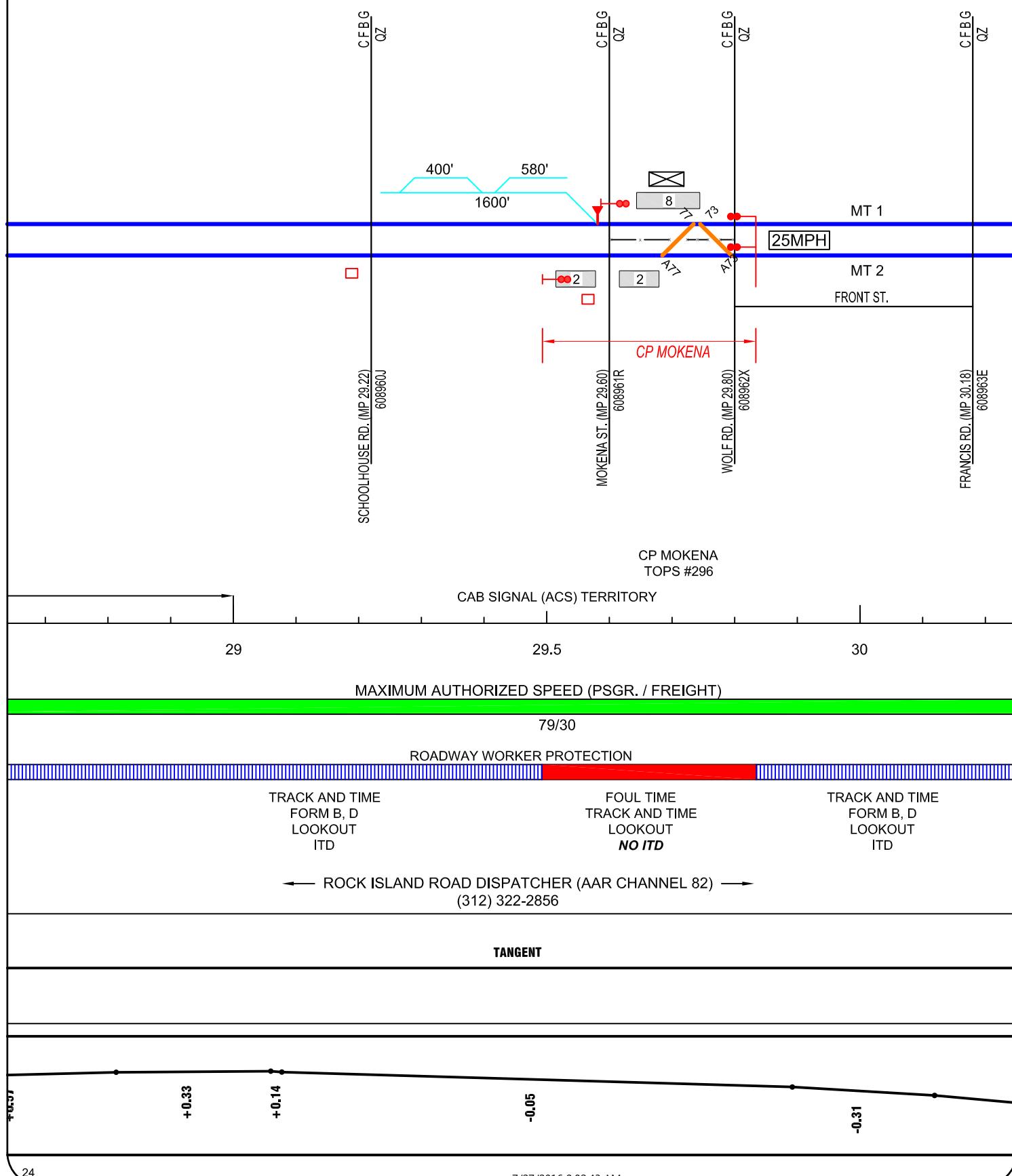
AGENT HOURS: 5:15AM - 12:40PM

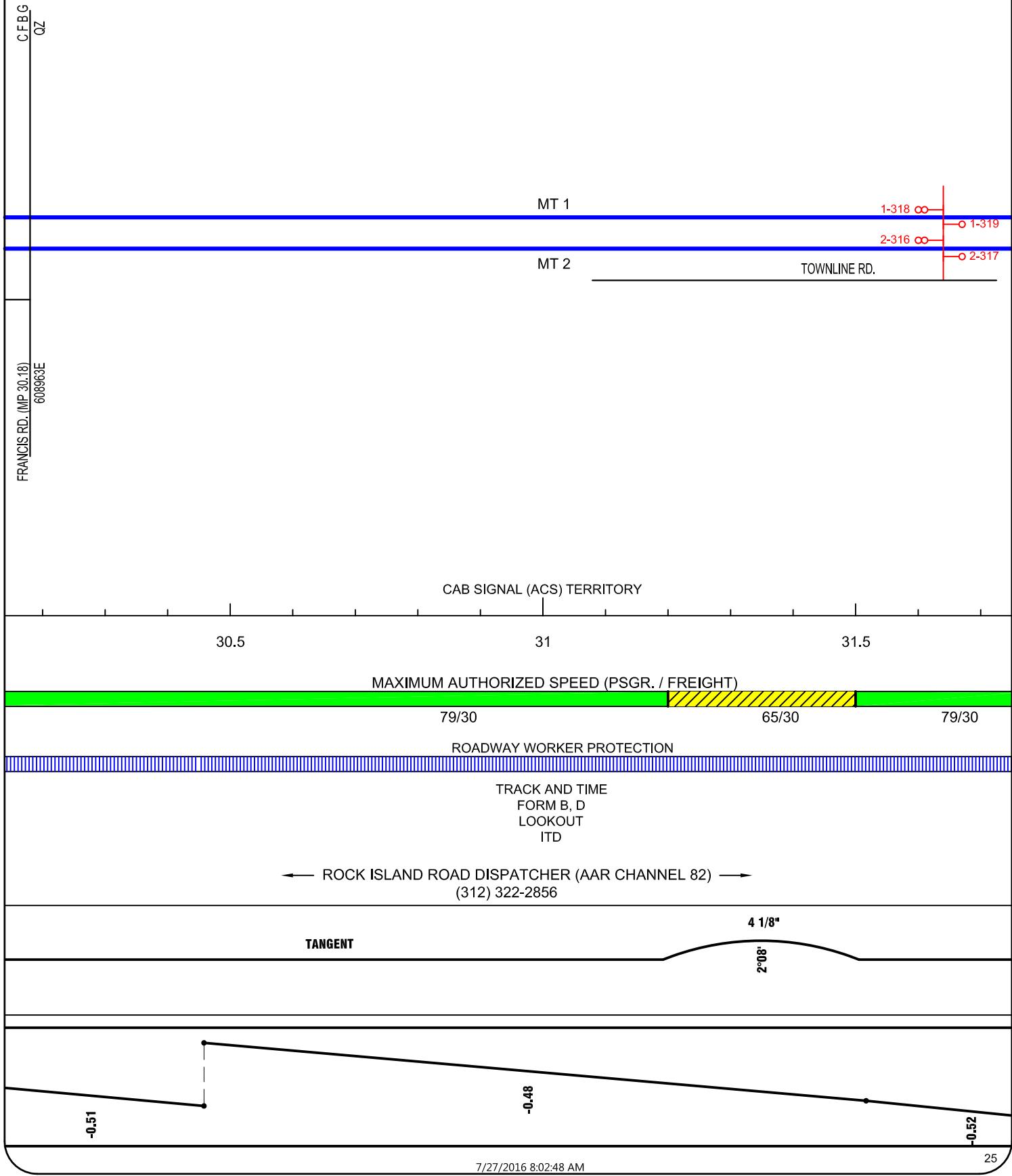
WAITING ROOM HOURS: 5:00AM - 1:00PM

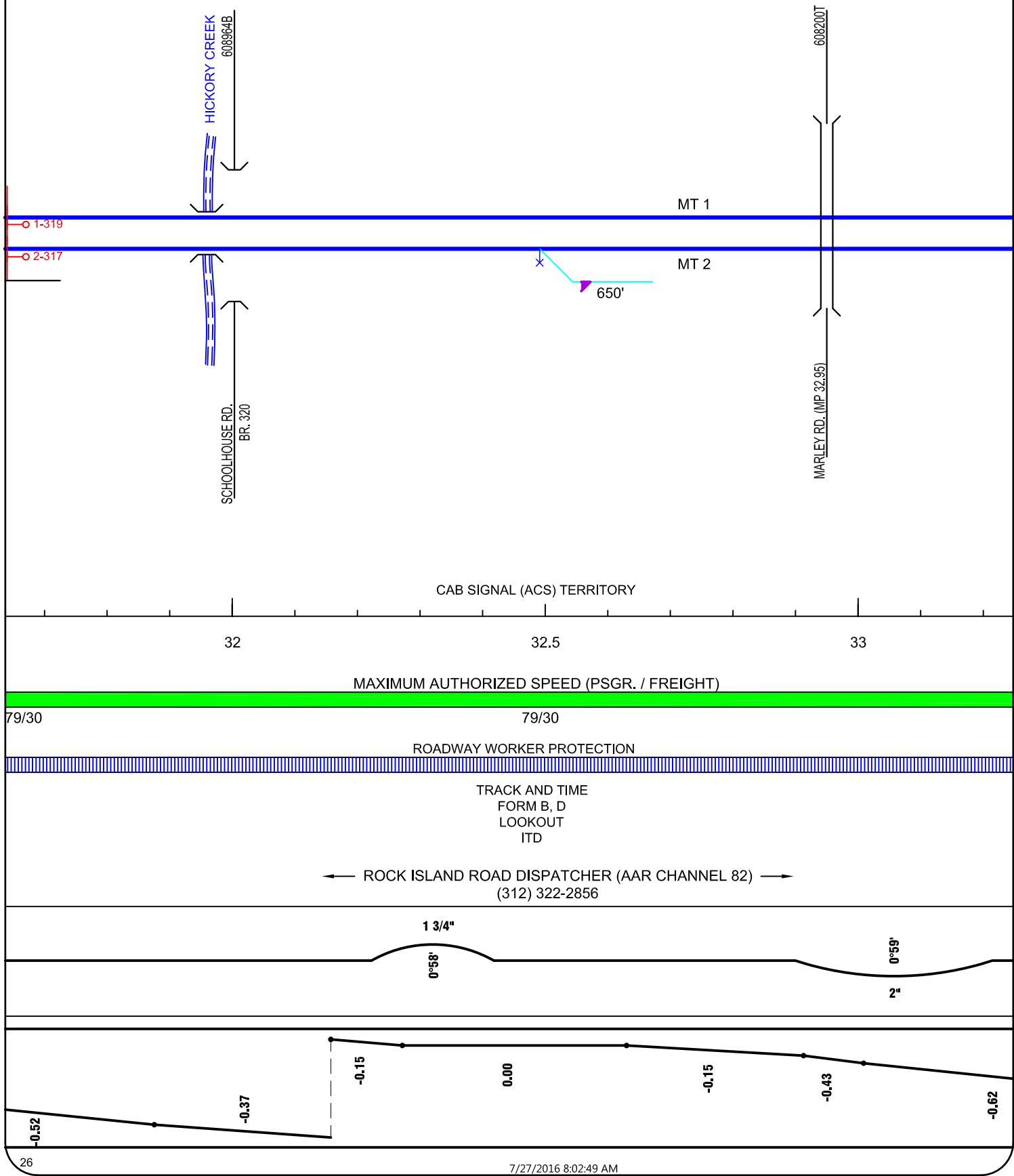
TOPS# 296

STATION CODE 6296

ZONE F







## NEW LENOX STATION

D, S, R &amp;

300 N. CHURCH STREET

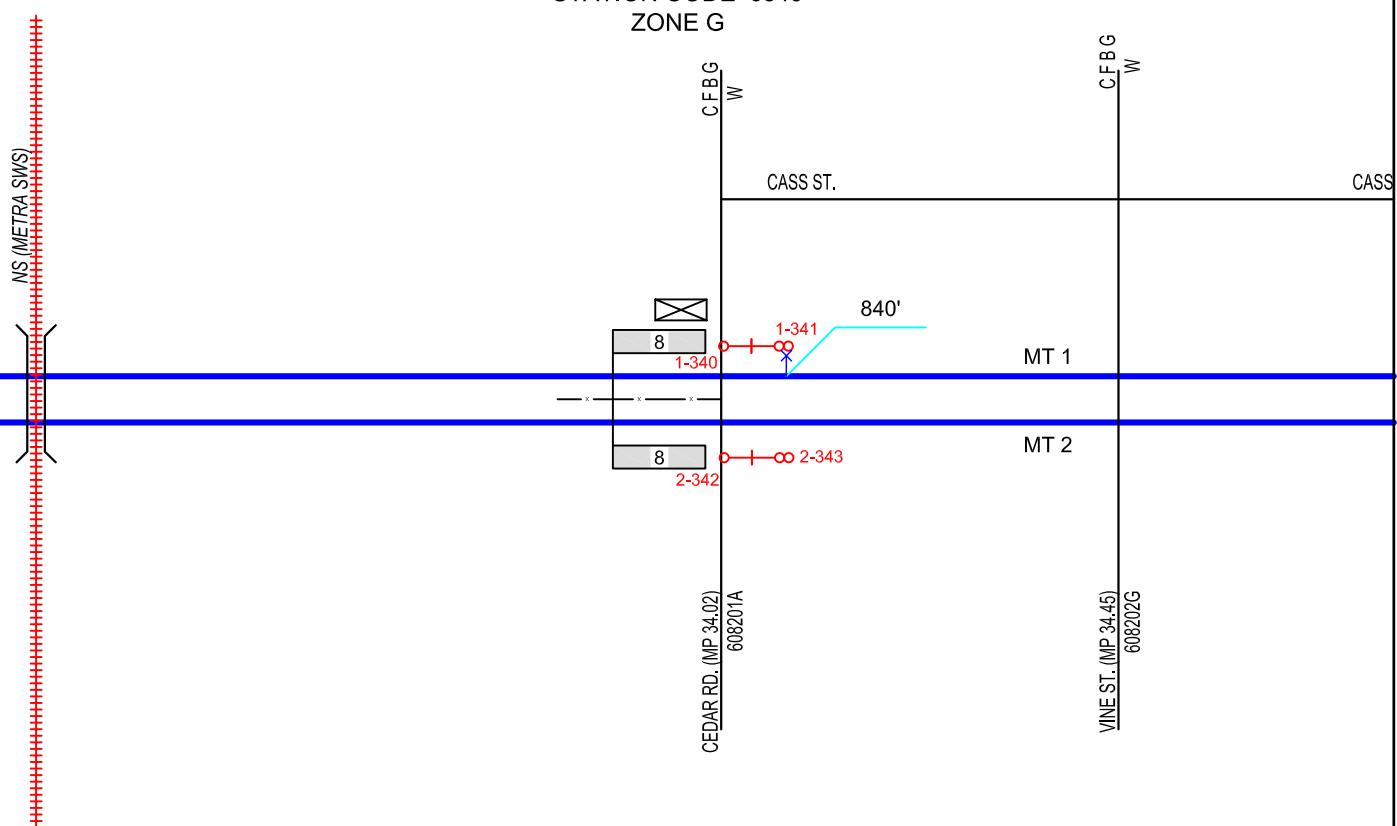
AGENT HOURS: 5:15AM - 12:40PM  
WAITING ROOM HOURS: 5:00AM - 1:00PM

