23 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 proposal package for overhaul, parts procurement without notifying OEM.

Manuals, Drawings, etc. shall be uploaded to a mutually agreed upon sharepoint.

23.1 DRAWINGS AND REPRODUCTIONS

23.1.1 Before the first trainset is delivered, the Contractor shall furnish a complete and correct electronic editable files of the following drawings

- 23.1.1.1 Electrical Schematics & Conduit Diagrams
- 23.1.1.2 Air Piping Diagram
- 23.1.1.3 Trainset General Arrangement
- 23.1.1.4 Clearnce Diagram
- 23.1.1.5 Wire Running List
- 23.1.1.6 (deleted)

23.1.2 The released editable as-built version of the drawing set according to the mutually signed NDA shall be provided thirty (30) days after the conditional acceptance of the last car in the digital formats (.pdf) and (.dwg). The bills of materials shall be provided in the digital formats (.pdf) and (.xlsx). **[CDRL C-23-01]**

23.1.3 (deleted)

23.2 PHOTOGRAPHS

23.2.1 Electronic version (jpg) of the following color photographs shall be provided for one trainset **[CDRL C-23-02]**:

- 23.2.1.1 Side elevation of the trainset
- 23.2.1.1 Combination front and side (three-quarter) view of the trainset
- 23.2.1.2 Head-on view of each end
- 23.2.1.3 Car seating, taken from three (3) different angles
- 23.2.1.4 Stairways
- 23.2.1.5 Both trucks in the ready to run condition, but not applied to car
- 23.2.1.6 Mobility aid lift, completely lowered and completely raised
- 23.2.1.7 Ten (10) miscellaneous photographs illustrating the construction of the cars
- 23.2.1.8 Communication and door control station
- 23.2.1.9 ADA positions
- 23.2.1.10 Interior of all lockers and control panels
- 23.2.1.11 Passenger boarding/alighting area
- 23.2.1.12 Undercar equipment
- 23.2.1.13 Major underframe connections (bolster at side and center sill, etc.)
- 23.2.1.14 Underframe, inverted, before addition of superstructure
- 23.2.1.15 Roof, before equipment is installed
- 23.2.1.16 Details of side panels
- 23.2.1.17 Details of all communications equipment
- 23.2.1.18 Details of the conductor panel and door system (door leaves, door drive).

23.3 DRAWING LISTS AND BILLS OF MATERIALS

23.3.1 (deleted)

23.3.2 (deleted)

23.4 SPARE PARTS CATALOGS AND MAINTENANCE MANUALS

23.4.1 The Contractor shall deliver, in searchable, electronic form drafts of the Maintenance manual to Metra prior to the shipment of the first production car. As-built updates, including car affectivity shall be provided through the life of the contract.

23.4.2 The Contractor shall deliver to Metra the final, editable electronic version of each manual within thirty (30) days after conditional acceptance of the last trainset. **[CDRL C-23-04] [CDRL C-23-05]**

23.4.3 All manuals shall be divided into the following sections:

X.X. Maintenance Preparation Work
X.X. Preventive Tasks
X.X.X. A - Higher Level Elements / Systems
X.X.X. B - Vehicle Body
X.X.X. C - Vehicle Outfittings
X.X.X. D - Interior
X.X.X. E - Running Gear
X.X.X. F - Power / Drive System
X.X.X. G - Control Systems
X.X.X. H - Auxiliary Equipment
X.X.X. J - Monitoring and Safety Equipment
X.X.X. K - External Lighting Equipment
X.X.X. L - HVAC
X.X.X. M - Ancillary Equipment
X.X.X. N - Doors
X.X.X. P - Information System
X.X.X. Q - Pneumatic System
X.X.X. R - Brake System
X.X.X. S - Coupler & Draft Gear
X.X.X. T - Carries Systems
X.X.X. U - Electrical Wiring
X.X. Corrective Tasks

23.4.3.1 (deleted)
23.4.3.2 (deleted)
23.4.3.3 (deleted)
23.4.3.4 (deleted)
23.4.3.5 (deleted)
23.4.3.6 (deleted)
23.4.3.7 (deleted)
23.4.3.8 (deleted)
23.4.3.9 (deleted)
23.4.3.10 (deleted)
23.4.3.11 (deleted)
23.4.3.12 (deleted)
23.4.3.13 (deleted)
23.4.3.14 (deleted)
23.4.3.15 (deleted)

23.4.4 Each section shall have a table of contents.

23.4.5 The contractor shall provide within the Stadler maintenance manual the reference to the manufacture maintenance manual. The manufacture name and part number for drop replacement parts shall be within these sub maintenance manuals.

