# DATA ITEM DESCRIPTION

Form Approved
OMB No. 0704-0188

| 2. TITLE | 1. IDENTIFICATION NUMBER |
|---|---|
| TELECOMMUNICATIONS SYSTEM ENGINEERING PLAN | DI-TCPS-81120 |

3. DESCRIPTION/PURPOSE

3.1 The Telecommunications System Engineering Plan presents the contractor's engineering concept of and solutions to the specification or statement of work (SOW) requirements. It also provides the implementation methods, formulas and calculations, and proposed major bill of material items. (Continued on Page 2)

| 4. APPROVAL DATE (YYMMDD) | 5. OFFICE OF PRIMARY RESPONSIBILITY (OPR) | 6a. DTIC APPLICABLE | 6b. GIDEP APPLICABLE |
|---|---|---|---|
| 901219 | ASQB-SEP-A | | |

7. APPLICATION/INTERRELATIONSHIP

7.1 This Data Item Description (DID) contains the format and content preparation instructions for the data product generated by the specific and discrete task requirement as delineated in the contract.

7.2 This DID is applicable to contracts requiring preparation of a system engineering plan as part of the telecommunications engineering project.

(Continued on Page 2)

| 8. APPROVAL LIMITATION | 9a. APPLICABLE FORMS | 9b. AMSC NUMBER |
|---|---|---|
| | | A6007 |

10. PREPARATION INSTRUCTIONS

10.1 Reference documents. The applicable issue of the documents cited herein, including their approval dates and dates of any applicable amendments, notices, and revisions, shall be as specified in the contract.

10.2 Content. Information contained in the Telecommunications System Engineering Plan (SEP) shall be in sufficient detail to illustrate that the system provided shall meet the performance requirements of the specification or SOW. The plan shall also contain the following material:

10.2.1 Summary schedule. The summary schedule shall list all the major actions required to complete the project. Deliverable items listed in the summary schedule shall be identified by contract line item number or contract data requirements list sequence number, as applicable, and delivery dates.

10.2.2 System block diagram. The diagram shall portray how the various individual equipments connect to form the completed system at the rack, station and overall system levels.

(Continued on Page 2)

11. DISTRIBUTION STATEMENT

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

Block 3, Description/Purpose (Continued)

3.2 The plan enables the government to monitor, review, and evaluate the contractor's engineering efforts prior to system installation.

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Block 7, Application/Interrelationship (Continued)

7.3 This DID supersedes DI-E-1135.

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Block 10, Preparation Instructions (Continued)

10.2.3 Link, system, and special circuit performance calculations.

a. Radio systems. Calculations shall include path profiles, terrain clutter, path design parameters, antenna heights, median and worst hour path loss calculation, distribution of path loss over a period of one year, median and worst hour fade margins, service probability factor, median and worst hour to approval of the system concept and preparation of detailed site installation plans, top-channel noises, median and worst hour signal-to-noise ratios, and noise margins. Link design parameters shall include tower heights, antenna heights, path clearance criteria, receiver intermediate frequency (IF) bandwidth, noise power ratio, transmitter power, frequency deviation, modulation index, receiver noise figure, feeder lengths, feeder losses, feeder voltage-standing-wave ratios, feeder velocity of propagation, equalization requirements to support system transmission requirement, order and type of diversity, type of combiner, threshold extension improvement, pre-emphasis, antenna size, antenna gain, and top baseband frequency. Link calculations shall include Fresnel zone clearance, total noise and its sources, signal-to-noise ratio, noise margin, fade margin, and time availability. Calculations shall be presented in a step-by-step manner with sufficient details for the Government to verify all calculations. Calculations shall be presented for frequency inter-modulation and total system frequency assignment and Radio frequency interferences (RFI) possibilities. Special circuit performance and method of calculations will be identified in the specification or SOW.

b. Telephone systems. Calculations shall include dc range of the central office, trunk loading, central office traffic loading, estimated or measured busy hour traffic data, trunk and switch blockage calculations, station battery endurance, telephone instrument ringer range, and receiver level.

c. Communications center and data systems. Calculations shall include estimated storage, output, and through-put capacities: reliability computations and specifications for each hardware component; and traffic flow.

Block 10, Preparation Instructions (Continued)

d. Other systems. Calculations shall include circuit performance requirements with method of calculation as identified in the specification or SOW.