TOPS# 340

STATION CODE 6340

ZONE G

APPENDIX C



CAB SIGNAL (ACS) TERRITORY

33.5

34

34.5

MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

79/30

60/30

79/30

ROADWAY WORKER PROTECTION

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →  
(312) 322-2856

1 3/8"

1 2/2"

-0.62

-0.47

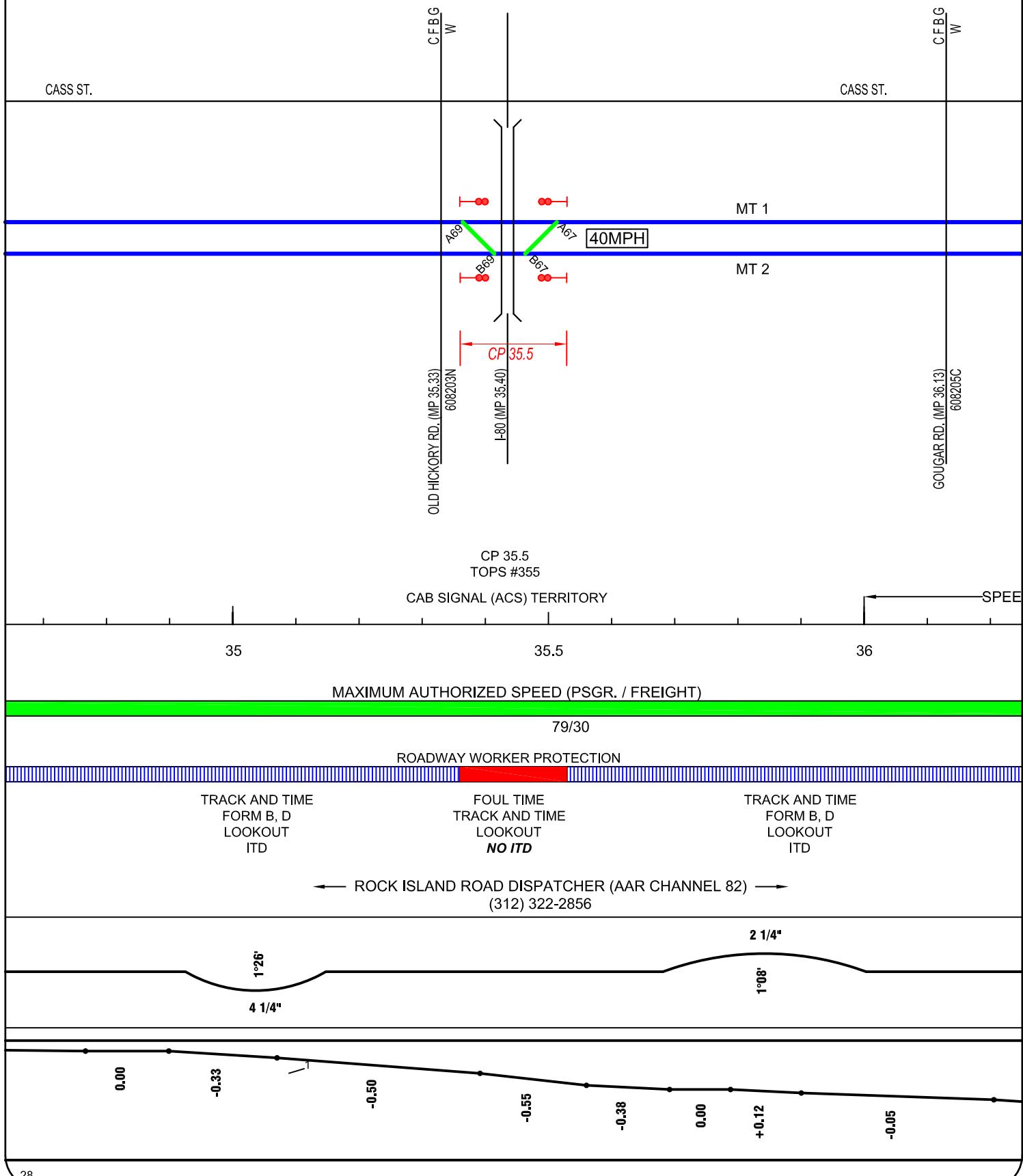
-0.53

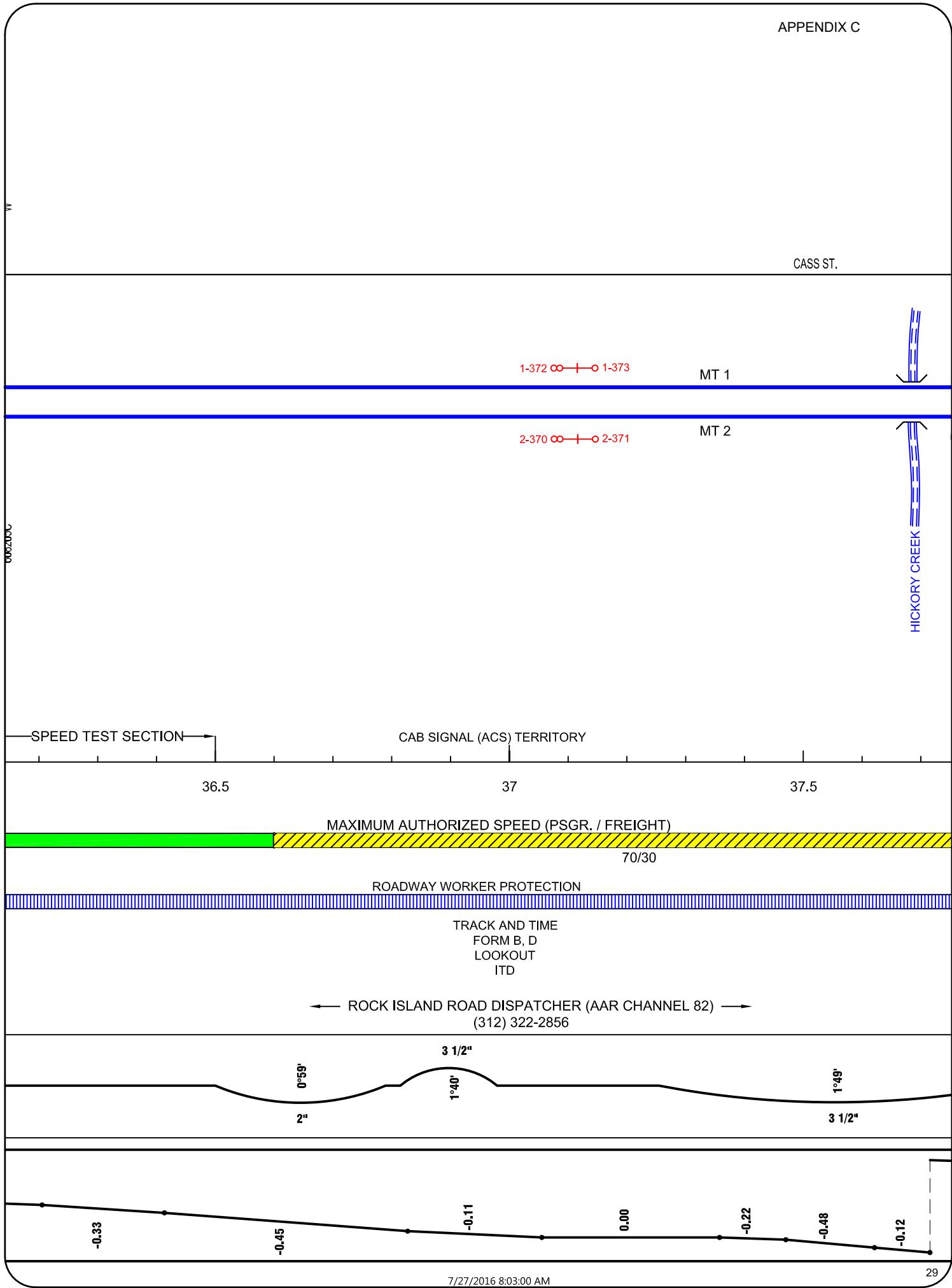
0.00

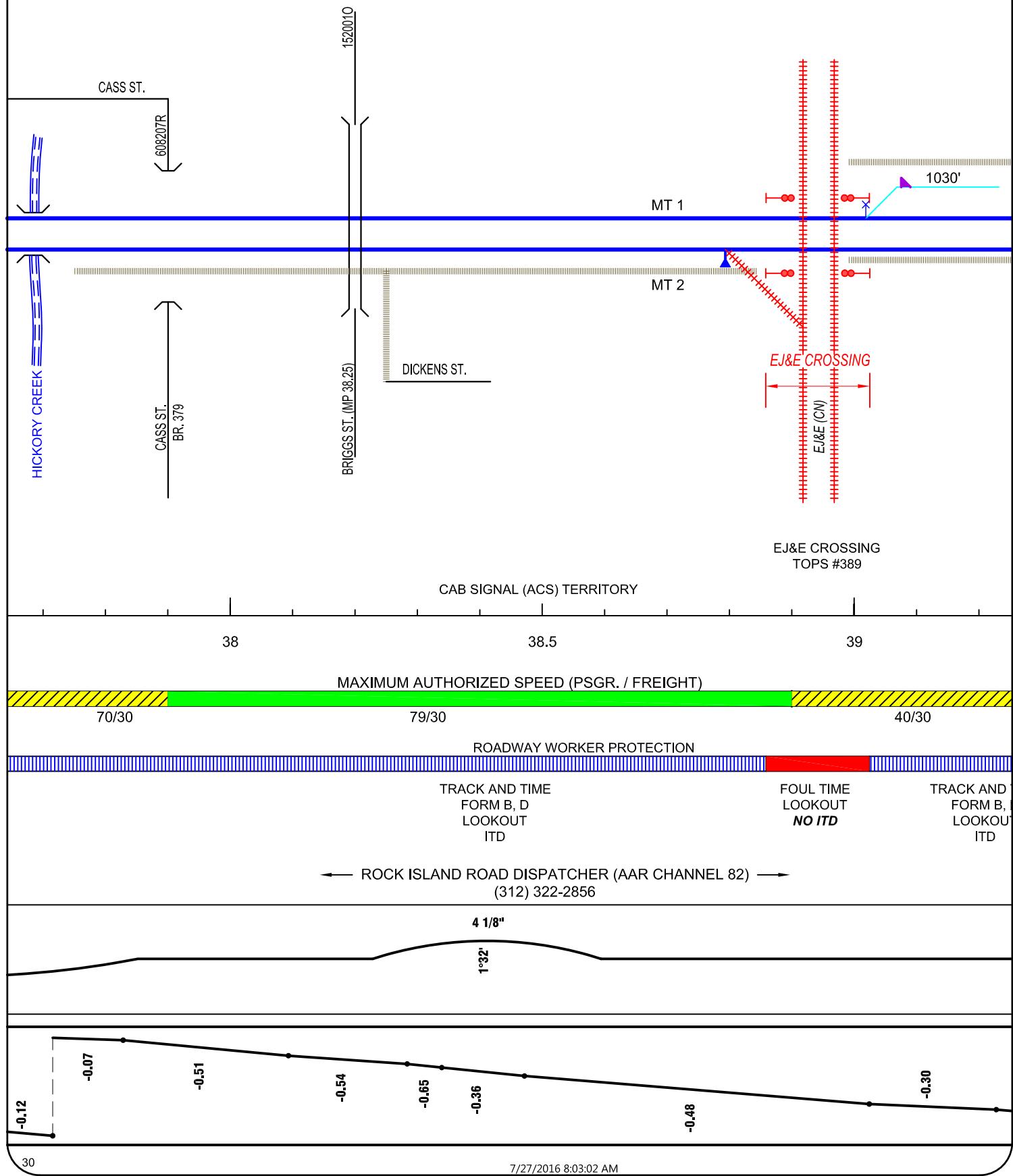
-0.38

+0.06

+0.18







## JOLIET STATION

D, R ⚡

APPENDIX C

50 E. JEFFERSON STREET

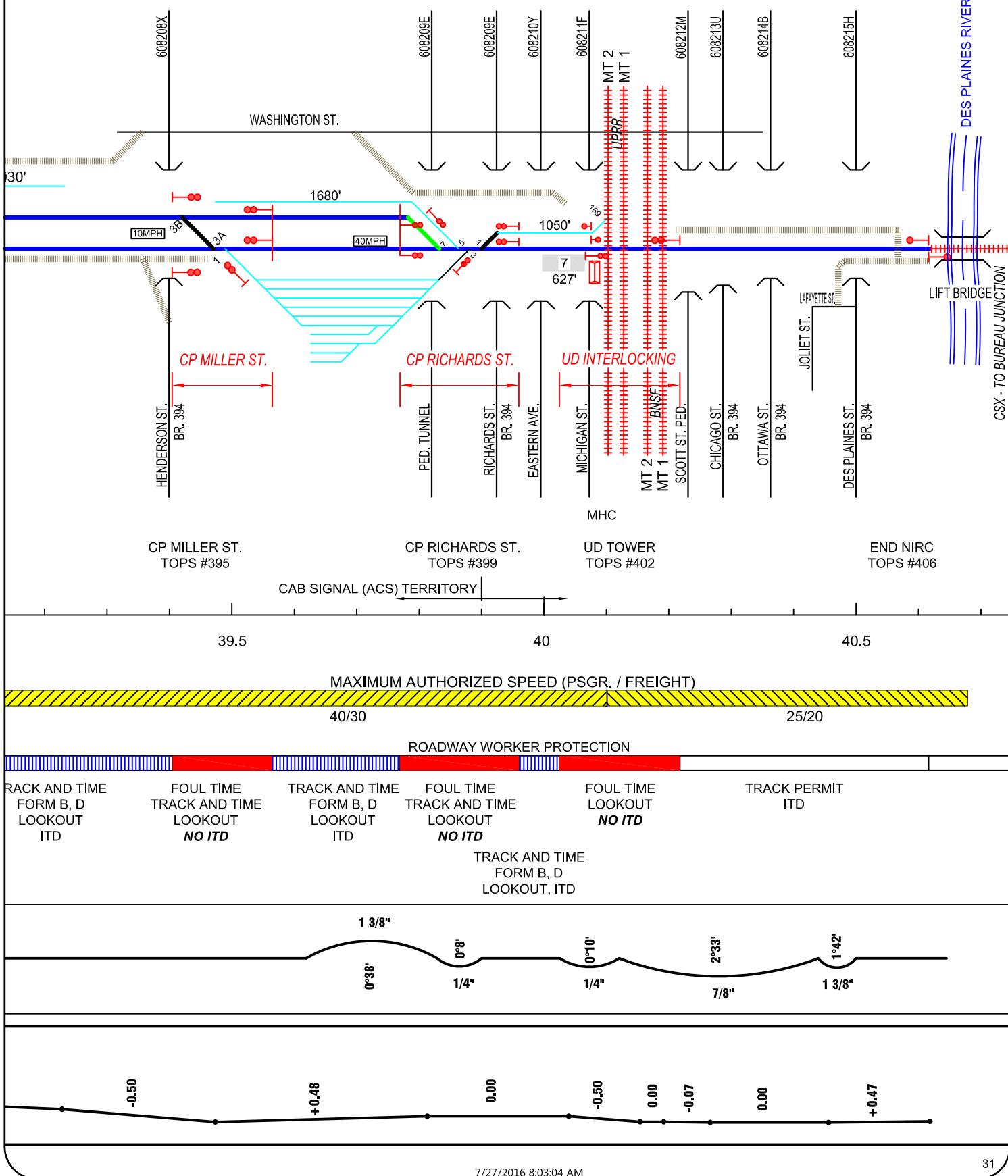
AGENT HOURS: 4:30AM - 12:30PM

WAITING ROOM HOURS: 5:00AM - 8:00PM

TOPS# 402

STATION CODE 6402

ZONE H



## BRAINERD STATION

WHO

8901 S. LOOMIS

NO AGENT

PM HOURS: 5

TOPS# 106

SECTION CODE

STATION CODE 7100

ZONE 5

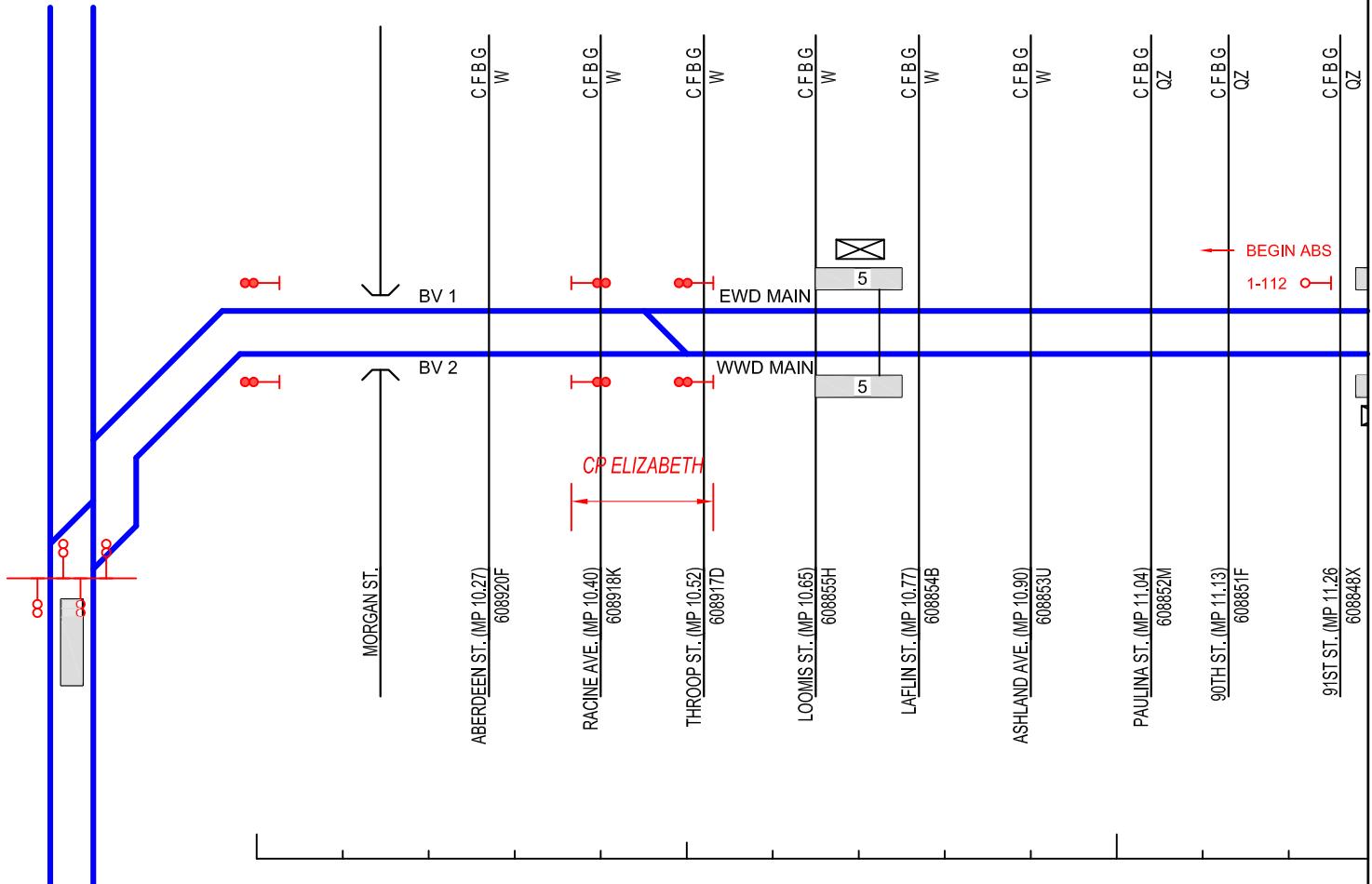
91ST S

9105

WAITIN

5:30

STAT



MAXIMUM AUTHORIZED SPEED (PSGB / FREIGHT)

30/30 30/10

30/30

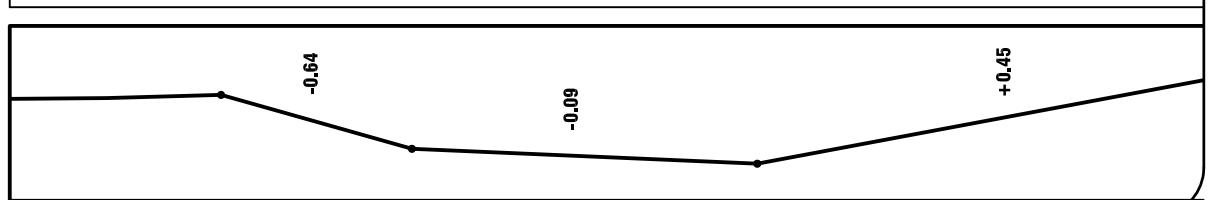