23.4.6 In all 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.

23.4.7 The Maintenance Manual together with the sub suppliers maintenance manuals 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.

23.4.8 The contractor's manual shall be divided into the following sections and address the following topics:

23.4.8.1 **Introduction** - This shall include the purpose of the manual, special tools, technical guidance including torque requirement, sealing requirement etc., and equipment and safety precautions.

23.4.8.2 **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.

23.4.8.3 **Operating Procedures** - This shall include the location and functional descriptions of all controls, monitors and indicators.

23.4.8.4 **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.

23.4.8.5 **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.

23.4.8.6 **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.

23.4.8.7 **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.

23.4.8.8 **Appendix** - This shall include a list of reference drawings, interface drawings, circuit diagrams, symbols, cross references and revisions.

23.4.9 The maintenance 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.

23.4.10 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.

23.5 OPERATING INSTRUCTION BOOK

23.5.1 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 cars. 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.

23.5.2 Diagrams and photographs shall be used where applicable.

23.5.3 All copies of the book covering the Metra cars shall be delivered sixty (60) calendar days before delivery of the first production car to Metra. The text of the operating instruction book shall be submitted to Metra for approval prior to printing. **[CDRL C-23-06]** In addition, an electronic version (format to be agreed upon) of this book shall be provided.

23.6 RECORD OF CONSTRUCTION/CAR HISTORY BOOKS

23.6.1 Trainset Contractor shall furnish in electronic form (Original pdf Files) to Metra a complete record of construction for each car consisting of the following information **[CDRL C-23-07]:**

23.6.1.1 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, traction motors; batteries and charging components; bearings, journal boxes, brake components, cab components and related components, HVAC systems and related components, Positive Train Control (PTC) equipment and related components, Cab signal and related components, display units, battery chargers and power supplies, Communications systems and related components, ADA systems and related components, pressurized components, toilet systems and related components yolk and coupler, and any other serialized parts, In addition, all software and firmware part numbers and revisions shall be provided.

23.6.1.2 Serial numbers, software and firmware part numbers and revisions shall be provided with each car 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.

23.6.1.3 Wheel and axle mounting reports

23.6.1.4 Contractor's standard test sheets

23.6.1.5 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

23.6.1.6 Written reports, tests, and approved contract changes made by the Contractor during car construction.

23.6.1.7 Specification sheets as required by FRA shall be completed and delivered to Metra no later than delivery date of each car.

23.7 AS BUILT SPECIFICATION

23.7.1 Car Contractor shall furnish an electronic version of an as built specification showing all details of car, all components used and naming supplier and model of all equipment on cars. These books shall be furnished to Metra no later than 30 calendar days after delivery of final car. If any changes were made during construction, the as built specification shall detail the changes, and indicate to which cars changes were made or different equipment was applied during construction. **[CDRL C-23-08]**

23.8 FIELD SERVICE

23.8.1 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 shall be submitted to Metra for review and approval. **[CDRL C-23-09]** 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.

23.8.2 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 14th St. Coach Yard or Rock Island Distrct 47th St. 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 cars. 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.

23.9 TEST EQUIPMENT

23.9.1 The Contractor shall supply, sixty (60) calendar days prior to delivery of the first production trainset, two (2) sets of Specialty Tools, and any test and diagnostic equipment necessary to support and maintain the cars and their sub-systems. 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-23-10]**

23.10 TRAINING

23.10.1 General

23.10.1.1 The Builder must provide a modular training program. 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 cars and to safely and satisfactorily operate, service, and maintain the cars 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.

23.10.1.2 The Contractor must provide modular training materials using Word-based and Power Point-based templates and style (active voice, present tense). The Contractor must be familiar with Information Mapping methods and techniques. This will allow for comprehensive training with respect to all aspects of operation and maintenance of the new equipment.

23.10.1.3 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 oversee the entire training process, oversee the training subcontractor, and who will interface directly with Metra's Director of Training & Development.

23.10.1.4 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.

23.10.1.5 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

23.10.1.6 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

23.10.1.7 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 car 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.

23.10.1.8 Training shall include instructor led classroom and hands-on instruction through the use of actual equipment, mock-ups, models, manuals, diagrams, and parts catalogs.

