

ANNEX J: MAINTAINANCE AND CONDITION ASSESSMENT (Normative)

This annex provides checklists for: (a) maintenance and condition assessment, and (b) field mapping of structures and appurtenances.

Note: This annex does not provide means and methods for RF protection.

J.1 Maintenance and Condition Assessment**A) Structure Condition**

- 1) Damaged members (legs and bracing)
- 2) Loose members
- 3) Missing members
- 4) Climbing facilities, platforms, catwalks – all secure
- 5) Loose and/or missing bolts and/or nut locking devices
- 6) Visible cracks in welded connections

B) Finish

- 1) Paint and/or galvanizing condition
- 2) Rust and/or corrosion condition including mounts and accessories
- 3) FAA or ICAO color marking conditions
- 4) Water collection in members (to be remedied, e.g., unplug drain holes, etc.)

C) Lighting

- 1) Conduit, junction boxes, and fasteners (weather tight and secure)
- 2) Drain and vent openings (unobstructed)
- 3) Wiring condition
- 4) Light lenses
- 5) Bulb condition
- 6) Controllers (functioning)
 - a) Flasher
 - b) Photo control
 - c) Alarms

D) Grounding

- 1) Connections
- 2) Corrosion
- 3) Lightning protection (secured to structure)

E) Antennas and Lines

- 1) Antenna condition
- 2) Mount and/or ice shield condition (bent, loose, and/or missing members)
- 3) Feed line condition (flanges, seals, dents, jacket damage, grounding, etc.)
- 4) Hanger condition (snap-ins, bolt on, kellum grips, etc.)
- 5) Secured to structure

F) Other appurtenances (walkways, platforms, sensors, floodlights, etc.)

- 1) Condition
- 2) Secured to structure

- G) Insulator Condition
 - 1) Cracking and chipping
 - 2) Cleanliness of insulators
 - 3) Spark gaps set properly
 - 4) Isolation transformer condition
 - 5) Bolts and connection secure

- H) Guys
 - 1) Strand condition (corrosion, breaks, nicks, kinks, etc.)
 - 2) Guy Hardware Conditions
 - a) Turnbuckles or equivalent (secure and safety properly applied)
 - b) Cable thimbles properly in place (if required)
 - c) Service sleeves properly in place (if required)
 - d) Cable connectors (end fittings)
 - (i) Cable clamps applied properly and bolts tight
 - (ii) Wire serving properly applied
 - (iii) No signs of slippage or damaged strands
 - (iv) Preformed wraps – properly applied, fully wrapped, and sleeve in place
 - (v) Poured sockets secure and showing no separation
 - (vi) Shackles, bolts, pins and cotter pins secure and in good condition
 - 3) Guy Tensions
 - 4) Measure guy tensions (refer to Annex K)
 - 5) Record temperature, wind speed and wind direction

Notes:

- 1) Minor variations in guy tensions are to be expected due to temperature and low wind speed conditions. The cause of significant changes should be determined immediately and proper remedial action taken. Possible causes may be initial construction loosening, previously experienced extreme wind or ice, anchor movements, base settlement, or connection slippage.
- 2) Tension variations at a single level are to be expected because of anchor elevation differences, construction deviations, and wind effects.

- I) Concrete Foundations
 - 1) Ground condition
 - a) Settlement, movement or earth cracks
 - b) Erosion
 - c) Site condition (standing water, drainage, trees, etc.)
 - 2) Anchorage condition
 - a) Nuts and/or nut locking device (tightened)
 - b) Grout condition
 - c) Anchorages and/or anchor rod condition
 - 3) Concrete condition
 - a) Cracking, spalling, or splitting
 - b) Chipped or broken concrete
 - c) Honeycombing
 - d) Low spots to collect moisture

- J) Guyed Mast Anchors
 - 1) Settlement, movement or earth cracks
 - 2) Backfill heaped over concrete for water shedding
 - 3) Anchor rod condition below earth (Maintain required structural capacity of anchor during exploration. Attachment to temporary anchorage may be required)
 - 4) Corrosion control measures (galvanizing, coating, concrete encasement, cathodic protection systems, etc.)
 - 5) Anchor heads clear of earth

- K) Tower Alignment
 - 1) Tower Plumb and Twist (See Figures J-1 and J-2)

J.2 Field Mapping

J.2.1 Mapping of Appurtenances

The mapping of appurtenances shall provide sufficient dimensional data in order to calculate the effective projected area, weight and location of all appurtenances.

