

AMTRAK SPECIFICATION - AED-1

**PROCEDURES AND DESIGN CRITERIA TO BE
EMPLOYED BY ELECTRIFICATION CONSULTANTS
ENGAGED IN THE DESIGN OF
ELECTRIFICATION FACILITIES
ON THE
NATIONAL RAILROAD PASSENGER CORPORATION**

PREPARED BY:
AMTRAK - OFFICE OF THE DEPUTY CHIEF ENGINEER, ET
PHILADELPHIA, PA
(REVISED 3/2024)

TABLE OF CONTENTS

<u>CONTENTS</u>	<u>PAGE #</u>
I. QUALIFIED CONSULTANTS LIST	3
II. PROCEDURES	5
III. DESIGN DRAWINGS.....	8
IV. STRUCTURAL DESIGN CRITERIA.....	10
V. ELECTRICAL DESIGN CRITERIA.....	12
VI. CONSTRUCTION RELATED SERVICES	12
VII. RECORD DRAWINGS.....	12
VIII. APPROVALS	13

I. QUALIFIED CONSULTANTS LIST

- A. Amtrak maintains a list of “Qualified Electrification Consultants” for its own convenience and to facilitate the process of selecting firms to perform electrification design of Amtrak infrastructure. This includes, but is not limited to, the design of overhead contact systems (OCS), transmission lines, signal power, third rail, movable bridge OCS, substations, frequency converters, SCADA systems, & bonding/grounding.
- B. Firms are included on Amtrak’s “Qualified Electrification Consultants” list based on the experience and knowledge of their key personnel, their past performance on electrification projects in general, and past performance on specific Amtrak projects from the prior year.
- C. The list is comprised of two categories based on the requirements in paragraph “I.B”, including pre-approval for “Major” and “Minor” Projects, defined as:

Major:

- New/Modified Interlocking Design
- Large-Scale Catenary or Transmission Wire/Structure Replacement
- Electrification of New or Non-electrified Tracks
- New/Modified Rail Yards
- New/Modified Passenger Stations with interlocking impacts
- Major Railroad Bridge Replacements
- New/Replacement of Traction Power Substation (AC/DC)
- New/Replacement of Frequency Converter Stations
- New/Replacement of Substation Control Houses

Minor:

- Electrification modifications of Overhead Bridges
- Electrification modifications of New/Modified Passenger Stations (without interlocking impacts)
- Design of Individual Catenary Structure Replacements/Repairs
- ET Coordination of Railroad Adjacent Third-Party Developments
- Line Support for Substations/Frequency Converter Stations
- New/Replacement of Switch Heater Unit Substations
- New/Replacement of Motor-Operated Disconnect Switches
- New/Replacement of Circuit Breaker or Transformer
- Other work as individually approved by Amtrak ET

- D. A Consultant applying for, but not currently on, the “Qualified Electrification Consultants” list shall be limited to “Minor Projects” status pending successful performance and completion of Amtrak Electrification Project(s).

- E. A Consultant may be **relocated from “Major Projects” to “Minor Projects”** status if
- 1) It is determined that the Consultant’s qualifications or staff experience/expertise do not align with the requirements for “Major Projects”
 - 2) The Consultant’s performance on Amtrak project(s) from the prior year is deemed inadequate. Infractions include:
 - Design deficiencies
 - Consistent inability to maintain schedule
 - Lack of Quality Control, resulting in numerous errors/omissions
 - 3) The Consultant has not performed electrification design services on an Amtrak project in the last 3 calendar years.
- F. In reference to paragraph “I.E” of this specification, **to regain "Major Projects" status**, the Consultant's forthcoming project submissions shall undergo evaluation by the Engineer to ensure compliance with the specified criteria outlined herein. The submissions are required to have fully addressed all previous comments, be virtually error-free, devoid of design deficiencies, and submitted within the stipulated timeframe. Quality Control documentation may also be requested.
- G. A Consultant may be **removed from Amtrak’s “Qualified Electrification Consultants” List completely** if the Consultant’s performance on Amtrak project(s) from the prior year is deemed severely inadequate or if it is determined that the Consultant no longer meets the requirements for inclusion as specified in paragraph “I.B”. Infractions resulting in complete removal from Amtrak’s “Qualified” List include:
- 1) Design errors or omissions resulting in significant construction failures and change orders
 - 2) Consistent failure to take direction from Amtrak ET
 - 3) Unethical management of Amtrak funds
 - 4) Unsatisfactory performance during a year on “Minor Project” status
- H. Applications shall be in the form of a letter of interest and shall have attached the following information:
- 1) Key Personnel and their qualifications, including resumes and a complete department organizational chart.
 - 2) Past and current electrification projects (other than Amtrak) with the names and telephone numbers of their clients.
 - 3) Past and current Amtrak electrification projects, including years of the contract and lessons learned from each.
 - 4) QA/QC standard practices and procedures for design submissions in compliance with provisions herein.