23.10.1.9 The Builder shall assume the attendees have no knowledge of the features of the new trainsets, 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.

23.10.1.10 All courses of instruction shall be presented in the English language.

23.10.1.11 Prior to the initiation of each classroom instruction, 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.

23.10.1.12 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.

23.10.1.13 In addition to the above requirements, the Builder shall submit as part of the proposal, in detail a projected training plan clearly linking each individual activity and deliverable to the car 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.

23.10.1.14 The program shall be conducted in a class room provided by Metra, at or near Metra's facilities in the Chicago, Illinois metropolitan area and shall include 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.

23.10.1.15 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 car.

23.10.1.16 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-23-11]**

23.10.1.17 Training materials including manuals, audio/visual aids, reference documents, computer hardware and software, models, check lists, and related items shall be as described in Section 23.10.9.

23.10.1.18 Prior to training materials being developed for a given module, the Builder shall submit a set of clearly defined Objectives for each class.

23.10.1.19 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.

23.10.2 Instructor Qualifications

23.10.2.1 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.

23.10.2.2 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-23-12]** Metra reserves the right to disqualify any of the builder's instructors for reasonable cause at any time.

23.10.2.3 Metra will recognize the instructor as qualified when the individual:

- Can communicate, in English, in a manner that allows the participants to understand
- Has been trained in adult teaching principles and methods and has had experience in conducting technical training courses
- 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.
- 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.

23.10.2.4 As part of the proposal, 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.

23.10.3 Training Schedules, Class Size, and Program Plan

23.10.3.1 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:

23.10.3.1.1 All assigned project team members including:
23.10.3.1.2 The tasks to which they are assigned
23.10.3.1.3 Company name
23.10.3.1.4 Location
23.10.3.1.5 Contact information
23.10.3.1.6 Project Objectives.
23.10.3.1.7 Detailed project phases, tasks, and deliverables (scope).
23.10.3.1.8 A detailed schedule of delivery dates, specifying milestones such as draft delivery dates, edited materials delivery dates, and final delivery dates.
23.10.3.1.9 The course modules and corresponding lessons.
23.10.3.1.10 The types of deliverables for each course module (CBT, hard copy materials, etc.)
23.10.3.1.11 Project team hierarchy, sign-off authority, and delivery process.
23.10.3.1.12 Communication and reporting plan.
23.10.3.1.13 Change management plan.

23.10.3.2 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 car components.

23.10.3.3 (deleted)

23.10.3.4 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.

23.10.3.5 Once the Contractor receives the edits from Metra, they must resubmit the edited version within twenty (20) working days for approval.

23.10.3.6 During materials development, the Contractor must work closely with Metra's project team to ensure the Contractor is meeting Metra's and project standards.

23.10.3.7 All final versions must be ready for delivery thirty (30) working days prior to the date scheduled training date.

23.10.3.8 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.

23.10.3.9 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 aidsas necessary during development and course validation. Metra must have full copyrights to reproduce and modify training materials for future use at Metra.

23.10.3.10 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.

23.10.3.11 All ancillary equipment should be proposed to maximize the training objectives.

23.10.3.12 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.

23.10.3.13 (deleted)

23.10.3.14 Metra will determine the class size. In general, class sizes will be from five (5) to ten (10) people.

23.10.3.15 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 classes. The amount of considered classes shall be in correspondence with chapter 23.10.3.22.

23.10.3.16 After Metra accepts the lessons, and objectives for each module, the Contractor must deliver a pilot class to verify content and presentation.

23.10.3.17 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.

23.10.3.18 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.

23.10.3.19 Metra is planning for a two-phase training approach. Phase I is described as the Introductory Phase, and will include:

23.10.3.19.1 Overview and conceptual information about the equipment.
23.10.3.19.2 Operation of the equipment.
23.10.3.19.3 Daily inspections.

23.10.3.20 Phase II is described as the Qualification phase, and will include:

23.10.3.20.1 Maintenance.
23.10.3.20.2 Troubleshooting.
23.10.3.20.3 Repair.

23.10.3.21 (deleted)

23.10.3.21.1 (deleted)
23.10.3.21.2 (deleted)

23.10.3.22 As part of this contract, Metra requires that the Contractor provide training on specific topics for employee specializing in specific crafts. This table contains the topics, the craft, and the amount of instructors that must be trained in each topic.