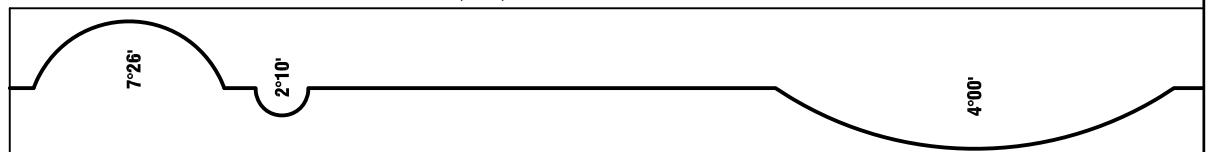
## **ROADWAY WORKER PROTECTION**

**TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD**

**FOUL TIME  
TRACK AND TIME  
LOOKOUT  
NO ITD**

**TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD**

← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →  
(312) 322-2856



## 91ST STREET STATION

WH

9105 S. PROSPECT

NO AGENT

WAITING ROOM HOURS:

5:30AM - 1:15PM M-F

TOPS# 113

STATION CODE 7113

ZONE C

## 95TH STREET STATION

D

1766 W. 95TH STREET

AGENT HOURS: 5:30AM - 1:10PM M-F

WAITING ROOM HOURS:

5:30AM - 1:30PM M-F

TOPS# 117

STATION CODE 7117

ZONE C

## 99TH STREET STATION

D&amp;

9901 S. WALDEN

AGENT HOURS: 5:30AM - 1:10PM M-F

WAITING ROOM HOURS:

5:30AM - 1:30PM M-F

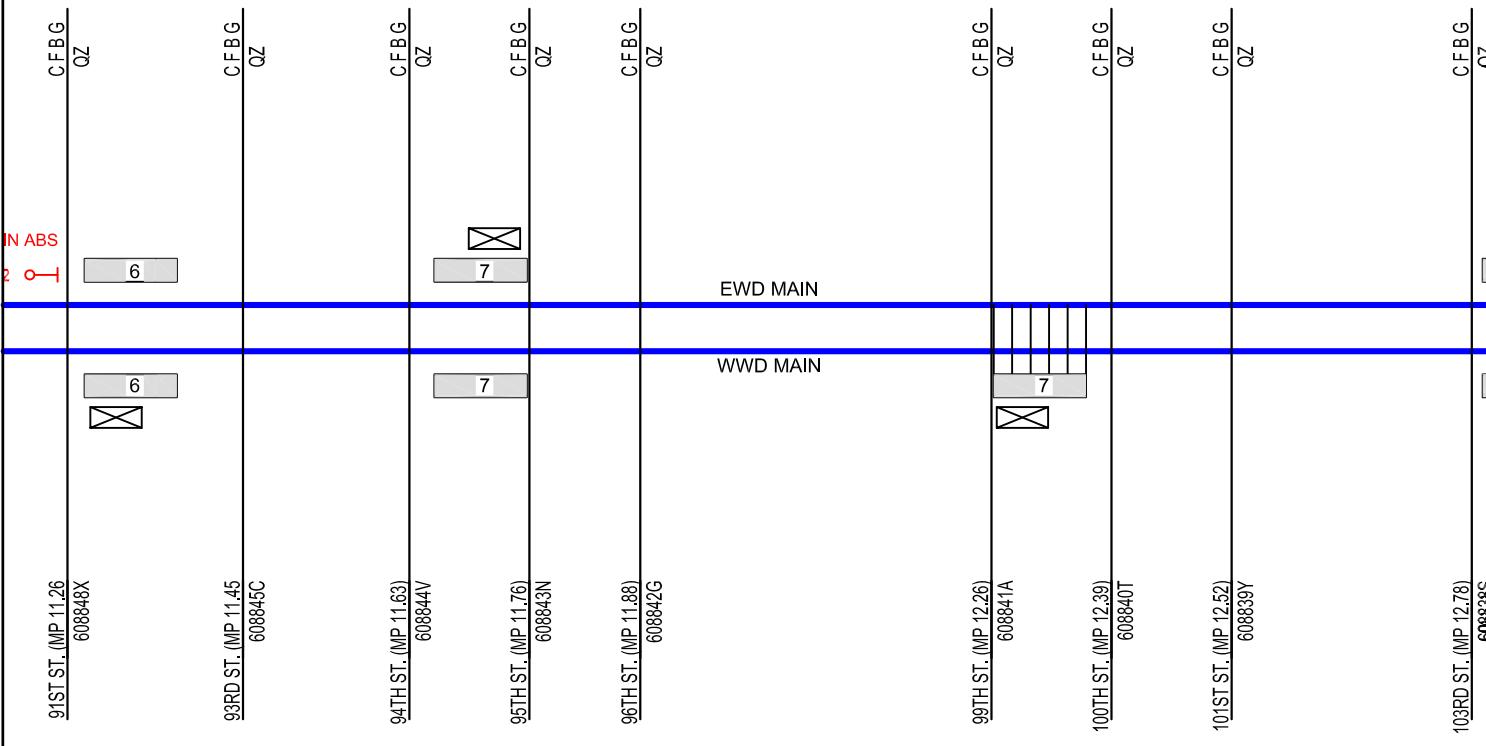
TOPS# 123

STATION CODE 7123

ZONE C

AGENT

W



11.5

12

12.5

MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

30/20

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →  
(312) 322-2856

1°00'

2°01'

2°53'