- I. Application for inclusion on Amtrak’s “Qualified Electrification Consultants” list shall be submitted electronically to both:

Faye Majekodunmi
Director, OCS/Transmission Design
Faye.Majekodunmi@amtrak.com

AND

Chris White
Director, Traction Power/SCADA/Frequency Convertors
Christopher.White@amtrak.com

- J. Consultants must re-apply for inclusion on Amtrak's Electrification Qualified List each calendar year. Submissions must be made prior to October 1st of the preceding year in order to be considered.
- K. Consultants will be informed of their status prior to January of each new year.

II. PROCEDURES

- A. Whenever the Term “Engineer” is used in this specification, it shall mean the Deputy Chief Engineer, ET of Amtrak, or an authorized representative. Whenever the Term “Consultant” is used in this specification, it shall mean the Qualified Electrification Consultant.
- B. Upon receipt of notice to proceed with design work, the Consultant shall provide the name of the Consultant’s Personnel responsible for the project management. Any changes in the Consultant’s key personnel shall be approved by the respective Director leading the project.
- C. Consultant’s personnel, before entering Railroad property, shall complete Amtrak’s Contractor’s Online Safety Class.
- D. It shall be the responsibility of the Consultant to verify the information contained on Amtrak record drawings pertaining to the project work by on-site inspection, or an existing condition survey. If any discrepancies are found during the on-site inspection, the Consultant shall document them with the Engineer and/or appropriate Amtrak Division personnel and update design documents accordingly.
- E. It shall be the responsibility of the Consultant during the design phase to perform underground survey/exploratory trenching to establish all underground Amtrak facilities such as ducts, pipes, and footings in all areas that excavation is required by the design. Hand dug exploratory trenches shall be as described in Section IV of this specification.
- F. Unless otherwise instructed, the Consultant shall utilize the current Amtrak standard structural, catenary, and electrical details and materials in the design of the project. All applicable Amtrak or third-party design standards are to be identified by the Consultant during preliminary design.

- G. Prior to proceeding with the final design, the Consultant shall submit to Amtrak conceptual plans for the proposed electrification modifications. This is especially important in work involving changes to any sectionalizing schemes for electrification facilities. The plans shall indicate the preliminary design concepts in sufficient detail for Amtrak design personnel to provide definitive direction in which to proceed with the design.

In conjunction with the conceptual submission, a field meeting shall be held between representatives of the Consultant and Amtrak ET to evaluate alternatives and establish an acceptable conceptual plan.

- H. Following approval of the conceptual plans, submissions at the 30%, 60%, 90%, 100%, & Issued for Bid (IFB)/Release for Construction (RFC) level, shall be provided for Amtrak's review and comment per the agreed upon schedule of submissions. Unless otherwise directed, submittals shall be sent to the attention of the Engineer. The design documents prepared by the Consultant shall include, but not be limited to, the following: (see Section III for additional information).

30% Submission (Preliminary)

- 1) Basis of Design Report, if required
- 2) Location Plan Sheet
- 3) Existing and Proposed Sectionalizing Plan
- 4) Existing and Proposed Conductor Particulars and Tension Charts
- 5) Existing and Proposed Ancillary and Catenary Wiring Plan(s)
- 6) Typical Structural Erection Diagrams (SEDs), if required

60% Submission

- 1) Address 30% Submission Comments
- 2) Updated Items 1 - 5 from 30% Submission, as required
- 3) Existing and Proposed Ancillary Profiles
- 4) Existing and Proposed Catenary Profiles
- 5) SEDs, must include the following unless otherwise noted:
 - a. Work Statements
 - b. Electrical Clearances Dimensioned
 - c. Horizontal Clearances to be shown to track for approval (DER if needed)
 - d. Plan Views, as required
 - e. Wire Heights matching provided profiles
 - f. Bill of Material
- 6) Catenary/Transmission Hardware and Details
- 7) Structural Steel and Foundation Details
- 8) Bonding and Grounding Plans
- 9) Catenary and Ancillary Staging Plans/Sequence of Construction
- 10) Catenary and Ancillary Design Calculations
- 11) Structural Steel and Foundation Design Calculations
- 12) Cost Estimate and Construction Schedule, if required
- 13) Technical Specification Table of Contents

