Form 301 or FCC Form 340, as appropriate.

(b) The field strength contours provided for in this section shall be considered for the following purposes only:

(1) In the estimation of coverage resulting from the selection of a particular transmitter site by an applicant for an FM broadcast station.

(2) In connection with problems of coverage arising out of application of § 73.3555.

(3) In determining compliance with § 73.315(a) concerning the minimum field strength to be provided over the principal community to be served.

(4) In determining compliance with § 73.215 concerning contour protection.

[28 FR 13623, Dec. 14, 1963, as amended at 31 FR 10126, July 27, 1966; 32 FR 11471, Aug. 9, 1967; 52 FR 10570, Apr. 2, 1987; 54 FR 9802, Mar. 8, 1989]

§ 73.312 Topographic data.

(a) In the preparation of the profile graphs previously described, and in determining the location and height above mean sea level of the antenna site, the elevation or contour intervals shall be taken from United States Geological Survey Topographic Quadrangle Maps, United States Army Corps of Engineers Maps or Tennessee Valley Authority maps, whichever is the latest, for all areas for which such maps are available. If such maps are not published for the area in question, the next best topographic information should be used. Topographic data may sometimes be obtained from state and municipal agencies. The data from the Sectional Aeronautical Charts (including bench marks) or railroad depot elevations and highway elevations from road maps may be used where no better information is available. In cases where limited topographic data can be obtained, use may be made of an altimeter in a car driven along roads extending generally radially from the transmitter site.

(b) The Commission will not ordinarily require the submission of topographical maps for areas beyond 24 km (15 miles) from the antenna site, but the maps must include the principal city or cities to be served. If it appears necessary, additional data may be requested.

(c) The U.S. Geological Survey Topography Quadrangle Sheets may be obtained from the U.S. Geological Survey Department of the Interior, Washington, DC 20240. The Sectional Aeronautical Charts are available from the U.S. Coast and Geodetic Survey, Department of Commerce, Washington, DC 20235. These maps may also be secured from branch offices and from authorized agents or dealers in most principal cities.

(d) In lieu of maps, the average terrain elevation may be computer generated except in cases of dispute, using elevations from a 30 second, point or better topographic data file. The file must be identified and the data processed for intermediate points along each radial using linear interpolation techniques. The height above mean sea level of the antenna site must be obtained manually using appropriate topographic maps.

[28 FR 13623, Dec. 14, 1963, as amended at 31 FR 10126, July 27, 1966; 49 FR 48937, Dec. 17, 1984; 58 FR 44950, Aug. 25, 1993; 63 FR 33877, June 22, 1998]

§ 73.313 Prediction of coverage.

(a) All predictions of coverage made pursuant to this section shall be made without regard to interference and shall be made only on the basis of estimated field strengths.

(b) Predictions of coverage shall be made only for the same purposes as relate to the use of field strength contours as specified in § 73.311.

(c) In predicting the distance to the field strength contours, the F(50,50) field strength chart, Figure 1 of § 73.333 must be used. The 50% field strength is defined as that value exceeded for 50% of the time.

(1) The F(50,50) chart gives the estimated 50% field strengths exceeded at 50% of the locations in dB above 1 uV/m. The chart is based on an effective power radiated from a half-wave dipole antenna in free space, that produces an unattenuated field strength at 1 kilometer of about 107 dB above 1 uV/m (221.4 mV/m).

(2) To use the chart for other ERP values, convert the ordinate scale by the appropriate adjustment in dB. For example, the ordinate scale for an ERP of 50 kW should be adjusted by 17 dB [10

log (50 kW) = 17 dBk], and therefore a field strength of 60 dBu would correspond to the field strength value at (60−17 =) 44 dBu on the chart. When predicting the distance to field strength contours, use the maximum ERP of the main radiated lobe in the pertinent azimuthal direction (do not account for beam tilt). When predicting field strengths over areas not in the plane of the maximum main lobe, use the ERP in the direction of such areas, determined by considering the appropriate vertical radiation pattern.

(d) The antenna height to be used with this chart is the height of the radiation center of the antenna above the average terrain along the radial in question. In determining the average elevation of the terrain, the elevations between 3 and 16 kilometers from the antenna site are used.

(1) Profile graphs must be drawn for eight radials beginning at the antenna site and extending 16 kilometers therefrom. The radials should be drawn for each 45° of azimuth starting with True North. At least one radial must include the principal community to be served even though it may be more than 16 kilometers from the antenna site. However, in the event none of the evenly spaced radials include the principal community to be served, and one or more such radials are drawn in addition, these radials must not be used in computing the antenna height above average terrain.

(2) Where the 3 to 16 kilometers portion of a radial extends in whole or in part over a large body of water or extends over foreign territory but the 50 uV/m (34 dBu) contour encompasses land area within the United States beyond the 16 kilometers portion of the radial, the entire 3 to 16 kilometers portion of the radial must be included in the computation of antenna height above average terrain. However, where the 50 uV/m (34 dBu) contour does not so encompass United States land area, and (i) the entire 3 to 16 kilometers portion of the radial extends over large bodies of water or over foreign territory, such radial must be completely omitted from the computation of antenna height above average terrain, and (ii) where a part of the 3 to 16 kilometers portion of a radial extends over large bodies of water or foreign territory, only that part of the radial extending from 3 kilometers to the outermost portion of land in the United States covered by the radial used must be used in the computation of antenna height above average terrain.

(3) The profile graph for each radial should be plotted by contour intervals of from 12 to 30 meters and, where the data permits, at least 50 points of elevation (generally uniformly spaced) should be used for each radial. In instances of very rugged terrain where the use of contour intervals of 30 meters would result in several points in a short distance, 60 or 120 meter contour intervals may be used for such distances. On the other hand, where the terrain is uniform or gently sloping the smallest contour interval indicated on the topographic map should be used, although only relatively few points may be available. The profile graph should indicate the topography accurately for each radial, and the graphs should be plotted with the distance in kilometers as the abscissa and the elevation in meters above mean sea level as the ordinate. The profile graphs should indicate the source of the topographical data used. The graph should also show the elevation of the center of the radiating system. The graph may be plotted either on rectangular coordinate paper or on special paper that shows the curvature of the earth. It is not necessary to take the curvature of the earth into consideration in this procedure as this factor is taken care of in the charts showing signal strengths. The average elevation of the 13 kilometer distance between 3 and 16 kilometers from the antenna site should then be determined from the profile graph for each radial. This may be obtained by averaging a large number of equally spaced points, by using a planimeter, or by obtaining the median elevation (that exceeded for 50% of the distance) in sectors and averaging those values.

(4) Examples of HAAT calculations:

(i) The heights above average terrain on the eight radials are as follows:

	Meters
0°	120

	Meters
45°	255
90°	185
135°	90
180°	−10
225°	−85
270°	40
315°	85

The antenna height above terrain (defined in § 73.310(a)) is computed as follows:

(120 + 255 + 185 + 90 − 10 − 85 + 40 + 85) / 8 = 85 meters.

(ii) Same as paragraph (d)(4)(i) of this section, except the 0° radial is entirely over sea water. The antenna height above average terrain is computed as follows (note that the divisor is 7 not 8):

(255 + 185 + 90 − 10 − 85 + 40 + 85) / 7 = 80 meters.

(iii) Same as paragraph (d)(4)(i) of this section, except that only the first 10 kilometers of the 90° radial are in the United States; beyond 10 kilometers the 90° radial is in a foreign country. The height above average terrain of the 3 to 10 kilometer portion of the 90° radial is 105 meters. The antenna height above average terrain is computed as follows (note that the divisor is 8 not 7.5):

(120 + 255 + 105 + 90 − 10 − 85 + 40 + 85) / 8 = 75 meters.

(e) In cases where the terrain in one or more directions from the antenna site departs widely from the average elevation of the 3 to 16 kilometer sector, the prediction method may indicate contour distances that are different from what may be expected in practice. For example, a mountain ridge may indicate the practical limit of service although the prediction method may indicate otherwise. In such cases, the prediction method should be followed, but a supplemental showing may be made concerning the contour distances as determined by other means. Such supplemental showings should describe the procedure used and should include sample calculations. Maps of predicted coverage should include both the coverage as predicted by the regular method and as predicted by a supplemental method. When measurements of area are required, these should include the area obtained by the regular prediction method and the area obtained by the supplemental method. In directions where the terrain is such that antenna heights less than 30 meters for the 3 to 16 kilometer sector are obtained, an assumed height of 30 meters must be used for the prediction of coverage. However, where the actual contour distances are critical factors, a supplemental showing of expected coverage must be included together with a description of the method used in predicting such coverage. In special cases, the FCC may require additional information as to terrain and coverage.

(f) The effect of terrain roughness on the predicted field strength of a signal at points distant from an FM transmitting antenna is assumed to depend on the magnitude of a terrain roughness factor (h) which, for a specific propagation path, is determined by the characteristics of a segment of the terrain profile for that path 40 kilometers in length located between 10 and 50 kilometers from the antenna. The terrain roughness factor has a value equal to the distance, in meters, between elevations exceeded by all points on the profile for 10% and 90% respectively, of the length of the profile segment. (See § 73.333, Figure 4.)

(g) If the lowest field strength value of interest is initially predicted to occur over a particular propagation path at a distance that is less than 50 kilometers from the antenna, the terrain profile segment used in the determination of terrain roughness factor over that path must be that included between points 10 kilometers from the transmitter and such lesser distances. No terrain roughness correction need be applied when all field strength values of interest are predicted to occur 10 kilometers or less from the transmitting antenna.

(h) Profile segments prepared for terrain roughness factor determinations are to be plotted in rectangular coordinates, with no less than 50 points evenly spaced within the segment using data obtained from topographic maps with contour intervals of approximately 15 meters (50 feet) or less if available.

(i) The field strength charts (§ 73.333, Figs. 1–1a) were developed assuming a terrain roughness factor of 50 meters, which is considered to be representative of average terrain in the United States. Where the roughness factor for a particular propagation path is found to depart appreciably from this value, a terrain roughness correction (ΔF) should be applied to field strength values along this path, as predicted with the use of these charts. The magnitude and sign of this correction, for any value of Δh, may be determined from a chart included in § 73.333 as Figure 5.

(j) Alternatively, the terrain roughness correction may be computed using the following formula:

$$\Delta F = 1.9 - 0.03(\Delta h)(1 + f/300)$$

Where:

ΔF=terrain roughness correction in dB
Δk=terrain roughness factor in meters
f=frequency of signal in MHz (MHz)

(Secs. 4, 5, 303, 48 Stat., as amended, 1066, 1068, 1082 (47 U.S.C. 154, 155, 303))

[28 FR 13623, Dec. 14, 1963, as amended at 40 FR 27678, July 1, 1975; 48 FR 29507, June 27, 1983; 52 FR 11655, Apr. 10, 1987; 52 FR 37789, Oct. 9, 1987; 57 FR 48333, Oct. 23, 1992; 63 FR 33877, June 22, 1998]

EFFECTIVE DATE NOTE: At 42 FR 25736, May 19, 1977, the effective date of § 73.313 paragraphs (i) and (j) was stayed indefinitely.

§ 73.314 Field strength measurements.

(a) Except as provided for in § 73.209, FM broadcast stations shall not be protected from any type of interference or propagation effect. Persons desiring to submit testimony, evidence or data to the Commission for the purpose of showing that the technical standards contained in this subpart do not properly reflect the levels of any given type of interference or propagation effect may do so only in appropriate rule making proceedings concerning the amendment of such technical standards. Persons making field strength measurements for formal submission to the Commission in rule making proceedings, or making such measurements upon the request of the Commission, shall follow the procedure for making and reporting such measurements outlined in paragraph (b) of this section. In instances where a showing of the measured level of a signal prevailing over a specific community is appropriate, the procedure for making and reporting field strength measurements for this purpose is set forth in paragraph (c) of this section.

(b) Collection of field strength data for propagation analysis.

(1) *Preparation for measurements.* (i) On large scale topographic maps, eight or more radials are drawn from the transmitter location to the maximum distance at which measurements are to be made, with the angles included between adjacent radials of approximately equal size. Radials should be oriented so as to traverse representative types of terrain. The specific number of radials and their orientation should be such as to accomplish this objective.

(ii) Each radial is marked, at a point exactly 16 kilometers from the transmitter and, at greater distances, at successive 3 kilometer intervals. Where measurements are to be conducted over extremely rugged terrain, shorter intervals may be used, but all such intervals must be of equal length. Accessible roads intersecting each radial as nearly as possible at each 3 kilometer marker are selected. These intersections are the points on the radial at which measurements are to be made, and are referred to subsequently as measuring locations. The elevation of each measuring location should approach the elevation at the corresponding 3 kilometer marker as nearly as possible.

(2) *Measurement procedure.* All measurements must be made utilizing a receiving antenna designed for reception of the horizontally polarized signal component, elevated 9 meters above the roadbed. At each measuring location, the following procedure must be used:

(i) The instrument calibration is checked.

(ii) The antenna is elevated to a height of 9 meters.

(iii) The receiving antenna is rotated to determine if the strongest signal is arriving from the direction of the transmitter.

(iv) The antenna is oriented so that the sector of its response pattern over which maximum gain is realized is in the direction of the transmitter.