+0.86

-0.06

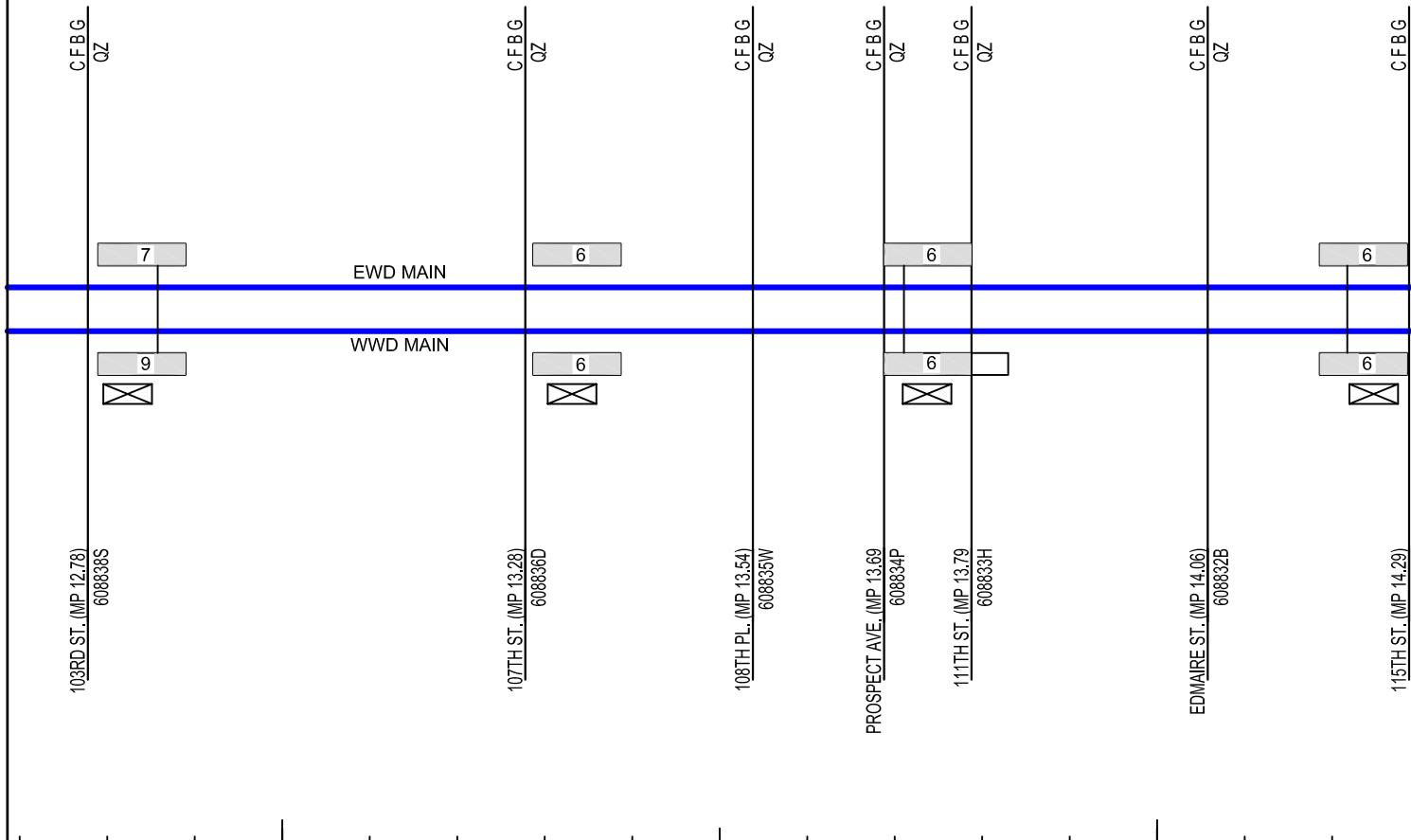
-0.50

0.00

-0.12

## APPENDIX C

103RD STREET STATION D & 10301 S. WALDEN AGENT HOURS: 5:30AM - 12:55PM M-F WAITING ROOM HOURS: 5:30AM - 1:30PM M-F TOPS# 128 STATION CODE 7128 ZONE C	107TH STREET STATION WH 10301 S. WALDEN NO AGENT WAITING ROOM HOURS: 6:00AM - 10:00AM M-F TOPS# 133 STATION CODE 7133 ZONE C	111TH STREET STATION D & 11046 S. HALE AGENT HOURS: 5:15AM - 12:55PM WAITING ROOM HOURS: 5:15AM - 1:15PM M-F TOPS# 138 STATION CODE 7138 ZONE C	115TH STREET STATION WH 11445 S. HALE NO AGENT WAITING ROOM HOURS: 5:15AM - 10:00AM M-F TOPS# 143 STATION CODE 7143 ZONE C
---	--	---	--



MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

30/20

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82) →  
(312) 322-2856

-0.12

+0.04

-0.38

-0.11

-0.06

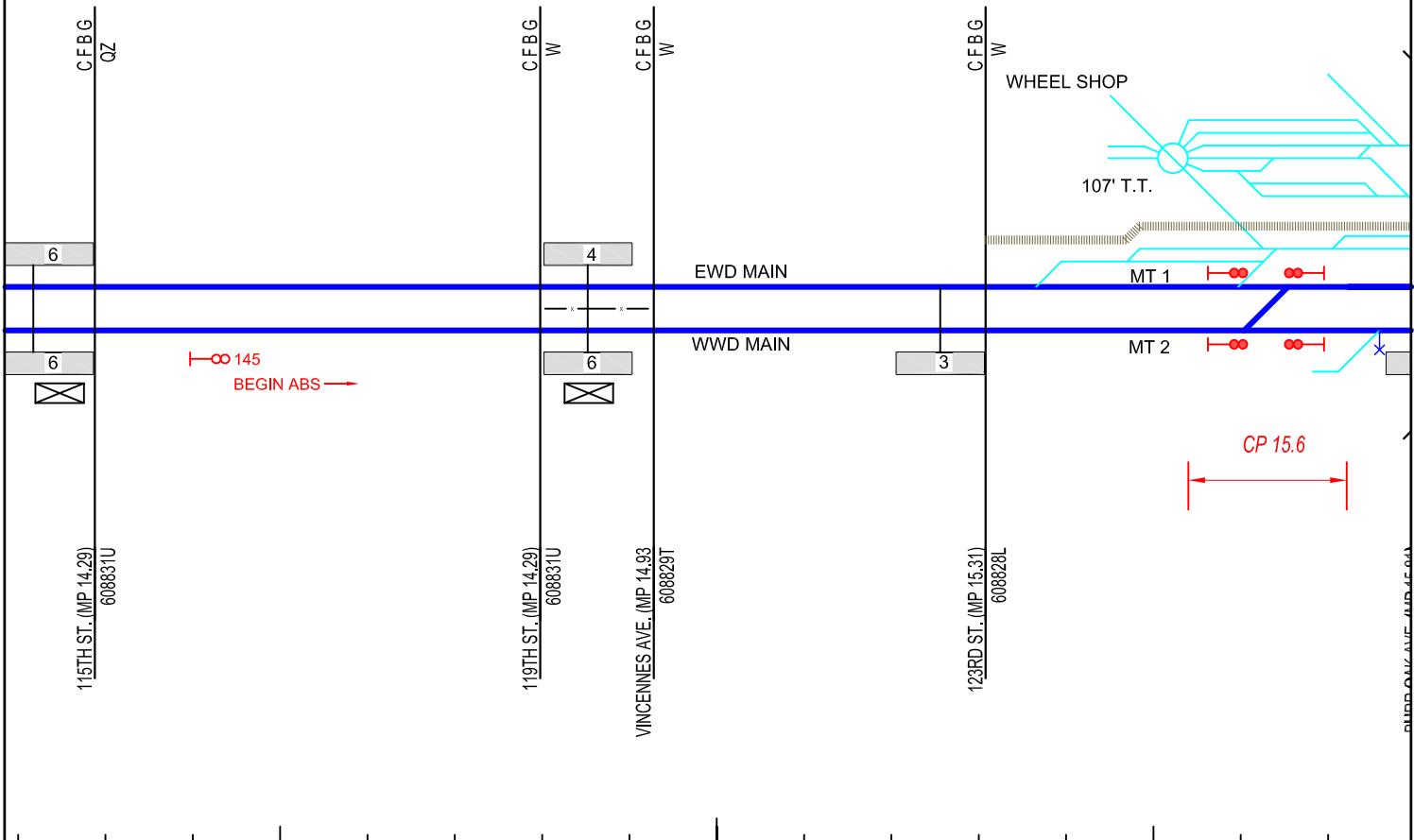
ATION  
E  
OURS:  
M M-F  
7143

119TH STREET STATION  
WH  
2040 W. 119TH ST.  
NO AGENT  
WAITING ROOM HOURS:  
5:30AM - 10:00AM M-F  
TOPS# 148  
STATION CODE 7148  
ZONE C

123RD STREET STATION  
S  
2120 W. 123RD ST.  
NO AGENT  
SHELTER ALWAYS OPEN  
TOPS# 152  
STATION CODE 7152  
ZONE D

APPENDIX C

PRAIRIE  
2100  
SHELT  
STAT



MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

30/20

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

FOUL TIME  
TRACK AND TIME  
LOOKOUT  
NO ITD

← ROCK ISLAND ROAD DISPATCHER (AAR CHANNEL 82)  
(312) 322-2856 →

0°30'

-0.06

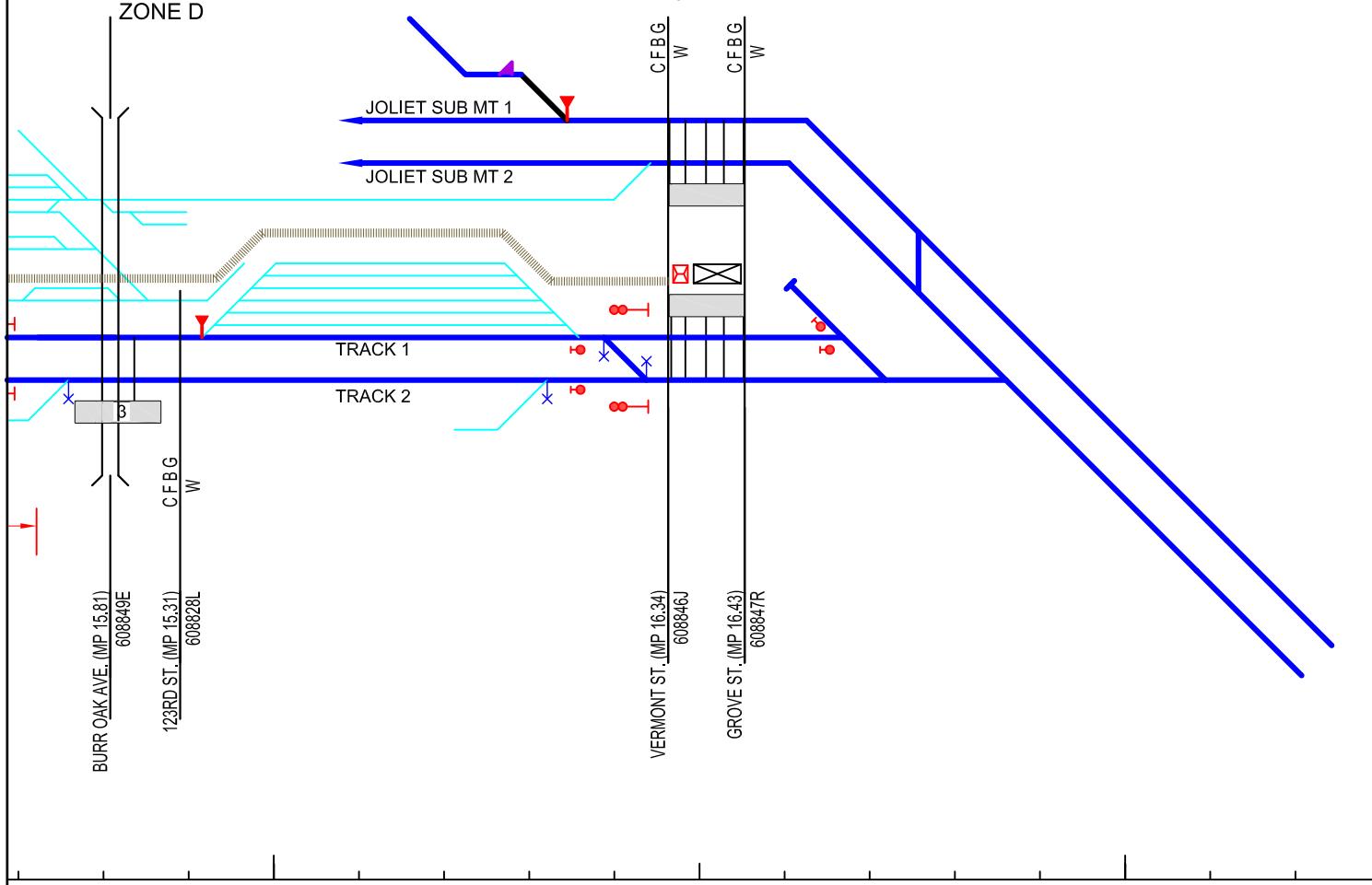
-0.23

-0.05

-0.15

PRAIRIE STREET STATION  
S  
2100 W. PRAIRIE ST.  
NO AGENT  
SHELTER ALWAYS OPEN  
TOPS# 158  
STATION CODE 7158  
ZONE D

BLUE ISLAND - VERMONT STREET STATION  
D &  
2300 W. GROVE STREET  
AGENT HOURS: 5AM - 12:45PM M-F  
WAITING ROOM HOURS: 5:00AM - 7:00PM  
TOPS #164  
STATION CODE 6157  
ZONE D



16

16.5

6

MAXIMUM AUTHORIZED SPEED (PSGR. / FREIGHT)

30/20

TIME

TRACK AND TIME  
FORM B, D  
LOOKOUT  
ITD

FOUL TIME  
TRACK AND TIME  
LOOKOUT  
**NO ITD**

BLUE ISLAND TOWER OPERATOR —————→  
(708) 388-7434

4'00"

3'20"