90% Submission

- 1) Address 60% Submission Comments
- 2) Finalized Items 2 – 12 from 60% Submission
- 3) Technical Specifications
- 4) Additional temporary plans and staging details required for fulfill Section III.K herein

100% Submission – Final

- 1) Address 90% Submission Comments
- 2) Updated and Finalized Items 2 – 6 from 90% Submission

IFB/RFC– Signed and Sealed

- 1) Address 100% Submission Comments
- 2) Signed and Sealed Items 1 – 2 from 100% Submission

- I. Prior to submitting the milestone design packages to Amtrak, the Consultant shall have one or multiple qualified and trained personnel to provide quality control for the work to minimize any design errors. The recognizing initials of the checker shall be filled out with the appropriate title and date recorded on the design submittal title block.
- J. Amtrak requires a minimum of 30 working days for design reviews and this is subject to increase depending on the size of the submittal or other ongoing projects.
- K. 100% drawings, specifications, and calculations shall be submitted to Amtrak for approval prior to being issued for bidding or construction, particularly with Contractor packages. Each final design drawing and calculation shall bear the stamp of a Professional Engineer, registered in the state in which the work will be performed.
- L. Unless otherwise directed, plan submissions prior to the final plan submittal shall contain all pertinent design documents in PDF file format. All submittals are to be sent to the respective Director leading the project (or appointed representative), via a file share site maintained by the Consultant, if required.
- M. Unless otherwise directed, after final plans are accepted and released for construction electronically submit all drawings (PDF and AutoCAD formats) material list, calculations, and specifications in their original file formats. Submittals shall be sent to the respective Director leading the project (or appointed representative).
- N. The Consultant shall be responsible for review of all shop and manufacturer’s drawings for all structures, catenary material, and/or electrical equipment designed or specified by the Consultant in connection with the project.

III. DESIGN DRAWINGS

The design drawings prepared by the Consultant for the proposed electrification system modifications shall include, but not be limited to the following, and shall be arranged as described below.

- A. The first drawing of the design set shall be a location plan sheet. The drawing shall contain, in addition to a plan of construction limits (scale not less than 1" = 100') the following information:
- 1) General notes – Amtrak requirements, steel, concrete, excavation, etc.
 - 2) List of abbreviations used.
 - 3) Division of work and material supply schedule.
 - 4) List of reference drawings.
 - 5) List of design drawings in set.
 - 6) Construction sequence.
- B. The next plan sheet shall be list the conductor particulars for the conductors being used within the design. Also shown on plan are the wire tension and sag charts for both ancillary and catenary conductors.
- C. The next plan sheets shall be existing and proposed Amtrak sectionalizing plans, plan of construction (if required)
- D. The next plan sheets shall be wiring plan drawings indicating all existing and new information pertaining to the catenary system, its supporting structures, and ancillary conductors. These wiring plan drawings shall be drawn to a scale 1" = 20', 1"=30' or 1"=40' (depending upon project size). Depending on the size of the project, ancillary wires can be shown on a separate dedicated plan.
- E. The next plan sheets shall be ancillary profile drawings indicating the modifications to existing overhead conductors (other than catenary) if required, and the relationship of the proposed construction to existing facilities. This shall include static wire, Amtrak transmission, 3rd Party Transmission (if required), signal power, fiber, 12kV feeders, and low-level ground wires (if required). This profile drawing shall be drawn to a vertical scale 1" = 20' and a horizontal scale of 1" = 100'. All dead ends to be shown on profiles. Provide bill of material, if required.
- F. The next plan sheets shall be the catenary profile drawings indicating the new and/or modifications to existing catenary wires and (if required) the relationship of the proposed construction to existing facilities. These profile drawings shall be drawn to a vertical scale 1" = 4' and a horizontal scale of 1" = 40'. Hanger tabulations may replace catenary profiles on mainline catenary if agreed upon with Amtrak ET. Profile drawings will be required for all new or modified crossovers and air breaks. Provide all new hanger/clip/in-span assembly allocations and rod lengths along with bill of material, if required.
- G. The next group of design drawings shall present erection diagrams for all new permanent, temporary structures, and/or existing modified structures. Erection diagrams shall be drawn to a scale of 1" = 10 and shall be accompanied by a structure loading diagram (on the same drawing) drawn to a scale of 1" = 20, indicating all design loads (vertical, wind, side pull) applied to the structure. Erection diagrams shall also be presented to indicate the total or partial removal of existing structures and steps that may be required to accomplish the removal. Each erection

diagram sheet shall contain a bill of material listing assembled items required per structure such as poles, crossbeams, sag braces, cross arms, insulator assemblies, guy anchors and foundation types. All listed items shall be marked and the drawings showing those details shall also be listed. Modified structures must have erection diagrams that have all of the information from the original document transposed onto them. These drawings will supersede the original drawings, provide the Amtrak reference drawing ID. The drawings must be drawn so that existing and new material can be differentiated.