Topic	Trainees per class	Days per Class	Amount of Classes	Total Trainees
Vehicle Knowledge - Driver Training for Typetest Driver	4	1	12	48
Vehicle Knowledge - Extended Driver Training & Troubleshooting for Train Driver	4	3	12	48
Vehicle Knowledge for Maintenance - Basic	8	1	6	48
Vehicle Knowledge for Maintenance - Extended	8	2	6	48
Re-Railing	10	1	5	50
General Maintenance	8	1	6	48
Fire Protection System	8	1	6	48
Brake System	8	1	6	48
Trucks / Truck Exchange	8	1	6	48
Air Supply Unit & Pneumatics	8	1	6	48
Driving Data	8	1	6	48

Topic	Trainees per class	Days per Class	Amount of Classes	Total Trainees
PIS	8	1	6	48
Front Coupler	8	1	6	48
Camera Supervision	8	1	6	48
HVAC	8	2	6	48
TCMS & TCMS Troubleshooting	8	2	6	48
ADA Equipment	8	1	6	48
ADA Operations	8	1	6	48
Traction Converter	8	1	6	48
Traction Battery	8	1	6	48
Door System	8	1	6	48
Train Radio	8	1	6	48
Documentation Management System	8	0.5	6	48

23.10.3.23 (deleted)

23.10.3.24 Training must include instructor-led classroom, and hands-on instruction using actual equipment, 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, models, and other training materials are to become Metra's property. The property is necessary for Metra to train new employees in the future.

23.10.3.25 Metra can require training aids (mock-ups) from the Contractor, as an option separate to the base order. The Contractor shall price this option out based on a mutally agreed mock-up setup as part of the IDR phase. These are the following equipments but not limited to:

ADA System A fully functional, ADA compliant lift, enabling both operational and maintenance training; and therefore, including related equipment, such as but not limited to exterior control panel, electrical pump enclosure, lift cassette and enclosure, manual pump operation apparatus.
HVAC System Builder must provide, for purposes of HVAC training, an air comfort system (a/c unit) which will include but is not limited to a maintenance rack, including a frame, unit and control panel. This mock-up should be developed to allow training on the new system, maintenance training, troubleshooting and any appropriate OSHA certification issues as they relate to the new system.
(deleted)
Air Brake System An operational braking system mounted on a training rack must be provided for the related training exercises.
Door System
Communication Systems (PA and TIMS) A communications mock-up demonstrating TIMS (Train Information Management System) primarily for operating crew orientation and practical exercises. This mock-up should be designed to allow crew members to learn and practice proper modulation when making announcements. Ancillary equipment should allow evaluation of performance through audible output and may also include (for the purpose of practice) visual metering or other devices showing an acceptable range.
(deleted)
Cab MockUp 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. METRA recommends to collaborate with the vendor Corys to establish the cab mockup simulator.

Toilet System The Builder must provide a functional mock-up of the toilet system. This mock-up must include but is not limited to the following sub-assemblies or items: actual toilet; air filter regulator; waste retention tank; freeze dump valve; etc. The mock-up must employ some type of water tank allowing sufficient water so that demonstrations can be conducted for the appropriate mechanical personnel.

23.10.3.26 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.

23.10.3.27 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.

23.10.3.28 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.

23.10.3.29 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.

23.10.3.30 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.

23.10.3.31 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.

23.10.3.32 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.

23.10.3.33 Metra shall provide classrooms including all necessary training equipment.

23.10.3.34 (deleted)

23.10.4 Operator and Inspector Training

23.10.4.1 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 car in maintenance yards and on the main tracks); troubleshooting procedures, and recovery operations (recovery from the situation, as in resolving the problem discovered when troubleshooting, i.e., fixing the problem).

23.10.4.2 Metra can require an operational simulator from the Contractor, as an option separate to the base order. The Contractor shall price this option out based on a mutally agreed operational simulator setup as part of the IDR phase.
If this option is chosen engineers will be trained in a fully operational cab simulator. 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.

23.10.4.3 Operational instructions must follow a logical progression involving the details of the

23.10.4.4 Cars, the manipulation of all controls, and actual operation of the Car 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 representative. Operating instruction must include trouble indications, their proper reporting, and corrective measures available to the engineers and operators.