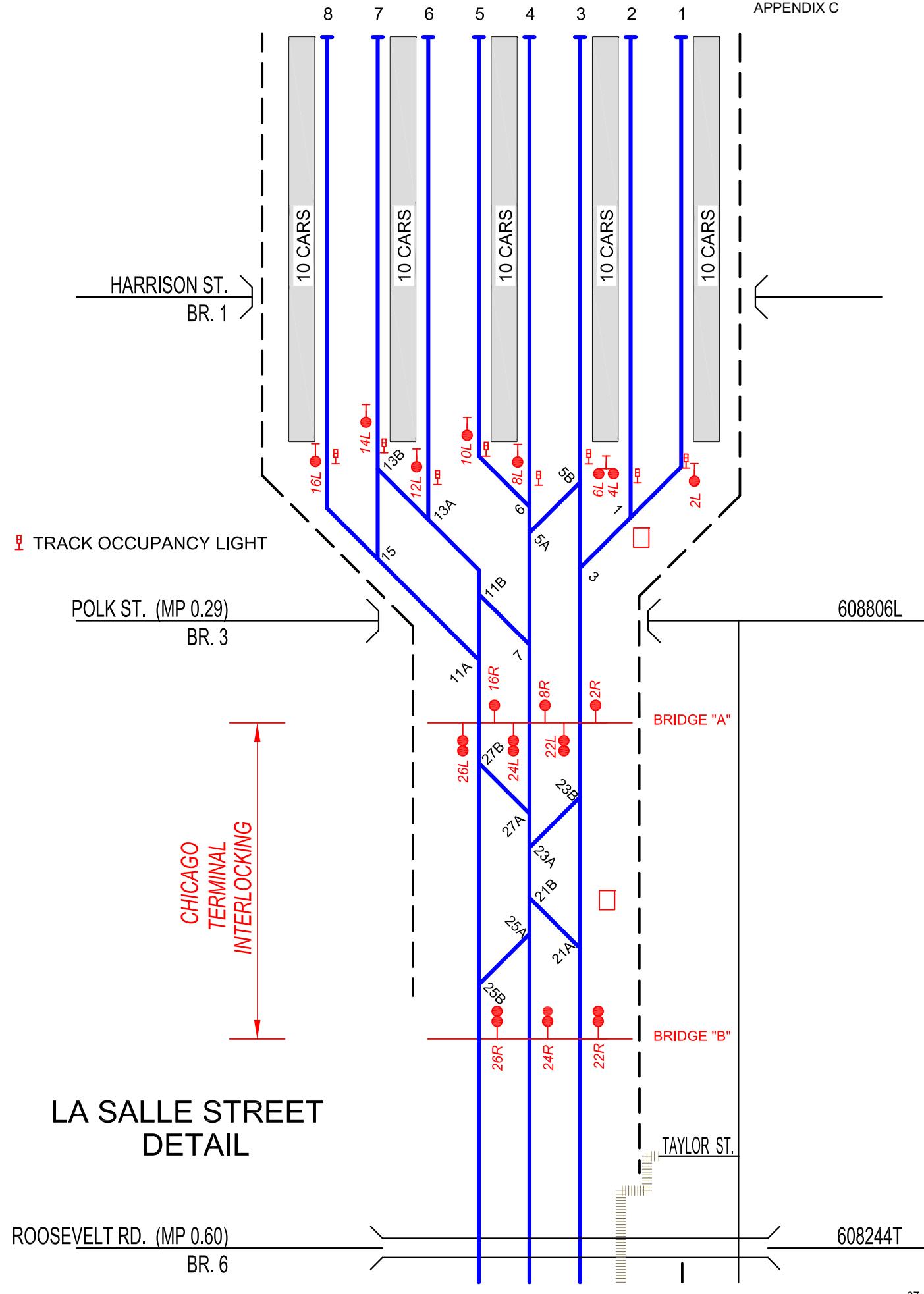
+0.03

-0.25

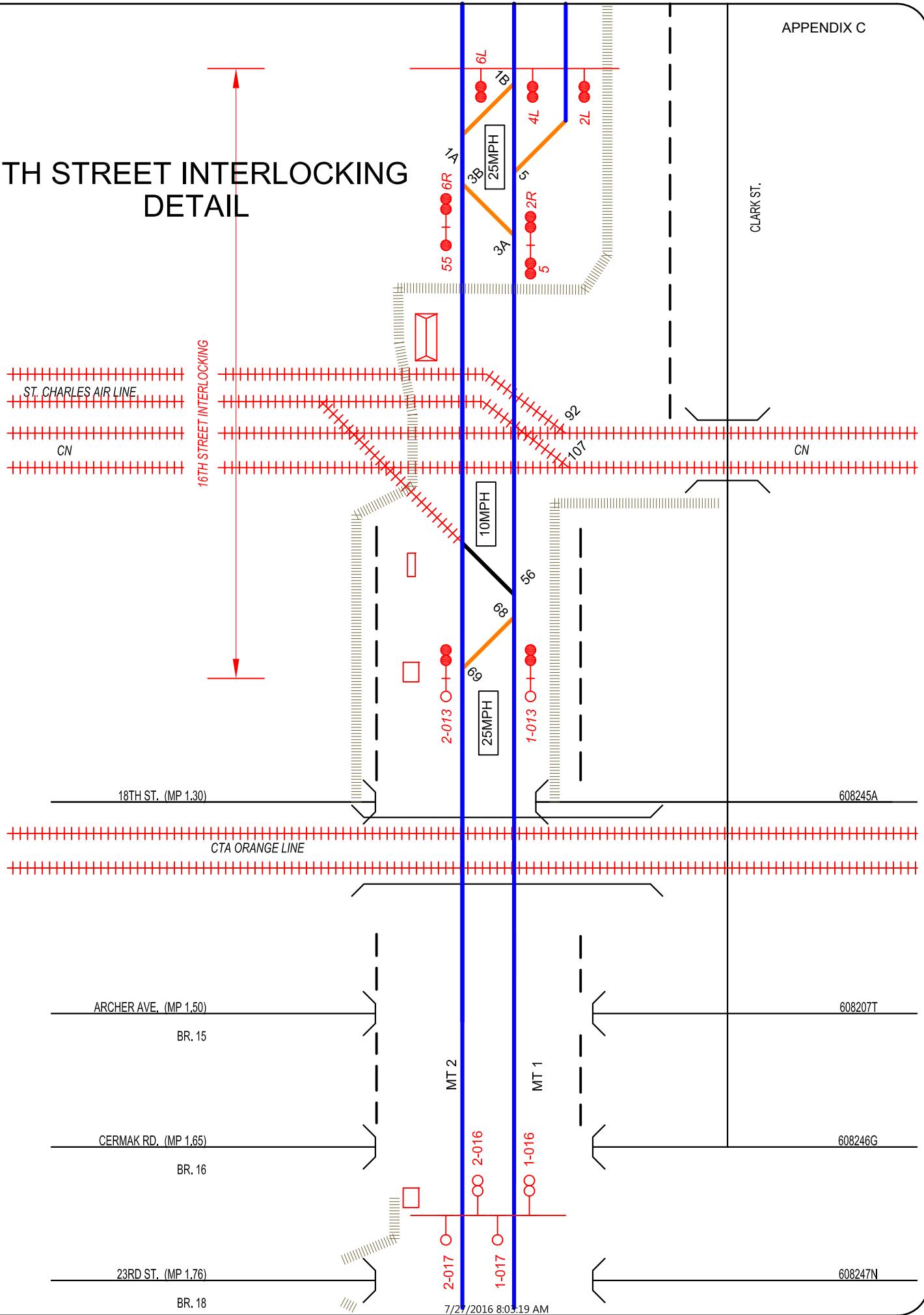
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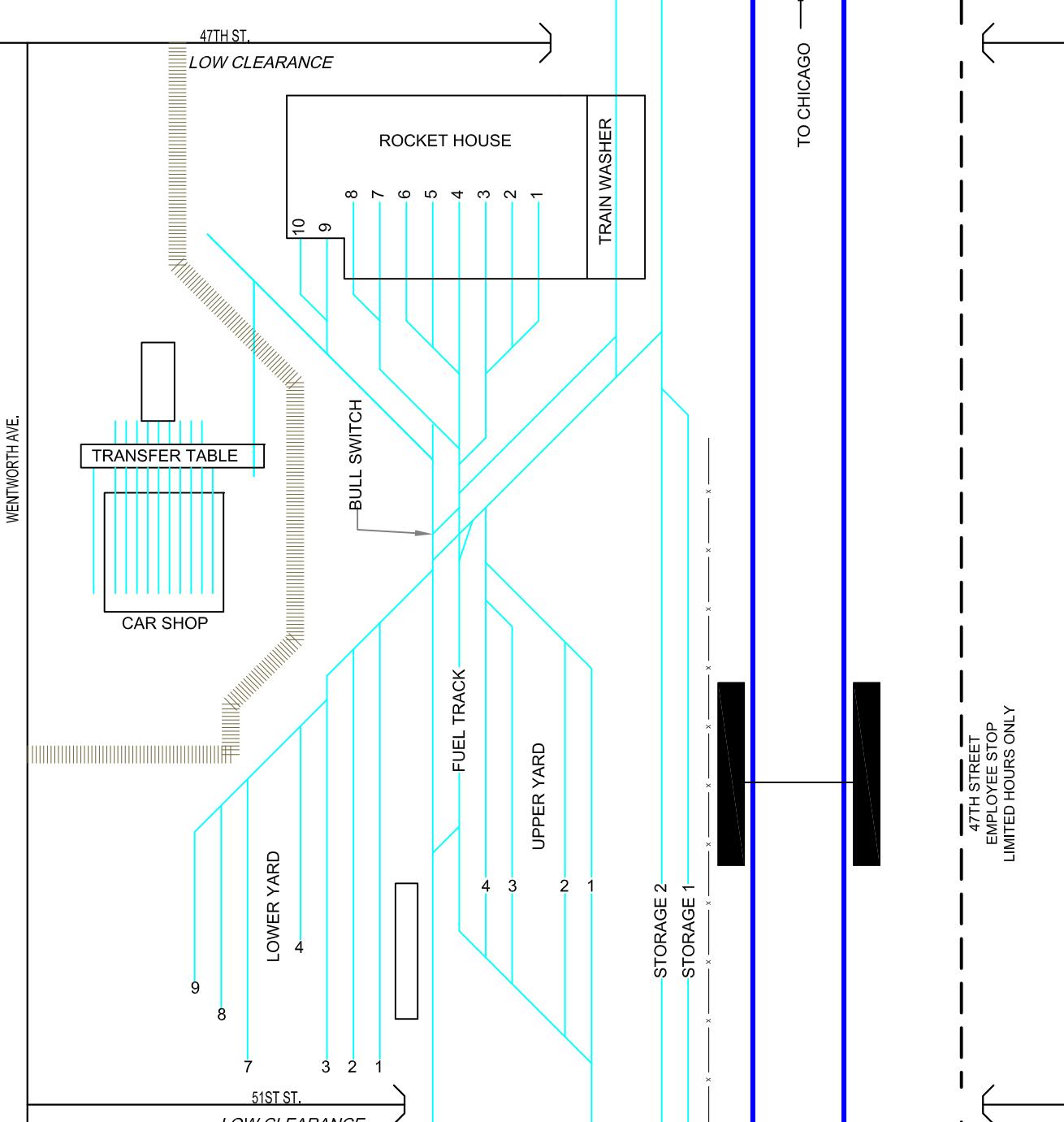
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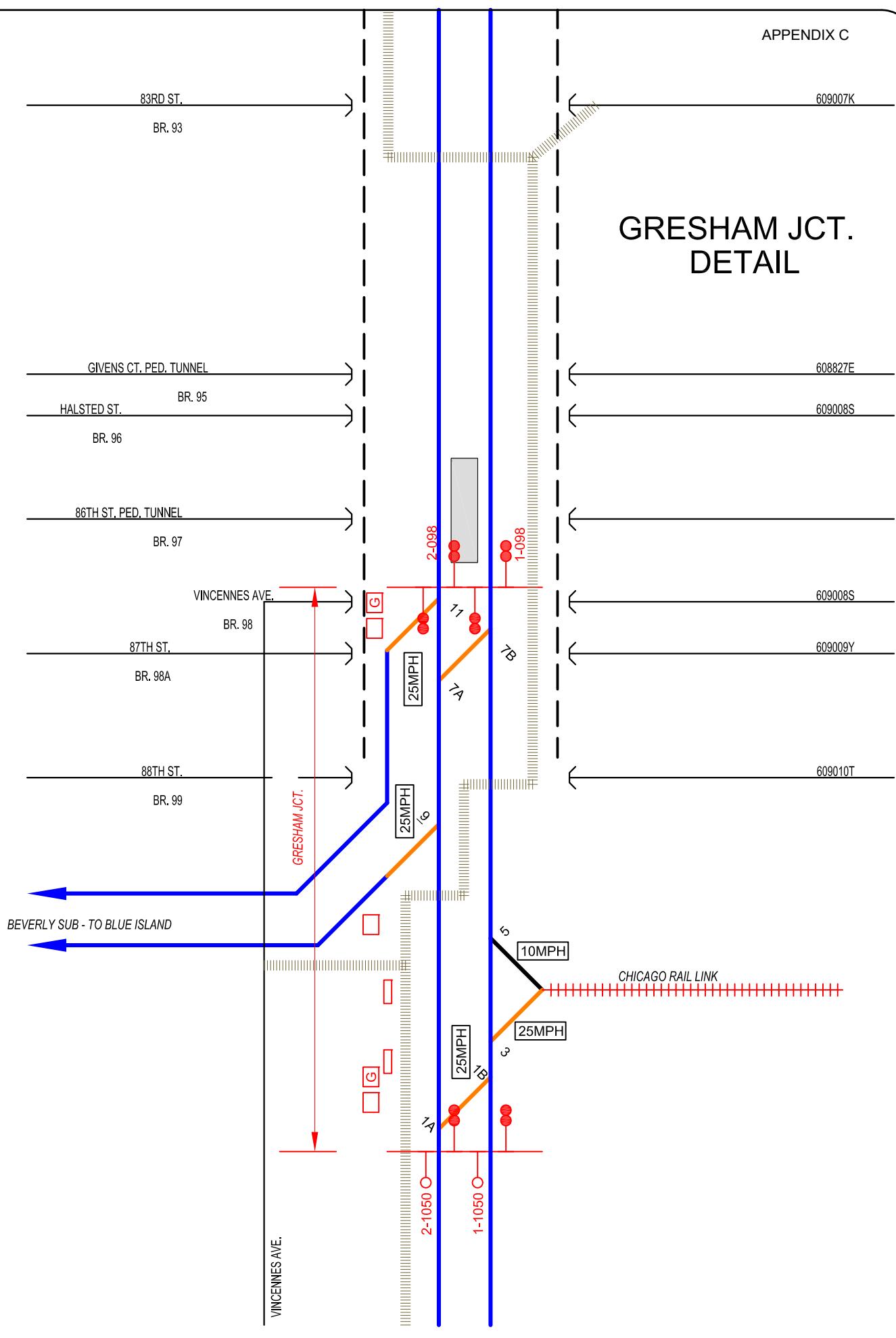