10.2.4 Availability, reliability, maintainability predictions.

a. Availability. An availability model shall identify all elements of the system included in the calculations. Discussion of the rationale for the decisions and assumptions reflected in the model shall also be included. Listing of factors to be included or excluded in calculations will be identified in the specification or SOW.

b. Reliability. A reliability model shall identify all elements of the system included in the calculations. Discussion of the rationale for the decisions and assumptions reflected in the model shall also be included.
Mean-time between failure data shall be included for all equipments. Analytical calculations shall be made using failure rates from manufacturers, users, and other approved sources. Failure rates from section 5 of MIL-HDBK-217 shall be used if rates are not available from other sources. Listing of factors to be included or excluded in calculations will be identified in the specification or SOW.

c. Maintainability. The maintainability calculations shall reflect the maintenance, repair or restore and philosophy developed for the system. Mean-time to repair and mean-time to restore requirements shall be included for all equipment.

10.2.5 Mission and supervisory multiplex plan. This plan shall satisfy the channelization and circuit identification listing. The plan shall include the system configuration with routing of supergroups and groups. The site multiplex terminals shall include channel equipment with designated spares.

10.2.6 Channelization listing. This listing shall include cross-referencing of each circuit, with supergroup, group, and channel assignment. Listing shall be from end-to-end, denoting every interconnect patch and type required. Circuits to receive best channel assignments shall be identified.

10.2.7 Requirement identification listing. This listing shall identify a unique identifier for each user circuit requirement and shall be prepared in table format with columns identifying requirement number, end-to-end points (terminals), and description of each user requirement.

10.2.8 Site plot plans and layout plans. The plans shall include drawings showing overall site plan with project areas clearly identified and building layout with equipment areas identified. These plans shall also include cables, conduit, pipelines, manholes, and other items that affect system engineering. Drawings shall additionally contain a site location map drawn to scale, a north arrow, site coordinates, and elevation and a graphic scale in both the English and metric system.

10.2.9 Detailed configuration drawings. Drawings shall include floor plan and equipment layout, cable tray system layout, rack face elevation drawings, cable routing and wire run lists, and outside plant installation details covering the systems identified in the following paragraphs.

a. Radio systems. Plans shall include radio equipment, order wire and fault alarm, antennas, waveguides and dehydrators; voice, teletypewriter, mission, and supervisory multiplex, including multiplex synchronization plan; equipment power arrangement; and redundancy switching arrangements.

b. Telephone systems. Plans shall include outside plant cable runs, cable vaults, frame, telephone switches, and power subsystems including standby power.

c. Technical control facilities. Plans shall include order wire and fault alarm, status display equipment; patching, test, and conditioning equipment; inverters and battery plant; ac power equipment; and redundancy switching arrangements.

d. Communication center and data systems. Plans shall include teletypewriter, digital terminal, and peripheral equipment; message switches; timing and synchronization schematics and synchronization equipment; patch and switch panels filters and isolators; and power equipment including standby power.

e. Other systems. Plans shall include equipment peculiar to the project being implemented as identified in the specification or SOW.

10.2.10 Interface drawings. These drawings shall depict the interface of the individual project subsystems to each other or to circuits of special or unique nature. These drawings may be of the basic block type and shall include such components as supergroup and group equipment, filters, hybrids, amplifiers, and impedance matching devices. The interrelation of the components shall be shown as they relate to the ultimate operation of the subsystem. If levels and impedances to be interconnected are not matched, the level and impedance transformation shall be depicted on the drawings. Points of interface of equipment with a subsystem or interface of one subsystem with another (to include technical control interface) shall be defined.

Block 10, Preparation Instructions (Continued)

10.2.11 Major contractor furnished equipment (CFE) and Government furnished equipment (GFE). A major CFE and GFE Bill of Material shall list the items required to implement the project, including manufacturer, model or specification number, description, quantity by site location, total quantity required for each item, and other data as required for identification.

10.2.12 Heat dissipation, power consumption, and circuit breaker requirements. This data shall include estimated heat dissipation and power consumption of all equipment provided or installed and circuit breaker characteristics (trip rating, number of poles, size of conductor connected, and identification of power panels in which they are mounted). Cooling, air handler, and air distribution requirements for the heating loads shall be included.

10.2.13 Description of facilities provided. Narrative description with drawings shall be included for all modifications to existing facilities and new construction.