23.10.4.5 All proposal 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."

23.10.4.6 If proposal respondents propose an alternative to fully functional passenger equipment, given the training objectives and the federal requirements of CFR § 238.109; proposal respondents should stipulate the alternative very clearly.

23.10.4.7 Phase I – Overview and Operations Training

23.10.4.8 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).

23.10.5 Maintenance Training

23.10.5.1 Metra's instructors (see chapter 23.10.3.22) 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 cars.

23.10.5.2 (deleted)

23.10.5.3 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.

23.10.5.4 (deleted)

23.10.5.5 (deleted)

23.10.5.6 (deleted)

23.10.5.7 (deleted)

23.10.5.8 (deleted)

23.10.5.9 (deleted)

23.10.5.10 (deleted)

23.10.5.11 (deleted)

23.10.5.12 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.

23.10.5.13 **Phase II - Maintenance Training**

23.10.5.13.1 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 systems. Troubleshooting training must include artificially induced defects so the trainees will have the opportunity to repair them.

23.10.5.13.2 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.

23.10.5.14 **Phase III – Heavy Maintenance Training**

23.10.5.14.1 (deleted)

23.10.5.14.2 (deleted)

23.10.6 Engineering and Supervisory

23.10.6.1 An overview course shall be provided familiarizing instructors for generalists (see chapter 23.10.3.22 for amount of trainees) 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.

23.10.6.2 Class size will be according to chapter 23.10.3.22. .

23.10.7 Parts Catalog Seminar

23.10.7.1 The Builder shall also include, as a part of its overall training program, a parts catalog seminar (or course of instruction) covering car and car component familiarization for material planners and operations support personnel (20 Materials Management personnel and from one hundred (100) to one hundred twenty (120) 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 car and component familiarization. An outline of this course of instruction shall be included in the Training Program Outline.

23.10.8 Field Instruction and Warranty Field Instruction

23.10.8.1 In addition to the formal training described above, initial field instruction must be provided by the builder during the warranty period for selected Metra personnel (approximately 16 trainees, 2x classes with 8 trainees per class). 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.

23.10.8.2 Field instruction involving use of the cars, including both maintenance and operation, shall be presented by qualified and approved instructors (in accordance with Section 20.10.2) having thorough experience in maintenance, service, or operation as the case may require.

23.10.8.3 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 cars, 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.

23.10.8.4 Operating instruction shall include trouble indications, their proper reporting, and corrective measures available to the operator.

23.10.8.5 (deleted)

23.10.9 Training Material Standards

23.10.9.1 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:
I 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

23.10.9.2 (deleted)

23.11 CYBERSECURITY

23.11.1 Summary

23.11.1.1 The contractor shall provide cybersecurity requirements for all hardware, software, and firmware (hereinafter referred to as the "products" for purposes of this section) under this Contract, whether resident within a microprocessor-controlled system, provided as part of test or interface equipment, provided for the purpose of post-download data analysis and processing, or incorporated within training technology and manuals, and Portable Test Equipment (PTE) as defined in the Technical Specification.

23.11.1.2 These requirements apply to all systems that include processors or other programmable components such as Programmable Logic Devices (PLDs) and Field-Programmable Gate Arrays (FPGA). Contractor is required to flow these requirements down to all subcontractors and require that these subcontractors flow these requirements down to all of their subcontractors and sub-suppliers, regardless of the tier. Thus, where the word "Contractor" is used, it includes all subcontractors and sub-suppliers, at every tier. If the Contractor fails to flow these requirements down to all subcontractors herein and fails to remedy such non-compliance upon notice from the Contracting Officer, the Authority may exercise all available legal, contractual and administrative remedies for such non-compliance, up to and including a default termination in accordance with the Termination for Default article in the Contract.

23.11.1.3 This applies not only to Contractors as defined in the above paragraph, but to manufacturers of all hardware, software, and firmware installed in the trainset or delivered as a part of the trainset procurement. Further, if the results of any penetration testing, vulnerability assessment or other examination or audit of the Contractor's cybersecurity protections

yields any results that the Authority deems to require further examination and/or audit, the Authority may share the results of such testing with Federal, state or local authorities for the purpose of protecting national security interests, the safety and security of the riding public, or personal and real property.