# 16TH STREET INTERLOCKING DETAIL

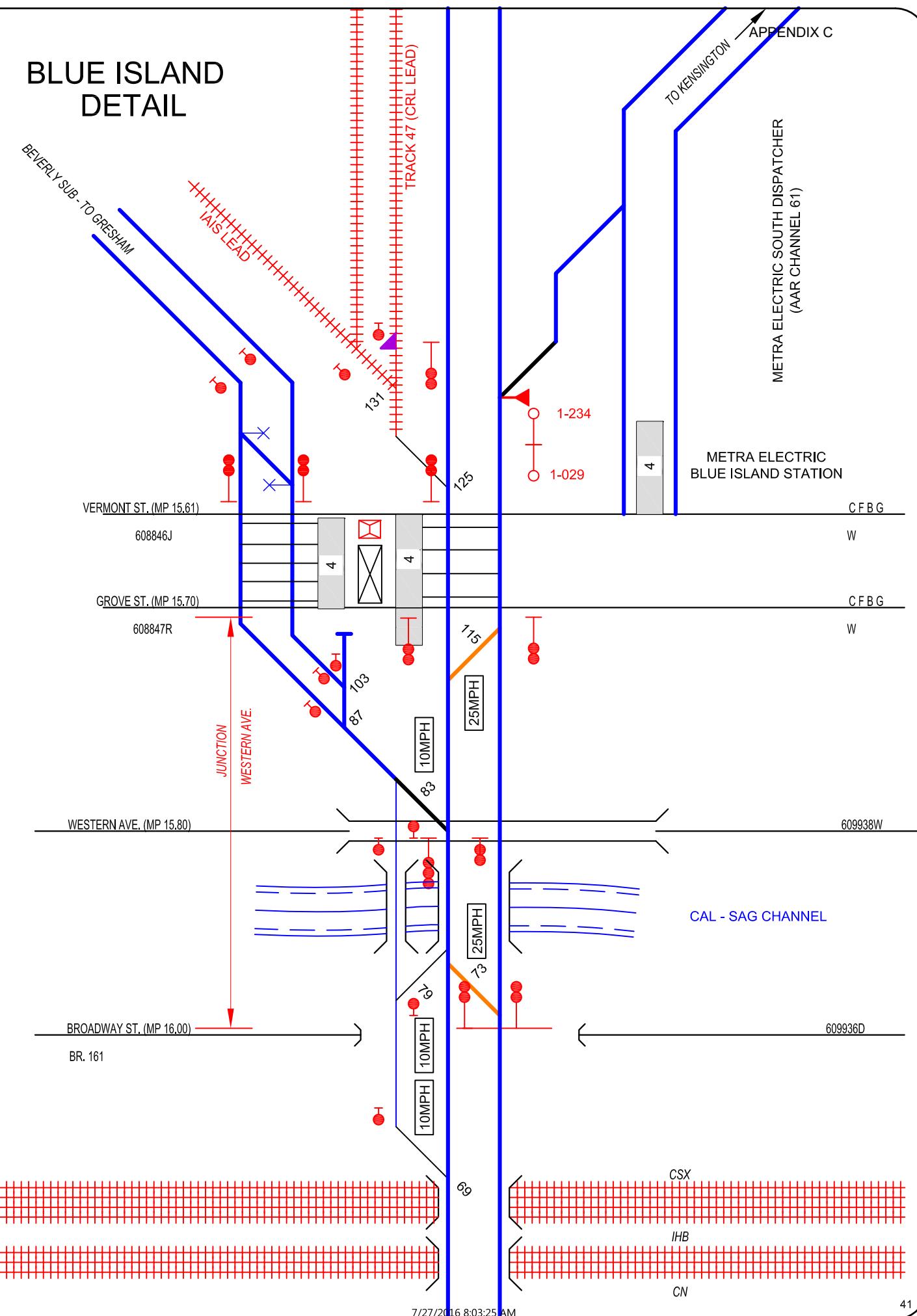




## 47TH STREET YARD DETAIL

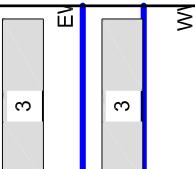


# BLUE ISLAND DETAIL

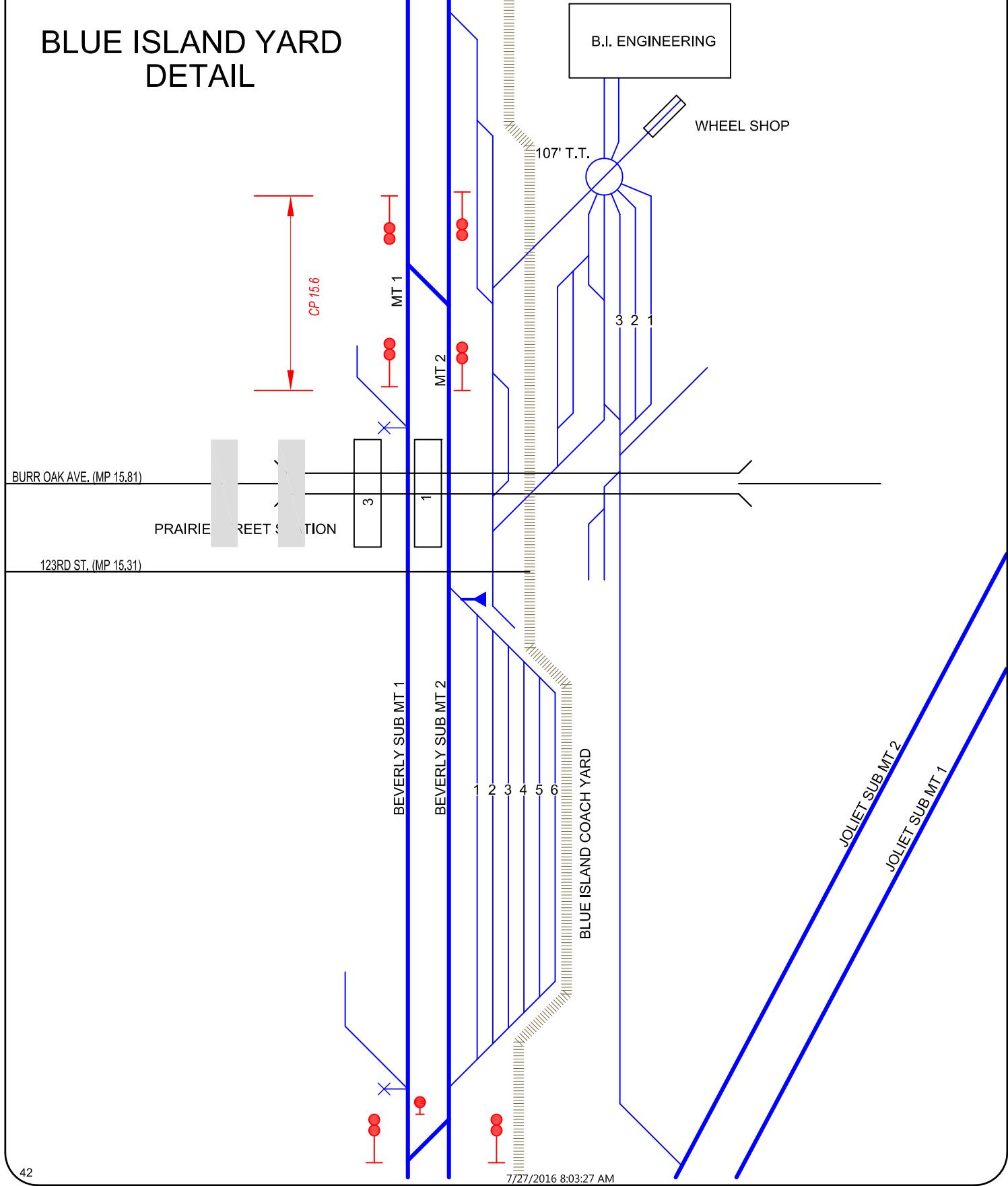


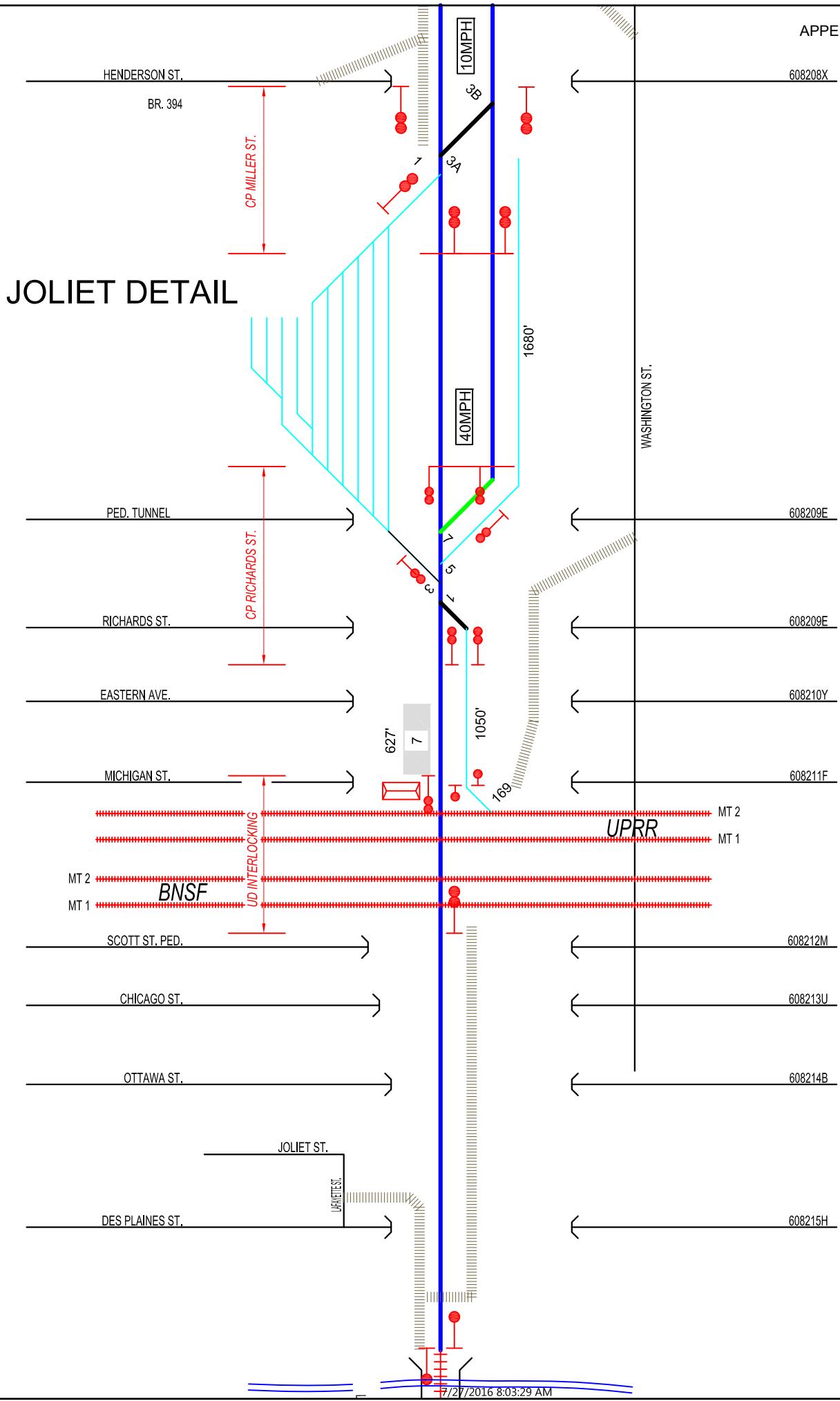
123RD STREET STATION

123RD ST. (MP 15.31)

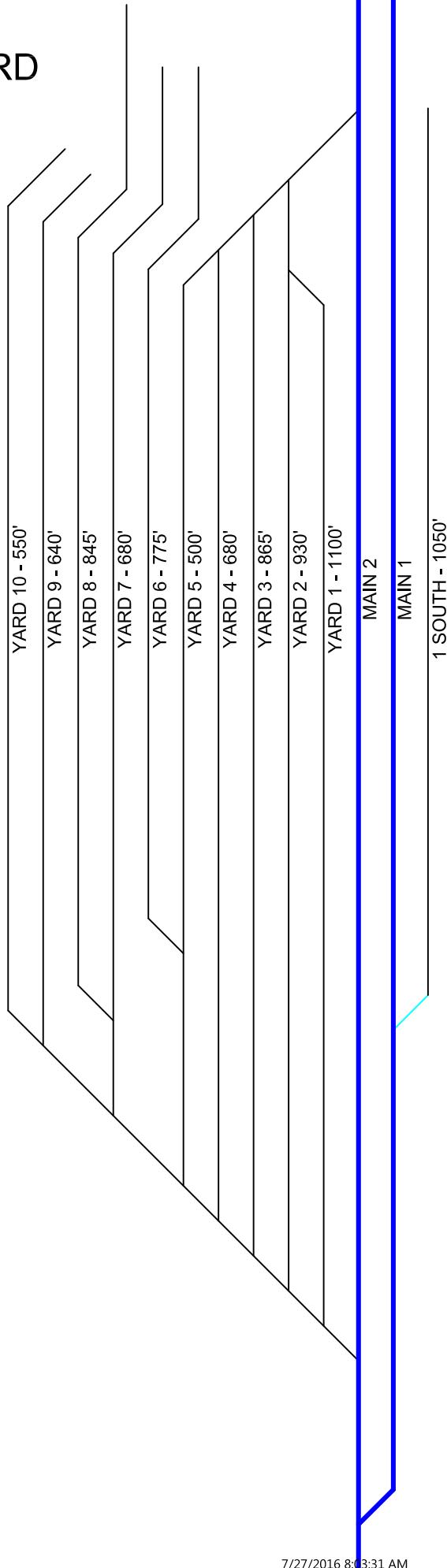


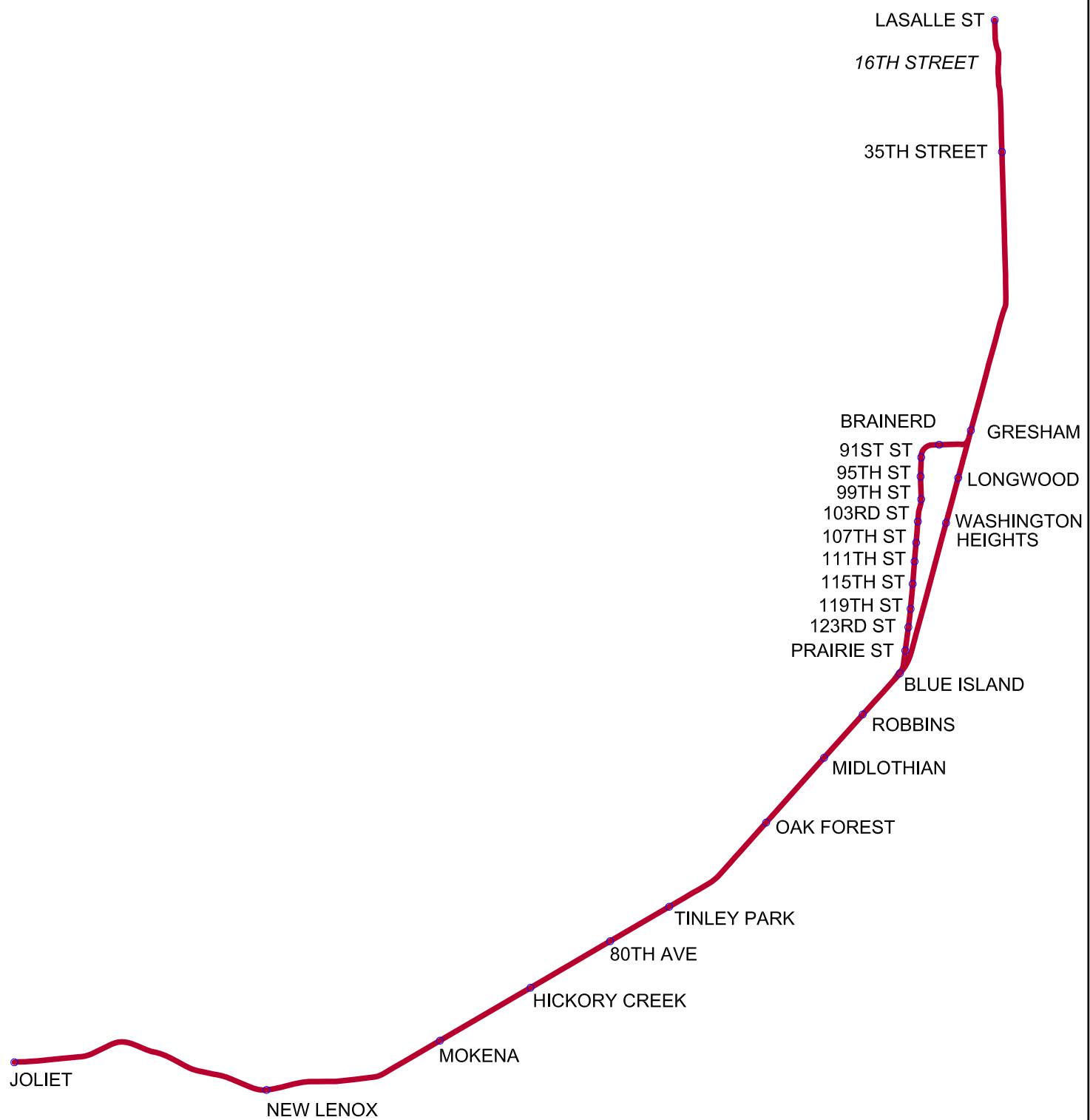
## BLUE ISLAND YARD DETAIL





# JOLIET YARD DETAIL





# **CONTRACT DOCUMENTS**

## **Section 5**

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## **REQUEST FOR PROPOSAL**

### **RFP No. 177045**

### **ALL-ELECTRIC PASSENGER LOCOMOTIVES**

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NORTHEAST ILLINOIS REGIONAL COMMUTER RAILROAD CORPORATION D/B/A METRA  
CONSTRUCTION & FACILITIES MAINTENANCE PROCUREMENT  
547 WEST JACKSON BOULEVARD  
CHICAGO, IL 60661

**PRE-PROPOSAL REQUEST FOR CHANGE OR APPROVED EQUAL (RFA)**

This form must be used for pre-proposal requested clarifications, changes, substitutes or approval of items equal to items specified with a brand name, and **must** be received no later than the time specified for Questions due/Pre-proposal Request for Change or Approved Equal (RFA) due in III. Proposed Schedule for the Procurement.