The mapping of appurtenances shall include, as a minimum:

- A) Inventory of existing antennas: Elevation, antenna type and dimensions/model number, support mount and location, spacing and orientation on cross-section, and corresponding transmission line(s).
- B) Inventory of other appurtenances (such as climbing ladders, platforms, etc.): Elevation, appurtenance type and dimensions, location, spacing and orientation on cross-section.
- C) A cross-section sketch locating and labeling the transmission lines (size and spacing) and showing the orientation of the lines and the structure with respect to North. For transmission lines in clusters: number of lines per row, number of rows, and separation between the lines, overall width and depth dimensions.

J.2.2 Mapping of Structural Components

In order to perform an analysis of a structure, the structural configuration and the size of all structural members must be mapped in order to calculate wind loading and member capacities.

The mapping of the structure and its main structural members shall include, as a minimum:

J.2.2.1 Self-Supporting Latticed Structures

- A) Sketch of overall structure numbering all sections.
- B) The Configuration of each section:
 - 1) Section height
 - 2) Panel height and number of panels
 - 3) Configuration of the panels (X, X with horizontal, K)
 - 4) Face width (Center to Center of legs) at all taper change locations.
 - 5) Sketch indicating the above for each typical section
- C) Member sizes for each section:
 - 1) Leg member sizes - i.e. pipe diameter (outside diameter & wall thickness using ultra sound device), solid round diameter, or angle size & thickness (60 deg. or 90 deg.)
 - 2) Diagonal member sizes - i.e. pipe diameter (outside diameter & wall thickness using ultra sound device), angle size, thickness and orientation (long leg back to back, LLBB, or short leg back to back, SLBB)

- 3) Horizontal member sizes - i.e. pipe diameter (outside diameter & wall thickness using ultra sound device), angle size, thickness and orientation (LLBB, SLBB)
- 4) Subbrace member sizes (if applicable) - i.e. pipe diameter (outside diameter & wall thickness using ultra sound device), angle size, thickness and orientation (LLBB, SLBB)

J.2.2.2 Guyed Masts

- A) Structure base type (fixed or pinned) and tapered or flat base
- B) Guy anchor dimensions: distance from base to guy anchors and their relative elevations to base and their orientation.
- C) Sketch of overall structure numbering all sections. Locate and label all guy wire levels.
 - 1) The configuration of each Section:
 - 2) Section height
 - 3) Panel height and number of panels
 - 4) Configuration of the panels (X, X with horizontals, K)
 - 5) Face width (center to center of legs) at all taper change locations
 - 6) Sketch indicating the above for each typical section
- D) Member sizes for each section:
 - 1) Leg member sizes - i.e. pipe diameter (outside diameter & wall thickness using ultra sound device), solid round diameter, angle size & thickness (60 deg. or 90 deg.)
 - 2) Diagonal member sizes - i.e. pipe diameter (outside diameter & wall thickness using ultra sound device), angle size, thickness and orientation (long leg back to back, LLBB, or short leg back to back, SLBB)
 - 3) Horizontal member sizes - i.e. pipe diameter (outside diameter & wall thickness using ultra sound device), solid round diameter, angle size, thickness and orientation (LLBB, SLBB)
 - 4) Subbrace member sizes (if applicable) - i.e. pipe diameter (outside diameter & wall thickness using ultra sound device), angle size, thickness and orientation (LLBB, SLBB)
- E) Guy wire elevation, size and type for each guy level

J.2.2.3 Pole Structures

- A) Sketch of overall structure numbering all sections.
- B) Configuration of each section:
- C) Section height – For flanged type, the length from splice to splice. For telescoping poles, the length from butt to butt
- D) If multi-sided, number of sides
- E) Flat to flat dimension or diameter and circumference at top and bottom of each section
- F) Port hole opening size, reinforcing and location
- G) Size for each Section:
 - 1) Wall thickness of each section

J.2.2.4 Connections

In order to perform a rigorous structural analysis of a structure the details of all structural connections must be mapped in order to calculate connection capacities.

The mapping of the structure connections shall include, as a minimum, the following:

- A) Member end connection details:
 - B) If Bolted: number, type and size of end bolts and center bolts
 - C) Size and thickness of gusset plate with related details (hole sizes, edge distances, weld size and length)
 - D) If Welded: weld size and length of end and center connections

- E) Splice connection details:
- F) Number, type and size of bolts
- G) Size and thickness of splice plate with related details (hole sizes, edge distances, weld size and length,) and distance from panel intersection point
- H) Anchor rod type, size, number, and bolt circle
- I) Guy Assembly and connection details:
- J) Preformed size/type, turnbuckle size, shackle size
- K) Socket size, pin size, link plate dimensions with related details
- L) Size and thickness of guy pull-off plate with related details (hole sizes, edge distances, weld size and length, stiffener size)
- M) Guy anchor head plate size, thickness, holes size, spacing, and edge distances of holes, shaft type, size and extension length and angle from horizontal plane and weld size and length of connection between shaft and fan plate