23.11.1.4 The Contractor shall support the Authority in all tasks necessary to implement best practices developed under section 2(c)(15) of the National Institute of Standards and Technology Act (15 U.S.C. 272(c)(15) as applicable to the current procurement. The Contractor shall also support the implementation of standards and best practices for rail fixed guideway public transportation systems developed under the authority of the Secretary of Homeland Security. This support shall include all necessary input, technology, and systems as identified by the latest NIST Framework for Improving Critical Infrastructure Cybersecurity to appropriately Identify, Protect, Detect, Respond, and Recover from cybersecurity threats related to Contractor supplied products. Additional specific requirements for this procurement are identified below.

23.11.2 Detailed Analysis

23.11.2.1 Cybersecurity Risk Assessment

23.11.2.1.1 The Contractor shall provide an analysis of the potential effects of various possible security attacks on network transmissions and the operation and effectiveness of the measures taken to ensure the security and safety of the networks. The security analysis shall be guided by the latest NIST Framework for Improving Critical Infrastructure Cybersecurity as well as TS-50701:2023, IEC 62443-3-2:2020, IEC 62443-4-1:2018, IEC 62443-4-2:2019, IEC 62443-3-3:2013 and relevant APTA whitepapers. This document shall be submitted for Authority review and approval prior to the first design review and updated and submitted for review annually throughout the duration of the design, production, and warranty periods.

23.11.2.2 Country of Origin

23.11.2.2.1 The Contractor shall identify the country (or countries) of origin of major components to be provided under this Contract, or any subcontracts, at any tier.

23.11.2.2.2 The Contractor shall identify the countries where the development, manufacturing, maintenance, and service for the product are provided or will be provided.

23.11.2.2.3 The Contractor must submit a list of the proposed products for Major Components identifying the country of origin ("List" hereinafter) to the Authority for approval.

23.11.2.2.4 The Contractor shall notify the Authority of any changes to the List no less than 90 days prior to the date that the change will be implemented. The Contractor shall maintain the list throughout the effective term of the contract.

23.11.2.3 Cybersecurity Practices

23.11.2.3.1 The Contractor shall adhere to the specified cybersecurity practices detailed below. In the event that the Contractor knows that it cannot comply with a requirement at the time of its proposal, it shall specify in sufficient detail the justification for non-compliance and its proposed alternative method for meeting the requirement. The Contractor has the affirmative duty to seek and identify any and all information that would result in actual or potential non-compliance during the course of Contract performance. The Contractor shall immediately notify the Authority so that corrective action can be taken.

23.11.2.4 Software and Services

23.11.2.4.1 The Contractor shall remove and/or disable, through software, physical disconnection, or engineered barriers, all services and/or ports in the product not required for routine operations, emergency operations, maintenance, troubleshooting, or repair. This will include communication ports and physical input/output ports (e.g., USB ports, video ports, UART ports, serial ports, software terminal ports). The Contractor shall provide documentation of disabled ports, connectors, and interfaces for each device to the Authority.

23.11.2.4.2 The Contractor shall provide summary documentation of the product's security features and security-focused instructions on maintenance, support, and reconfiguration of the product's default settings.

23.11.2.4.3 The Contractor shall disclose the existence of all known methods for bypassing computer authentication contained in the product, often referred to as "backdoors," and provide written documentation that all such backdoors have been permanently deleted from the product.

23.11.2.5 Access Control

23.11.2.5.1 The Contractor shall restrict physical access to system components to all but authorized personnel.

23.11.2.5.2 The Contractor shall configure each component of the product to operate using the principle of "least privilege." This includes operating system permissions, file access, device access, device / user accounts, and communications / data transfer.

23.11.2.5.3 The Contractor shall provide user accounts with configurable access and permissions associated with one or more defined user role(s).

23.11.2.5.4 The Contractor shall utilize access control lists and provide a system administration mechanism for changing users' roles (e.g., group) or associations.

23.11.2.5.5 The Contractor shall configure the product such that when a session or inter-process communication is initiated from a less privileged application, access will be limited to and enforced at the more privileged side.

23.11.2.5.6 The Contractor shall provide a method for protecting against unauthorized privilege escalation.

23.11.2.5.7 The Contractor shall document options for defining access and security permissions, user accounts, and applications with associated roles. The Contractor shall configure these options, as specified by the Authority.

23.11.2.5.8 The Contractor shall recommend methods for the (Client) to prevent unauthorized changes to the Basic Input/Output System (BIOS) and other firmware. If it is not technically feasible to protect the BIOS to reduce the risk of unauthorized changes, the Contractor shall document this and provide mitigation recommendations.