<b>RFP No. 177045</b>	<b>Proposer:</b>	<b>Proposer's Request #:</b>
<b>Document and Page(s):</b>		<b>Section:</b>
<b>Question/Clarification/Approved Equal:</b>		
<b>Metra's Response:</b>		

**Proposal Form**

**Acknowledgement of Addenda**

Failure to acknowledge receipt of all addenda may cause the proposal to be considered nonresponsive to the solicitation. Acknowledged receipt of each addendum must be clearly established and included with the proposal.

The undersigned acknowledges receipt of the following addenda to the documents:

Addendum No.:                      Dated:

**Proposal**

By execution below by a duly authorized representative of the proposer, the proposer hereby offers to furnish equipment and services as specified in its proposal submitted to Metra in response to RFP No. 177045 in its entirety and that proposal shall remain valid for a period of 270 days.

Proposer/Firm: \_\_\_\_\_

Street Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

Phone: \_\_\_\_\_

Name of Authorized Signer: \_\_\_\_\_

Title of Authorized Signer: \_\_\_\_\_

---

Authorized Signature

---

Date

**Proposal Deviation Form**

This form shall be completed for each condition, exception, reservation, assumption, or understanding (Proposal Deviation) in the Proposer's submitted Proposal in accordance with XXV. Conditions, Exceptions, Limitations, or Deviations. Each Proposal Deviation shall be submitted on a separate Proposal Deviation Form and included in the applicable proposal package as specified in XXV. Preparation of Proposals.

Metra RFP No. 177045 All-Electric Passenger Locomotives	
<b>Contractor:</b>	<b>Contractor's Deviation No.:</b>
<b>Proposal Package No.:</b>	<b>Contract Section/Subsection/Page No.:</b>
<b>Complete description of deviation:</b>	
<b>Rationale:</b>	

**Pre-Award Evaluation Data Form**

NOTE: If the Contractor or Subcontractor is a joint venture, submit this form for each member of the joint venture along with a copy of the joint venture agreement.

<b>Metra RFP No. 177045 All-Electric Passenger Locomotives</b>			
Name of firm:		Address:	
<input type="checkbox"/> Individual	<input type="checkbox"/> Partnership	<input type="checkbox"/> Corporation	<input type="checkbox"/> Joint Venture
Date Organized:		State in which incorporated:	
Names of officers or partners:			
How long has your firm been in business under its present name?			
Have you been terminated or defaulted, in the last five years, on any contract you were awarded? <input type="checkbox"/> YES or <input type="checkbox"/> NO If yes, attach as <b>SCHEDULE ONE</b> the full particulars regarding each occurrence.			
The above information is confidential and will not be divulged to any unauthorized personnel.			
The undersigned certifies to the accuracy of all information:			
<b>Name and title:</b>			
<b>Company:</b>			
<hr/> <b>Signature</b>		<hr/> <b>Date</b>	

**AFFIDAVITS /CERTIFICATIONS FOR CONTRACTORS**

**FILL IN THE BLANKES AND SUBMIT THIS FORM WITH BID. HAVE APPLICABLE SIGNATURES NOTARIZED.**

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

The Undersigned represents that s/he is \_\_\_\_\_ ("Undersigned") the  
(Print Name)

\_\_\_\_\_  
(Print President or Other Proper Title) of \_\_\_\_\_  
\_\_\_\_\_  
Print name of Entity)

("Company" or "Undersigned") and is authorized to attest on behalf of himself/herself and said Company by stating as follows:

**A. PROHIBITED INTERESTS AND CONFLICTS OF INTEREST**

**1. PUBLIC OFFICER PROHIBITED ACTIVITIES ACT AFFIDAVIT**

The Company is the bidder submitting this bid and that the proposer is in compliance with Provisions set forth in the Public Officer Prohibited Activities Act, 50 ILCS 105/0.01, et seq., and to the best of its knowledge and belief, no person holding office, either by election or appointment under the laws or constitution of this State, is in any manner interested, either directly or indirectly, in his/her own name or in the name of any other person, association, trust, or corporation, in this contract or the performance of any work/services under this contract which such officer has been or may be called upon to act or vote.

**2. METRA'S CONFLICTS OF INTEREST ORDINANCE**

Pursuant to §4.03 of Metra's Bidding Regulations:

Members of the Board, officers, and employees of Metra, their spouses, their children, their parents, their brothers and sisters and their children, are prohibited from having or acquiring any contract or any direct pecuniary interest in any contract which will be wholly or partially performed by the payment of funds or the transfer of property of the Metra. Any firm, partnership, association, or corporation from which any member of the Board, officer, or employee of the Metra is entitled to receive more than seven and one half percent (7-1/2%) of the total distributable income, is prohibited from having or acquiring any contract or direct pecuniary interest in any contract which will be performed in whole or in part by payment of funds or the transfer of property of Metra.

Any firm, partnership, association, or corporation from which members of the Board, officers, employees of Metra, their spouses, their children, their parents, their brothers and sisters and their children, are entitled to receive in the aggregate more than fifteen percent (15%) of the total distributable income, is prohibited from having or acquiring any contract or direct pecuniary interest in any contract which will be performed in whole or in part by the payment of funds or the transfer of property of Metra.

Board members and employees are prohibited from participating in the selection, award, or administration of a contract supported by Metra funds, federal funds, or any other grant funds if a real conflict of interest or, to his or her knowledge, an apparent conflict of interest would be involved. A real or apparent conflict of interest would arise when any of the following has an interest in the entity selected for award: (a) an employee, officer, board member, or agent; (b) any member of his or her immediate family (as listed above in the first paragraph); (c) his or her business partner; or (d) an organization that employs; or intends to employ, any of the above. "Apparent" is defined under this paragraph as being one in which a person is an officer or director of an entity, or has an interest in the ownership or profits of an entity, and such interest appears substantial to a reasonable person. "Interest" is defined under this paragraph as a direct or indirect entitlement to receive any of the entity's profits.

In addition, Undersigned states that no officer of Metra has represented, either as an agent or otherwise, the proposer with respect to this application or bid for contract. Finally, Undersigned states that to best of its knowledge and belief, no officer of Metra has received or been offered from any person on behalf of the proposer, either directly or indirectly, any money or other thing of value as a gift, bribe, or means of influencing any vote or action in any official's capacity. Furthermore, Undersigned certifies that, to the best of its knowledge, it is in compliance with Metra's Bidding Regulations and is unaware of any of the foregoing persons having an interest prohibited by Section 4.03 of the Bidding Regulations.

## **B. NON-COLLUSION AFFIDAVIT**

The Company is the bidder submitting this bid and that such bid was not made in the interest of or on behalf of any undisclosed person, partnership, company, organization or corporation; that such bid is genuine and not collusive or a sham and that said proposer has not been a party to any agreement or collusion among bidders/proposers or prospective bidders/proposers in restraint of freedom of competition by agreement to bid a fixed price or otherwise, or to refrain from proposing, and has not, directly or indirectly, by agreement, communication, or conference with anyone, attempted to induce action prejudicial to the interest of Metra, or of any proposer or anyone else interested in the proposed contract.

## **C. CERTIFICATE FOR BID**

As a part of its offer to contract for services to Metra, the Undersigned hereby certifies that neither the Company nor any of its principals are barred from proposing on the aforementioned contract as a result of a violation of either Section 33E-3 or 33E-4 of 720 ILCS 5/33E.

#### D. CERTIFICATE OF DEBARMENT

As the potential contractor for a primary contract, or subcontractor to a primary contractor for subcontracts over \$25,000.00, the Undersigned certifies to the best of its knowledge and belief, the Company and its principals:

1. Are not included on the U.S. Comptroller General's Consolidated List of Persons or Firms Debarred from federal contracts for violations of various public contracts incorporating labor standard provisions;
2. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal, state, or local government entity;
3. (a) have not been convicted under the laws of Illinois or any other state of bribery or attempting to bribe any government officer or employee or have made an admission of guilt of that conduct that is a matter of record but has not been prosecuted for that conduct. No business shall be barred from contracting with Metra as a result of a conviction under this Section of any employee or agent of the business if the employee or agent is no longer employed by the business and: i) the business has been finally adjudicated not guilty; or ii) the business demonstrates to Metra, and Metra finds that the commission of the offense was not authorized, requested, commanded, or performed by a director, officer, or high managerial agent on behalf of the business as provided in paragraph (2) of subsection (a) of Section 5-4 of the Criminal Code of 1961. For purposes of this Subsection (a), when an official, agent, or employee of a business committed the bribery or attempted bribery on behalf of the business and in accordance with the direction or authorization of a responsible official of the business, the business shall be chargeable with the conduct. Contractor hereby certifies that the contractor and its subcontractors are not barred from being awarded a contract or subcontract under this Section.  
  
(b) Are not convicted of a felony. No person or business shall do business with Metra from the date of conviction until 5 years after the date of completion of the sentence for that felony, unless no person held responsible by a prosecutorial office for the facts upon which the conviction was based continues to have any involvement with the business. Contractor hereby certifies the Contractor is not barred from being awarded a contract under this Section.
4. Are not presently indicted for, or otherwise criminally or civilly charged by a government entity (federal, state or local) for any reason; or
5. Have not, within a three-year period preceding this bid, had one or more public transactions (federal, state or local) terminated for cause or default.

(If the Undersigned is unable to certify to any of the statements in this certification, the Undersigned shall attach an explanation).

**THE UNDERSIGNED CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF THE FEDERAL FALSE CLAIMS ACT ARE APPLICABLE THERETO.**

**E. CERTIFICATION OF RESTRICTIONS ON LOBBYING**

This certification is required to be completed with the solicitation if the bid exceeds \$100,000.00. Failure to return this certification with the solicitation may result in a determination that the offer is non-responsive or non-responsible.

The Undersigned certifies to the best of its knowledge or belief that:

1. No federal appropriated funds have been paid or will be paid, by or on behalf of the Undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of an federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.
2. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee or any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of federal contact, grant, loan, or cooperative agreement, the Undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions.
3. The Undersigned shall require that the language of this certification be included in the award document for all sub-awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements), and that all subrecipients shall certify and disclose accordingly.

**F. REVOLVING DOOR PROHIBITION**

The Undersigned has reviewed its list of employees (and subcontractors) involved in this procurement and it has no knowledge of any former Metra employee being involved in the solicitation process in violation of Section 4.05 of Metra's Bidding Regulations.

Section 4.05 states that all Metra Board members and non-contract personnel in specified positions are expressly prohibited, for a period of one (1) year after terminating employment with Metra, from engaging in any procurement activity with Metra. A "specified position" is one that is non-contract, is held for a period of six (6) months preceding such termination, is at a Grade P12 or above (including M Grades), and is not merely clerical or ministerial in nature. The prohibition includes, but is not limited to: lobbying the procurement process; specifying;

bidding; or proposing bid, proposal, or contract documents on the part of the former employee or Board member, or in association with the former employee or Board member by or on behalf of any firm, partnership, association, or corporation affiliated with the former employee or Board member. The Undersigned certifies that the award and/or execution of a contract would not cause any violation of Section 4.05.

#### **G. CONTINUING OBLIGATION TO INFORM METRA**

If Company acquires information after executing this certification that there may be an actual or apparent violation of any of the above Company shall promptly bring such information to the attention of Metra's Procurement Officer. Company shall thereafter cooperate with Metra's review and investigation of such information, and comply with any instruction it receives from Metra in regard to remedying the situation.

#### **H. ILLINOIS WAGE ACT/DAVIS-BACON ACT CERTIFICATION**

To the extent applicable, the Undersigned hereby certifies that the wage rate paid by said Undersigned will be no less than the wage rates set forth by the State of Illinois and the Federal Davis-Bacon Act. Labor classifications and current wage rates are available for review at Metra's headquarters upon written request.

#### **I. PENALTIES**

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into the Contract pursuant to Metra's regulations and 31 U.S.C. §1352. A Company who makes a false statement, materials to the certification, is subject to termination for cause.

#### **J. DEBT TO STATE**

Contractor certifies that neither it, nor its affiliate(s) is/are barred from receiving a contract Award because Contractor, or its affiliate(s) is/are delinquent in payment of any debt to the State, unless Contractor, or its affiliate(s), has/have entered into a deferred payment plan to pay off the debt, and Contractor acknowledges Metra may declare the Agreement void if certification is false. (5 ILCS 500/50-11).

#### **K. INTERNATIONAL BOYCOTT**

Contractor certifies that neither it or any substantially owned affiliated company is participating or shall participate in an international boycott in violation of the provision of the U.S. Export Administration Act of 1979 (50 USC Appendix 2401 et seq. or regulations of the Department of Commerce under that Act (15 CFR Parts 730 through 774).