- H. Erection diagram sheets shall be followed by:
 - 1) Hardware and insulator assembly details which shall have bills of material identifying the various assembly components, quantities, and Amtrak reference drawings
 - 2) Miscellaneous details as required.
 - 3) Structural steel design detail drawings.
 - 4) Foundation and guy anchor design detail drawings.
 - 5) Underground duct relocation plan, profile, and detail drawings, if required.
 - 6) Electrical design drawings.
 - 7) Master Bill of Material indicating mark number, Amtrak reference drawing number, AMMS number, description, manufacturer, unit of measurement, and ordering totals of the material being used.

- I. On overhead bridge projects, drawings shall be prepared in accordance with Amtrak standard drawings ET1120-C, ET-1446-D, and ET-1447-D. These drawings shall indicate the temporary and permanent bonding and grounding of the bridge and shall contain a plan of the bridge crossing and all necessary details, clearances and elevations required to clearly show all of the work involved. Warning signs shall also be indicated and shall conform to current Amtrak standards as to location, size, and type used. An itemized bill of material (including Amtrak AMMS number) shall be included for all Railroad work.

- J. Existing Amtrak structure bonding and grounding plans, and other related drawings shall be revised (where applicable) to indicate modifications and submitted in accordance with Section II of this specification.

- K. Final drawings shall be accompanied by a suggested construction procedure outlining a step-by-step sequence to be followed to accomplish the project. This suggested procedure will be prepared to minimize electrical outages, track occupations, interruptions to Railroad traffic, and to maintain the safety of the workmen and the integrity of the transmission, catenary and signal systems during the proposed construction. All construction activities related to the project shall be integrated into the sequence of construction. The Consultant shall include all essential staging plans and temporary design necessary, including but not limited to, temporary sectionalizing, schematics/wiring plans, profiles, SEDs, catenary, and structural details.

IV. STRUCTURAL DESIGN CRITERIA

A. All structural design shall be in accordance with the current Amtrak specifications for the Design of Catenary Supporting Structures (AED-2) with the following amendments:

- 1) Current AISC specifications shall be used for the design fabrication and the erection of structural steel, except that allowable stresses shall not be increased one-third above stress values given in specifications when produced by wind loading unless specifically approved by Amtrak.
- 2) Current ACI Building Code Requirements for Reinforced Concrete shall be used for the design and construction of reinforced concrete structural elements of any structure.
- 3) Soil boring information including location of borings shall be provided on the design drawings, preferably on the foundation drawings if possible. A soil boring shall be taken at each new foundation location of any modified or proposed new structure. When the number of foundations makes it impracticable to provide a boring for every foundation, a proposed boring plan must be submitted to the Engineer for approval. **Amtrak approval of a reduced boring program does not relieve the requirements for exploratory trenching at all new foundation locations.** Foundations shall be designed in accordance with allowable soil bearing values of materials encountered.

B. The Consultant is advised that the following criteria are to be included in the design and construction of all permanent and temporary facilities adjacent to Amtrak tracks:

- 1) On electrification projects involving modifications to existing facilities, a minimum of 12'-0" (plus curvature allowance) is to be maintained from centerline of track to face of any new pole or guy strand.
- 2) On new electrification extensions or independent pole transmission lines a clearance of 18'-0" from centerline of track to face of pole or guy is required.

Note: Minimum clearances less than those stated above must be approved by the Deputy Chief Engineer, ET of Amtrak.

- 3) New anchors and foundations shall be located and designed so that any temporary sheeting required for their construction will not be closer than toe of slope shown for standard track section (7'-5" is dimension from gage of rail to toe of ballast slope for tangent track; see dimension on Standard Plan No. 70003B for dimensions on curved track).
- 4) Exploratory trenches (3) three feet deep and fifteen (15) inches wide in the form of an "H" with outside dimensions matching the outside sheeting dimensions, are to be hand dug to determine the presence of any underground installation. The design drawings shall show an outline of the exploratory trenches. All work must be done in accordance with Amtrak requirements for temporary sheeting and shoring to support Amtrak's facilities.