23.11.2.5.9 The Contractor shall verify and provide documentation for the product, attesting that unauthorized logging devices are not installed on the provided service laptops (e.g., key loggers, cameras, and microphones).

23.11.2.5.10 (deleted)

23.11.2.6 Authentication/Password Policy and Management

23.11.2.6.1 The Contractor shall document the levels, methods, and capabilities for authentication and authorization of passwords. The Contractor shall deliver a product that adheres to standard authentication protocols.

23.11.2.6.2 The Contractor shall protect all passwords, including, but not limited to the following methods: Contractor shall not store passwords in clear text and Contractor shall not hardcode passwords into software or scripts.

23.11.2.7 Logging and Auditing

23.11.2.7.1 The Contractor shall provide logging capabilities for all products where supported and applicable. As specified by the Authority, the product shall cover the following events, at a minimum (as appropriate to their function):

23.11.2.7.1.1 (deleted)

23.11.2.7.1.2 Successful and unsuccessful authentication and access attempts

23.11.2.7.1.3 (deleted)

23.11.2.7.1.4 Privileged uses.

23.11.2.7.1.5 The Contractor shall time-stamp log files.

23.11.2.7.1.6 The Contractor shall provide security protection of log files.

23.11.2.7.1.7 The Contractor shall implement for Authority use an approach for automatic collection and storage of generated log files.

23.11.2.7.1.8 The Contractor shall provide a list of all log management activities that the product is capable of generating and the format of those logs. This list shall identify which of those logs are enabled by default.

23.11.2.7.2 Communication Restrictions

23.11.2.7.2.1 The Contractor shall provide detailed information on all communications (e.g., protocols and full interface control documents) required between the Authority's wayside systems and on-board train network security zones whether inbound or outbound and identify each.

23.11.2.7.2.2 The Contractor shall provide a method to restrict communications traffic between different network security zones. The Contractor shall provide documentation on any method or equipment used to restrict communications traffic.

23.11.2.7.2.3 The Contractor shall provide the Authority with access, including administrative access on as-needed basis, to the network components of the product where applicable.

23.11.2.7.2.4 The Contractor shall document all remote access entry pathways.

23.11.2.7.2.5 The Contractor shall document the IP address and routing scheme for Authority review and approval where needed for communication between the train and wayside systems.

23.11.2.7.2.6 The Contractor shall document the network components and their configurations (e.g. electrical schematics, network configuration concept and addresses)

23.11.2.7.2.7 The Contractor shall certify that the network configuration management interface is secure.

23.11.2.7.2.8 The use of encryption, public/private keypairs, and hardware keys is encouraged as a mitigation. These technologies shall be implemented as required as a result of the Contractor's comprehensive cybersecurity risk assessment.

23.11.2.7.2.9 The Contractor shall establish appropriate isolation of safety and security critical system functions from other functions.

23.11.3 Certification

23.11.3.1 Independent Assessment of Software and Firmware Quality

23.11.3.2 The Contractor shall procure an independent third-party assessment of all software and firmware used in safety-critical or related applications which are rated into the categories SIL-2, SIL-3 and SIL-4 according to EN 50657:2017. provided as part of this project. Software and firmware which are not safety-critical or related and therefore rated into the category Basic Integrity according to EN 50657:2017, but whose unmitigated risk identified as a part of the cybersecurity risk assessment retain unacceptable or undesirable residual risk shall also be put through an independent third-party assessment, procured by the Contractor, as an additional method of reducing the residual risk.

23.11.3.3 The assessment shall be performed by a qualified, independent organization approved by the Authority.

23.11.3.4 The Contractor shall ensure that the software suppliers shall check software and firmware to ensure that critical application security weaknesses (including OWASP's Top 10 and SANS' Top 25 Most Dangerous Software Errors) are addressed.

23.11.3.5 The Contractor shall ensure that the software supplier performs testing to identify potential cybersecurity weaknesses and vulnerabilities according to the standards mentioned in

section 23.11.2.1.1. This testing shall include, but is not limited to, fuzz testing, static testing, and dynamic testing.

23.11.3.6 The Contractor shall ensure that the assessment reports of any software supplier or any independent software and firmware quality assurance assessment are sent directly from the third-party provider to the Authority and the Contractor.

23.11.3.7 The Contractor shall provide a response to the third-party's assessment including plans to correct identified vulnerabilities. The Contractor's response and corrective action plan shall be sent to the Authority for approval.