10.2.14 Description of power upgrade. This description shall include single-line wiring diagrams with circuit breaker and power panel requirements; primary, standby, and emergency system; stability of electrical power and definition of allowable transients; auto or manual and uninterruptable power supply information; and all electrical characteristics such as voltage, current, phase, kilovoltampere (kVA), power factor.

10.2.15 System radio frequency plan. The plan shall contain the necessary technical inputs identified in 4. of AR 5-12 and shall be presented as specified in Chapter 12 of DCAC 330-175-1.

10.2.16 Electromagnetic compatibility control plan. This plan shall conform to 4. of MIL-HDBK-237, to ensure that various project elements are electromagnetic-compatible and that proper grounding, bonding, shielding, and cabling criteria are observed. Tests and test methods shall be as specified in 5. and Appendix C of MIL-HDBK-237.

10.2.17 RED/BLACK considerations. RED/BLACK areas shall be clearly defined. Description of areas which are considered limited-exclusion areas, controlled access areas, controlled BLACK equipment areas, and physical control zones shall be provided within the criteria of 4. and 5. of MIL-HDBK-232. Other pertinent design considerations to be addressed include grounding, shielding, and filtering requirements to comply with TEMPEST criteria as applicable. Other special considerations to be addressed will be identified in the specification or SOW.

10.2.18 Electromagnetic pulse design consideration. Electromagnetic pulse design consideration for the protection of telecommunication equipment shall be clearly indicated with justification for methods employed. Design guidance and constraints will be identified in the specification or SOW.

10.2.19 Description of testing concepts. A description and discussion of testing concepts, approaches, and responsibilities shall be included for system, link, and circuit testing as appropriate.

10.2.20 Government, host country, or other action. All actions required by agencies other than the system contractor to implement the project such as right-of-way, Government-leased circuits, and radio frequency authorization shall be identified and shall include site location, responsible agencies, time requirements, and other data as specified in the specification or SOW.

10.2.21 Other design plans and software requirements.

a. Message switch design plan. This plan shall include definition of the switch and its operation to permit visualization, analysis, and evaluation of system reliability or maintainability, throughput capability, flexibility, and operations performance. The plan shall include the following:

(1) Software design and rationale.

(2) Hardware selection, configuration, and rationale.

(3) General and detailed block diagram with narrative.

(4) Detailed procedures for:

(a) Internal control and format.

(b) Message integrity, security, and accountability.

(c) Statistics control and accountability.

(d) Software recovery and restart.

(e) Files, lists, and table make-ups.

(f) Message retrieval and recovery.

(5) Input and output interface characteristics parameters.

(6) Map of system memory (core layout), including overlays.

Block 10, Preparation Instructions (Continued)

(7) Reliability computation and specification for each hardware component.

(8) Detailed discussion of traffic flow.

(9) Detailed plan for performance of software maintenance.

(10) Detailed plan for hardware maintenance.

(11) Storage requirements for software, files, tables and statistics, identifying each item of a type and requirement as to off- or on-line storage.

b. Telephone numbering plan. This plan shall include user network and tie trunks to satisfy operational requirements outlined in the specification or SOW.

c. Other design plans and software requirements necessary to ensure the successful completion of the systems engineering effort will be identified in the specification or SOW.

10.4 Binding. Binding shall be consistent with the number of pages and intended use of the manuscript. Generally submissions with self-covers should use saddle stitching or side stitching (two staples on the left side would be acceptable). Submissions with separate covers may use side stitching, spiral, or plastic binder, or 3-ring binders as may be required so that the submission will best serve its intended use. For example, loose-leaf binding would be desirable where there is a requirement for the submission to lie flat with no likelihood of the sheets turning by themselves.

10.5 Drawings. Drawings larger than page size shall be furnished separately when 15 or more such drawings are included in the Telecommunications System Engineering Plan. For the draft submittal these drawings shall be furnished as full-sized reproductions. For the final submission, the drawings shall be reduced to 8 1/2 x 14 inches and shall be bound as outlined in 10.4 above. When fewer than 15 drawings are provided, they shall be reduced and folded to conform to the page size of the Telecommunications System Engineering Plan.

10.6 Format. The Telecommunications Systems Engineering Plan format shall be contractor selected. Unless effective presentation would be degraded, the initially used format arrangement shall be used for all subsequent submissions.