- 5) The following should be included in the general notes on all drawings for temporary sheeting, shoring and excavation to be performed adjacent to Amtrak's tracks:
 - a) The Contractor (if applicable) is to provide a schedule of each operation and obtain approval of Amtrak so that it may be properly supervised by Amtrak personnel.
 - b) Exploratory trenches are to be hand dug to determine the presence of any underground installation. Before proceeding, these trenches are to be back filled and immediately compacted. This work must be done in the presence of a railroad inspector.
 - c) Absolute use of track is required while driving sheeting adjacent to running track.
 - d) Cavities created by driving of sheet piling shall be filled with sand and any disturbed ballast should be restored and tamped immediately.
 - e) Sheet piling shall be cut off at top of tie during construction and then, after construction, shall be cut off eighteen (18) inches below existing ground line or grade and left in place.
 - f) The excavation should be covered and ramped each night and barricades and warning lights provided as directed by Amtrak.
 - g) Final back filling shall be as required by specifications.
 - h) When support of track or tracks is necessary during construction of above-mentioned facilities, interlocking steel sheeting adequately braced and designed to carry E-80 live load plus 50% impact is required. Soldier piles and lagging will be permitted for supporting adjacent track or tracks only when required penetration of steel sheet piling cannot be obtained or when in the opinion of the Engineer, steel sheet piling would be impracticable to place.
- 6) All drawings for temporary sheeting and shoring shall be prepared and stamped by a Professional Engineer and shall be accompanied by complete design computations when submitted for approval. The need for the Consultant to include details of temporary sheeting on design drawings will be determined when reviewing drawings submitted to Amtrak for structural approval.
- 7) Particular care shall be taken to avoid erosion or filling of Railroad's drainage facilities. Erosion and sediment control in the vicinity of the Railroad shall be as approved by the Engineer and the Railroad. Disrupted Railroad drainage facilities shall be corrected promptly as directed by the Engineer at the Contractor's sole expense.

V. ELECTRICAL DESIGN CRITERIA

- A. Electrical Clearances shall be in accordance with applicable, current Amtrak and AREMA specifications. Any deviation from the established Railroad standards must be approved by Amtrak. Vertical clearances between overhead electrical transmission lines and roadways must also meet state and local municipal requirements.
- B. The catenary gradient should be designed not to exceed the value $1/(5 \times \text{Speed})$ where practicable. As an alternate the catenary gradients specified in Chapter 33 of the AREMA Manual may be considered.

VI. CONSTRUCTION RELATED SERVICES

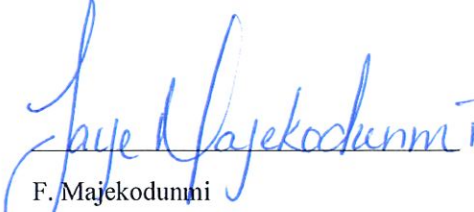
- A. The A/E shall provide Construction Related Services for the duration of project construction. These services shall include, but are not limited to the following:
 - 1) Responding to Contractor's requests for information (RFI's).
 - 2) Evaluating Contractor's submittals.
 - 3) Reviewing shop drawings, calculations, and technical requirements.
 - 4) Preparing as-built drawings.
 - 5) Providing technical assistance during construction, testing and turnover.
 - 6) Attending project meetings.
 - 7) Participating in on-site inspections.
 - 8) Preparing revised design documents to clarify or modify drawings during construction.
 - 9) Assisting with preparation and resolution of punch list items.
 - 10) Other Construction Related Services as required.

The Consultant shall keep the Engineer apprised of all transactions related to the above Construction Related Services.

VII. RECORD DRAWINGS


- A. Upon completion of the construction, the Consultant shall provide Amtrak with "as-built" or record drawings. This work will include the following.
 - 1) Revisions to existing Amtrak drawings as required. These include, but are not limited to, erection diagrams, overhead bridge drawings, track maps, bonding and grounding plans, catenary/signal power/transmission sectionalizing plans, plans of construction, impedance diagrams, and control wiring diagrams.
 - 2) Design drawings shall be updated to reflect any changes during construction.
 - 3) As-built plans shall be submitted to Amtrak in PDF and AutoCAD format.

VIII. APPROVALS



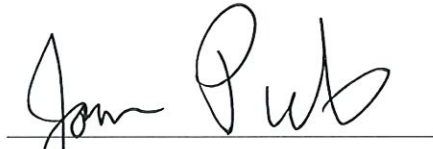
F. Majekodunni
Director, OCS/Transmission Design

03/06/24
DATE



C. White
Director, Traction Power/Frequency Converters/SCADA

03/7/24.
DATE



J. Pardini
Deputy Chief Engineer, E.T.

3/7/24
DATE