23.11.3.8 This independent assessment of software and firmware which are rated into the categories SIL-2, SIL-3 and SIL-4 according to EN 50657:2017, shall be provided to the Authority for each software release.

23.11.4 Independent Rail Car Penetration Test

23.11.4.1 To demonstrate compliance with specified functional and cybersecurity requirements relating to this Contract, the Contractor shall procure an independent third-party penetration test/vulnerability assessment according to the standards mentioned in section 23.11.2.1.1.

23.11.4.2 This penetration test/vulnerability assessment shall be performed by a qualified, independent organization approved by the Authority.

23.11.4.3 The penetration test/vulnerability assessment shall cover all software and firmware packages, which are part of the trainset software configuration included in this procurement, as described in the other sections of the Technical Specifications.

23.11.4.4 The Contractor shall ensure that the results of any independent penetration test/vulnerability assessment are sent directly from the third-party provider to the Authority and the Contractor.

23.11.4.5 The Contractor shall provide the Authority with a response to the third-party assessment, including a Corrective Action Plan to correct identified vulnerabilities subject to the Authority's approval.

23.11.4.6 This independent penetration test/vulnerability assessment of software and firmware, which are rated into the categories SIL-2, SIL-3 and SIL-4 according to EN 50657:2017, shall be provided to the Authority for each software release.

23.12 CONTRACT DELIVERABLES REQUIREMENT LIST

CDRL	Title
C-23-01	As-Built Drawings, Drawing Lists and Bills of Material
C-23-02	Photographs
C-23-03	(deleted)
C-23-04	Maintenance Manuals
C-23-05	Parts Manuals
C-23-06	Operator Instruction Book
C-23-07	Car History Books
C-23-08	As-Built Specification
C-23-09	Field Service

C-23-10	Test Equipment
C-23-11	Training Program
C-23-12	Instructor Qualification Submittal

24 PROPOSAL DELIVERABLES REQUIREMENTS LIST

PDRL	Title
P-3-01	Car Width
P-3-02	Car Height
P-3-03	Seating Capacity
P-3-04	Passenger Flow
P-3-05	(deleted)
P-4-01	Exterior General Arrangement and Rendering
P-7-01	Door System
P-8-01	Carbody Interior
P-8-02	Accessibility (ADA) Provisions
P-9-01	HVAC System
P-10-01	Lighting Plan and Description
P-10-02	LLEPM
P-11-01	Electrical System and Load Study
P-11-02	(deleted)
P-12-01	Functionality and the Onboard Equipment of Complete Communication System
P-12-02	Infotainment Proposal
P-13-01	Air Brake and Air Supply System
P-13-02	Braking Performance Calculation
P-15-01	Truck System
P-15-02	(deleted)
P-17-01	Traction System
P-17-02	Prime Mover System
P-18-01	Auxiliary Power System
P-20-01	Audible Noise Proposal

25 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-1-14	Reliability Program Plan
C-1-15	Reliability Prediction Analysis
C-1-16	Failure Modes, Effects and Criticality Analysis
C-1-17	Reliability Demonstration Report
C-1-18	Maintainability Analysis
C-1-19	Maintainability Demonstration
C-1-20	System Safety Program Plan
C-1-21	Preliminary Hazard Analysis
C-1-22	Hazard Tracking Log
C-1-23	Fault Tree Analysis
C-3-01	Clearance Diagram
C-3-02	Car Weight
C-4-01	(deleted)
C-4-02	Car-Body Strength Test Document
C-4-03	Emergency Roof Access
C-4-04	End Structure Design
C-4-05	Cross Bearer and Underframe Design
C-4-06	Jacking Pad Location
C-4-07	Insulation Samples.
C-4-08	Thermal Analysis
C-4-09	HVAC Duct and Piping Insulation Installation
C-4-10	Diaphragm/Gangway Design and Installation
C-4-11	Ingress Emergency Window Layout
C-4-12	Egress Emergency Window Layout and Design
C-5-01	Exterior Safety Appliance and Handhold Design and Installation
C-5-02	Safety Gate Design
C-5-03	Interior Safety Appliance and Handhold Design and Installation
C-6-01	Coupler System Design
C-7-01	Side Loading Door Design and Configuration
C-7-02	Side Loading Timing and Announcement
C-7-03	External Door Release Design
C-7-04	Traction Interlock