**L. GOODS FROM CHILD LABOR ACT**

Contractor certifies that no foreign-made equipment, materials, or supplies furnished to the State under this Agreement have been produced in whole or in part by the labor of any child under the age of twelve (12) (30 ILCS 584).

**PRIME CONTRACTOR SIGNATURES REQUIRED ON NEXT PAGE**

**EXHIBIT 1-B**  
**AFFIDAVIT/CERTIFICATION**

---

The undersigned certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Company understands and agrees that the provisions of 31 U.S.C. §3801, et seq., apply to this certification and disclosure.

(Print) Name of Company \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Signature of Person Making Affidavit (Undersigned listed above)

(Print) Title of Person Making Affidavit \_\_\_\_\_

**NOTARIZE HERE**

Subscribed and sworn to before me  
This \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_.  
\_\_\_\_\_  
Notary Public

**CERTAIN SUBCONTRACTOR SIGNATURES REQUIRED ON NEXT PAGE**

**SUBCONTRACTOR  
DEBARMENT CERTIFICATION**

**NOTE: PRIMARY CONTRACTOR IS RESPONSIBLE FOR THIS FORM BEING SUBMITTED PRIOR TO AWARD. SUBCONTRACTOR(S) WITH SUBCONTRACTS OVER \$25,000.00 MUST ALSO COMPLETE AND SIGN THE FOLLOWING:**

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

The Undersigned represents that s/he is \_\_\_\_\_ ("Undersigned Subcontractor")  
(Print Name)

The \_\_\_\_\_ of \_\_\_\_\_  
(Print "President" or Other Proper Title) (Print name of Subcontractor Entity)

("Subcontractor" or "Undersigned Subcontractor") and is authorized to attest on behalf of himself/herself and Subcontractor Entity by stating as follows:

1. As a subcontractor to a primary contractor for subcontracts over \$25,000.00, the undersigned Subcontractor certified to the best of its knowledge and belief that the debarment statements in Section D above are truthful and accurate.
2. If Undersigned Subcontractor acquires information after executing this certification that there may be an actual or apparent violation of any of the above, Subcontractor shall promptly bring such information to the attention of Metra's Procurement Officer.
3. The provisions of Section 1 above are applicable.

\_\_\_\_\_  
(Print) Name of Subcontractor Entity

By: \_\_\_\_\_  
Signature of Person Making Affidavit (Undersigned listed above)

Date: \_\_\_\_\_

\_\_\_\_\_  
(Print) Title of Person Making Affidavit

**NOTARIZE HERE**

Subscribed and sworn to before me  
This \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_.  
\_\_\_\_\_  
Notary Public

## ROLLING STOCK

**(FOR ROLLING STOCK INCLUDING TRAIN CONTROL SYSTEMS, ROLLING STOCK COMMUNICATIONS SYSTEMS, AND TRACTION POWER EQUIPMENT)**

### BUY AMERICA CERTIFICATE

Section 165 of the Surface Transportation Assistance Act of 1982 as amended, (P.L. 97-424) and the implementing regulations published at 49 CFR, Part 661, require that steel and manufactured products used in FTA funded projects be produced in the United States. That Act and the regulations also provide for exceptions if certain requirements are met.

*Certificate of Compliance with 49 U.S.C. 5323 (j)(2)(C)*

The bidder or offeror hereby certifies that it will meet the requirements of 49 U.S.C. 5323 (j)(2) and (C) and the regulations in 49 CFR Part 661.11.

Date \_\_\_\_\_

Signature \_\_\_\_\_

Company Name \_\_\_\_\_

Title \_\_\_\_\_

OR

*Certificate of Non-Compliance with 49 U.S.C. 5323 (j)(2)(C)*

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. 5323 (j) (2)(C) and 49 C.F.R. 661.11, but it may qualify for an exception pursuant to 49 U.S.C. 5323 (j)(2)(A), 5323 (j)(2)(B), or 5323 (j)(2)(D), and 49 C.F.R. 661.7.

Date \_\_\_\_\_

Signature \_\_\_\_\_

Company Name \_\_\_\_\_

Title \_\_\_\_\_

**Note: The U.S./Canadian Free Trade Agreement does not supersede the Buy American Requirement.**

Bidders must sign that either they "will comply" or, "cannot comply" with the Buy America Certificate. If bidder signs both compliance and non-compliance to the Buy America Certificate bidder will be deemed non-responsive.

**Transit Vehicle Manufacturers (TVM) Certification**

The bidder/proposer, if a transit vehicle manufacturer, hereby certifies that it has complied with the requirements of 49 CFR 26.49.

The bidder/proposer, if a non-vehicle manufacturer supplier, hereby certifies that the manufacturer of the transit vehicle to be supplied has complied with the above-referenced requirements of 49 CFR 26.49.

Manufacturer: \_\_\_\_\_

Manufacturer Representative Signature: \_\_\_\_\_

If applicable:

Supplier: \_\_\_\_\_

Supplier Representative's Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**BOND NO:** \_\_\_\_\_

**LABOR AND MATERIAL PAYMENT BOND**

KNOW ALL PERSONS BY THESE PRESENTS; that

CONTRACTOR: \_\_\_\_\_  
(Address) \_\_\_\_\_  
\_\_\_\_\_

as Principal (hereinafter referred to as the “Contractor”), and

SURETY: \_\_\_\_\_  
(Address) \_\_\_\_\_  
\_\_\_\_\_

as Surety or Co-Sureties (hereinafter collectively referred to as the “Surety”), are held and firmly bound unto

OBLIGEE: \_\_\_\_\_  
(Address) \_\_\_\_\_  
\_\_\_\_\_

as Obligee (hereinafter referred to as the “Obligee”) in the sum of \_\_\_\_\_

DOLLARS

(\$ \_\_\_\_\_) (hereinafter referred to as the “Contract Price”), for the payment of which the Contractor and Surety bind themselves, and their respective heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated \_\_\_\_\_ entered into

Contract Number \_\_\_\_\_ (hereinafter referred to as the “Contract”) with Obligee for the performance of

CONTRACT WORK \_\_\_\_\_  
\_\_\_\_\_

at the project commonly referred to as \_\_\_\_\_  
(hereinafter referred to as the "Project").

NOW, THEREFORE, Surety and Contractor agree to be bound as follows:

1. If Contractor shall promptly make payment to all claimants as herein defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise, it shall remain in full force and effect.

2. The Surety agrees that no change, extension of time, alteration, addition, deletion, amendments or other modification of the terms of the Contract or any agreement entered into by the Obligee related to the Project, or in the work to be performed, or in the specifications, or in the plans shall in anywise affect its obligations on this Bond, except that the penal sum of this Bond shall increase directly with any amendments issued to the Contract, and the Surety hereby waives any notice of such changes, extensions of time, alterations, additions, deletions, amendments, and other modifications.

3. A Claimant is defined as one having a direct contract with the Contractor or a subcontractor of the Contractor for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil gasoline, telephone service, or rental equipment directly applicable to the Contract.

4. The Contractor and Surety hereby jointly and severally agree with the Obligee that every Claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such Claimant's work or labor was done or performed, or materials were furnished by such Claimant may sue on this Bond for the use of such Claimant, prosecute the suit to final judgment for such sum or sums as may be justly due Claimant and have execution thereon. The Obligee shall not be liable for the payment of any costs or expenses of any such suit.

5. No suit or action shall be commenced hereunder by any Claimant.

a. After the later of (a) expiration of one (1) year from the date on which final payment became due to the Claimant; or (b) the applicable date or period according to the statutes of the state in which the Project is located;

b. Unless appropriate notice has been given, which is the later of:

i. unless Claimant, other than one having a direct contract with the Contractor, shall have given written notice to the following: the Contractor, the Obligee and the Surety above named, within ninety (90) days after such Claimant did or performed the work or labor, or furnished the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served

by mailing the same registered mail or certified mail, postage prepaid, in an envelope addressed to the Contractor, Obligee and Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer; or

- ii. as required by the statutes of the state in which the Project is located.
  - c. Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.
6. If Contractor and Surety shall indemnify Obligee and its surety (if any) for any payments made by Obligee or its surety (if any), whether due to a lien or payment bond claim or otherwise, to any Claimant, as defined herein, including any and all legal expenses (including but not limited to attorneys' fees and costs) necessarily incurred by Obligee or its surety in connection with such payments, then this obligation shall be void, otherwise it shall remain in full force and effect.
7. The amount of this Bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.

IN WITNESS WHEREOF, the Contractor and Surety have hereunto caused this Bond to be duly executed and acknowledged as set forth below this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

(Impress Corporate Seal)

ATTEST:

PRINCIPAL:

---

Name:  
Title:

---

Name:  
Title:

(Impress Corporate Seal)

ATTEST:

SURETY:

---

Name:  
Title:

---

Name:  
Title:

**BOND NO:** \_\_\_\_\_

**PERFORMANCE BOND**

KNOW ALL PERSONS BY THESE PRESENTS; that

CONTRACTOR: \_\_\_\_\_  
(Address) \_\_\_\_\_  
\_\_\_\_\_

as Principal (hereinafter referred to as the “Contractor”), and

SURETY: \_\_\_\_\_  
(Address) \_\_\_\_\_  
\_\_\_\_\_

as Surety or Co-Sureties (hereinafter collectively referred to as the “Surety”), are held and firmly bound unto

OBLIGEE: \_\_\_\_\_  
(Address) \_\_\_\_\_  
\_\_\_\_\_

as Obligee (hereinafter referred to as the “Obligee”) in the sum of \_\_\_\_\_

DOLLARS

(\$ \_\_\_\_\_) (hereinafter referred to as the “Contract Price”), for the payment of which the Contractor and Surety bind themselves, and their respective heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated \_\_\_\_\_ entered into

Contract Number \_\_\_\_\_ (hereinafter referred to as the “Contract”) with Obligee for the performance of

CONTRACT WORK \_\_\_\_\_  
\_\_\_\_\_

at the project commonly referred to as \_\_\_\_\_  
(hereinafter referred to as the "Project").

NOW, THEREFORE, Surety and Contractor agree to be bound as follows:

1. If Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise, it remains in full force and effect.

2. The Surety agrees that no change, extension of time, alteration, addition, deletion, amendments or other modification of the terms of the Contract or any agreement entered into by the Obligee related to the Project, or in the work to be performed, or in the specifications, or in the plans shall in anywise affect its obligations on this Bond, except that the penal sum of this Bond shall increase directly with any amendments issued to the Contract, and the Surety hereby waives any notice of such changes, extensions of time, alterations, additions, deletions, amendments, and other modifications.

3. In the event Contractor shall require financing assistance to complete the Contractor Work, the Surety may finance Contractor to completion of its Contractor Work. Direct reasonable Project-related completion costs financed by the Surety and not refunded to the Surety by the Contractor, excluding interest, expenses and other administrative expenses, shall reduce the penal sum of this Bond. The foregoing shall be subject to the prior written approval of the Obligee of the financing and the financing plan, as well as any deviations from the original financing plan.

4. Whenever Obligee has declared Contractor to be IN DEFAULT OF THE CONTRACT, the Surety shall, within fifteen (15) calendar days of its receipt from notice from Obligee that Subcontract is in default, respond as follows:

- a. Complete the Contract Work in accordance with the Contract terms and conditions; or
- b. Obtain bids or offers from contractors acceptable to Obligee for completing the Contract in accordance with its terms and conditions, and upon determination by Obligee and Surety jointly of the lowest responsible bidder or offeror, arrange for a contract between such completion contractor and the Obligee, and arrange for new performance and payment bonds for such completion contractor form a surety acceptable to the Obligee. Upon acceptance of the completion contractor by the Obligee, the Surety shall pledge to the Obligee the difference between the cost to complete the Contract Work and the balance of the Contract Price, including the cost of obtaining new performance and payment bonds; or
- c. Tender to Obligee the penal sum of the Bond less any amounts expended by the Surety in financing the Contractor pursuant to Paragraphs 3 or 4(e) hereof; or
- d. Having made an independent investigation of the facts and circumstances of the alleged default, deny its liability in whole or in part and notify to the Obligee the reasons why the Surety believes it does not have liability for the default, in which

event Obligee may proceed to take such action as may be allowed under the Contract or at law and the Surety's liability shall be determined in accordance with Paragraph 10 hereof; or

- e. Upon request, Surety shall be entitled to obtain an extension of up to fifty (50) calendar days in the time to act under this Paragraph 4 by financing performance of the Contract Work during the extension period on a schedule and in a manner acceptable to Obligee. The cost of such financing assistance provided by Surety shall reduce the penal sum of this Bond, but Obligee shall have no obligation to reimburse Surety or otherwise pay for the work performed until Surety has committed to remedy the default pursuant to this Subparagraphs 4, and then only from funds earned under the Contract. To the extent the cost of such financing assistance exceeds the amount earned under the terms of the Contract for the work accomplished, such costs shall not be refunded to the Surety but shall be applied to reduce the penal sum of this Bond.
5. Upon the issuance of written notice by Surety to Obligee of the commitment to remedy the default through one of the options set forth in Paragraph 4, Obligee shall make available as Contract Work progresses, the balance of the Contract Price. The term "balance of the Contract Price" as used in this Paragraph and Subparagraph 4(b), shall mean the amount of the Contract Price, including any amendments issued thereto prior to the declaration of the default, less the amount paid by Obligee to Contractor in accordance with the terms of the Contract, less any other amounts for which Surety is liable under this Bond and Contractor is liable under the Contract.
6. The Surety shall be liable for:
  - a. The responsibilities of the Contractor for correction of defective work and completion of Contractor Work;
  - b. The responsibilities of the Contractor for additional legal and design professional costs resulting or arising from the Contractor's default, or resulting or arising from the actions or failure to act of the Surety under Paragraph 4 herein; and
  - c. The responsibilities of the Contractor for liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by the delayed performance or non-performance of the Contractor.
7. Surety agrees to pay Obligee its reasonable attorney's fees and costs that arise from Contractor's default, including but not limited to any and all attorney's fees and costs incurred to enforce the terms of this Bond.

8. No right of action shall accrue on this Bond to or for the use of any person or corporation other than Obligee or heirs, executors, administrators, assigns or successors of Obligee.
9. In the event of a dispute between Surety and Obligee related to the Contract or Bond, then either Surety or Obligee may institute litigation in the state or federal court where the Project is located.

IN WITNESS WHEREOF, the Contractor and Surety have hereunto caused this Bond to be duly executed and acknowledged as set forth below this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

(Impress Corporate Seal)

ATTEST:

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Name:  
Title:

PRINCIPAL:

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Name:  
Title:

(Impress Corporate Seal)

ATTEST:

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Name:  
Title:

SURETY:

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Name:  
Title: