



**U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION**

**NOTICE
N 8260.58**

Effective Date:
6/21/06

Cancellation Date:
6/21/07

**SUBJ: APPLICATION OF THE GLIDEPATH QUALIFICATION SURFACE (GQS) FOR
VERTICALLY GUIDED APPROACH PROCEDURES**

- 1. PURPOSE.** This notice describes evaluation of the airspace between the decision altitude (DA) point and the landing threshold on a vertically guided instrument approach procedure. These criteria (appendix 1) provide the current guidance for the evaluation of Glidepath Qualification Surface and must be used in place of the criteria contained in FAA Order 8260.3B, United States Standard for Terminal Instrument Procedures (TERPS), Volume 3, paragraph 2.12.
- 2. DISTRIBUTION.** This notice is distributed in Washington headquarters to the branch level in Offices of Airport Safety and Standards and Communications, Navigation, and Surveillance Systems; to Air Traffic, Airway Facilities, Aircraft Certification, and Flight Standards Services; to the National Flight Procedures Group and the Regulatory Standards Divisions at the Mike Monroney Aeronautical Center; to branch level in the regional Flight Standards, Airway Facilities, Air Traffic, and Airports Divisions; to Flight Standards District Offices (FSDOs), special mailing list ZVS-827, and to special military and public addressees.
- 3. BACKGROUND.** Vertically guided instrument approach procedures provide the pilot with track deviation information in 3 dimensions (3-D, along track, cross track, and vertical track). Examples of 3-D approach procedures are instrument landing system (ILS), microwave landing system (MLS), lateral navigation/vertical navigation (LNAV/VNAV), Wide Area Augmentation System (WAAS), lateral precision performance with vertical guidance (LPV), transponder landing system (TLS), precision approach radar (PAR), and localizer-type directional aid (LDA) with glide slope. Three-D procedures establish aircraft on a stabilized descent trajectory from the final approach fix to touchdown. It is essential for the descent to remain stable to assure safe landing. Obstacles of sufficient height that interfere with this trajectory destabilize the descent negating the safety margin provided by vertically guided approach procedures. The GQS evaluation identifies obstructions encountered after DA that could destabilize descent and indicates the runway will not support 3-D approach procedures.
- 4. DISPOSITION.** The criteria and standards provided in appendix 1 will be published in Order 8260.3B, United States Standard for Terminal Instrument Procedures (TERPS).

Signed by Carol Giles

James J. Ballough
Director, Flight Standards Service

Distribution: A-W(AS/ND/AT/AF/IR/FS)-3; AJW-32 (200 Cys); AMA-200 (80 Cys);
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Public Addressees **Initiated By:** AFS-420

APPENDIX 1. ORDER 8260.3B, VOLUME 3, PARAGRAPH 2.12**2.12 GLIDEPATH QUALIFICATION SURFACE (GQS).**

The GQS extends from the runway threshold along the runway centerline extended to the DA point. It limits the height of obstructions between DA and runway threshold (RWT). When obstructions exceed the height of the GQS, an approach procedure with positive vertical guidance (ILS, MLS, TLS, GLS, VNAV, etc.) is not authorized.*

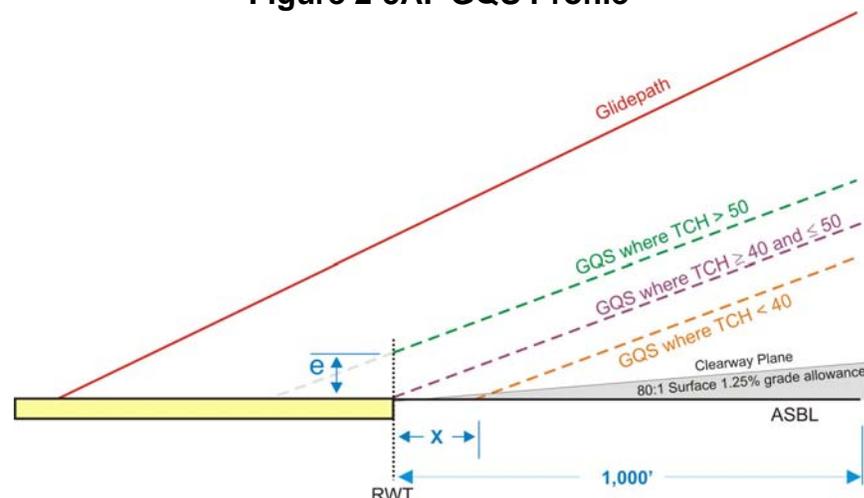
**NOTE: Where obstructions penetrate the GQS, vertically guided approach operations may be possible with aircraft groups restricted by wheel height. Contact the FAA Flight Procedure Standards Branch, AFS-420, (or appropriate military equivalent) for case-by-case analysis.*

2.12.1 Area.**2.12.1 a. Origin and Length.**

The GQS extends from the origin to the DA. The obstacle clearance surface (OCS) origin is dependent on the threshold crossing height (TCH) value (see figure 2-5A).

- If the TCH > 50, the GQS originates at RWT (x=0) "e" feet above ASBL.
 $e = \text{TCH} - 50$ Example: $55 - 50 = 5'$.
- If the TCH ≤ 50 and ≥ 40 , the GQS originates at RWT at ASBL elevation.
- If the TCH < 40, the GQS originates "x" feet from RWT (e=0) at ASBL elevation.
 $x = \frac{40 - \text{TCH}}{\tan(\theta)}$ (Where θ = glide slope angle) Example: $\frac{40 - 37}{\tan(3)} = 57.24'$.

The area between the RWT and point "x" should be clear of obstacles above the clearway plane (see paragraph 2.12.1d(1)) except frangible radar reflectors and other objects required for Category I/II/III instrument landing operations.

Figure 2-5A. GQS Profile

2.12.1

b. **Width.** The GQS lateral boundary is 100 ft from the runway edge at RWT. It expands uniformly to a width of “E” feet at DA (see figures 2-5B and 2-5C).

Figure 2-5B. Example: $TCH \geq 40'$

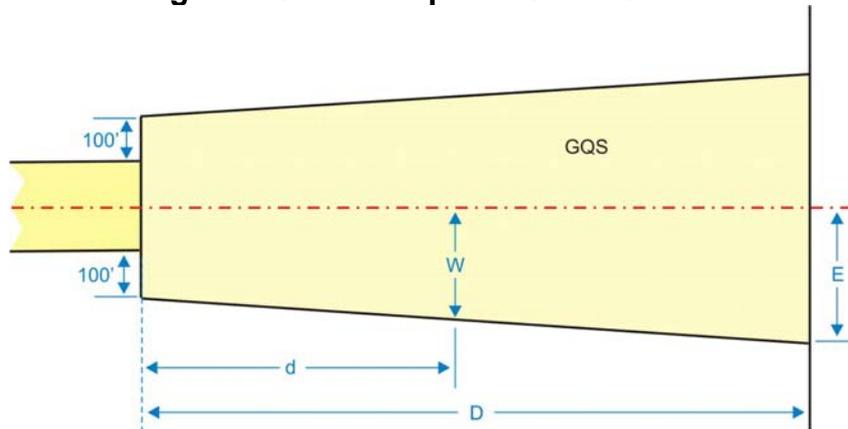
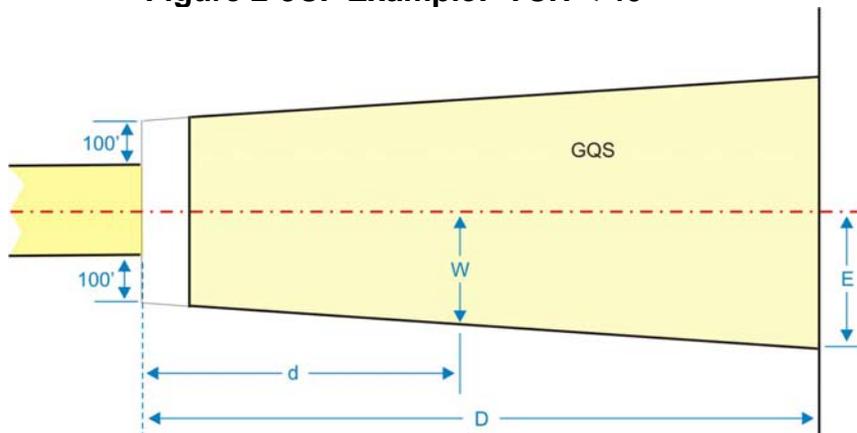


Figure 2-5C. Example: $TCH < 40'$



Calculate the GQS half-width “E” at the DA point measured along the runway centerline extended using the following formula:

$$E = 0.036D + 392.8$$

Where: **D** = the distance (ft) measured along RCL extended from RWT to the DA point
E = GQS half-width (ft) at DA

Example: $0.036 \times 3,816.23 + 392.8 = 530.18'$

Calculate the half-width (**w**) of the GQS at any distance “d” from RWT using the following formula:

$$w = \left(\frac{E - k}{D} d \right) + k$$

Where: **D** = distance (ft) from RWT to the DA point
d = desired distance (ft) from RWT
w = GQS half-width at distance d
E = GQS half-width at DA from step 1 above
k = $\frac{\text{RWY width}}{2} + 100$

Example

D = 3200 d = 1800 k = 175 E = 508

$$w = \left(\frac{508 - 175}{3200} \times 1800 \right) + 175 = 362.31$$

2.12.1

c. If the course is offset from the runway centerline more than 3°, expand the GQS area on the side of the offset as follows referring to figures 2-5D and 2-5E:

STEP 1. Construct line **BC**. Locate point “B” on the runway centerline extended perpendicular to the course at the DA point. Calculate the half-width (E) of the GQS for the distance from point “B” to the RWT. Locate point “C” perpendicular to the course distance “E” from the course line. Connect points “B” and “C.”

STEP 2. Construct line **CD**. Locate point “D” 100 ft from the edge of the runway perpendicular to the LTP. Draw a line connecting point “C” to point “D.”

STEP 3. Construct line **DF**. Locate point “F” 100 ft from the edge of the runway perpendicular to the LTP. Draw a line connecting point “D” to point “F.”

STEP 4. Construct line **AF**. Locate point “A” distance “E” from point “B” perpendicular to the runway centerline extended. Connect point “A” to point “F.”

STEP 5. Construct line **AB**. Connect point “A” to point “B.”

Figure 2-5D. Example: $TCH \geq 40'$

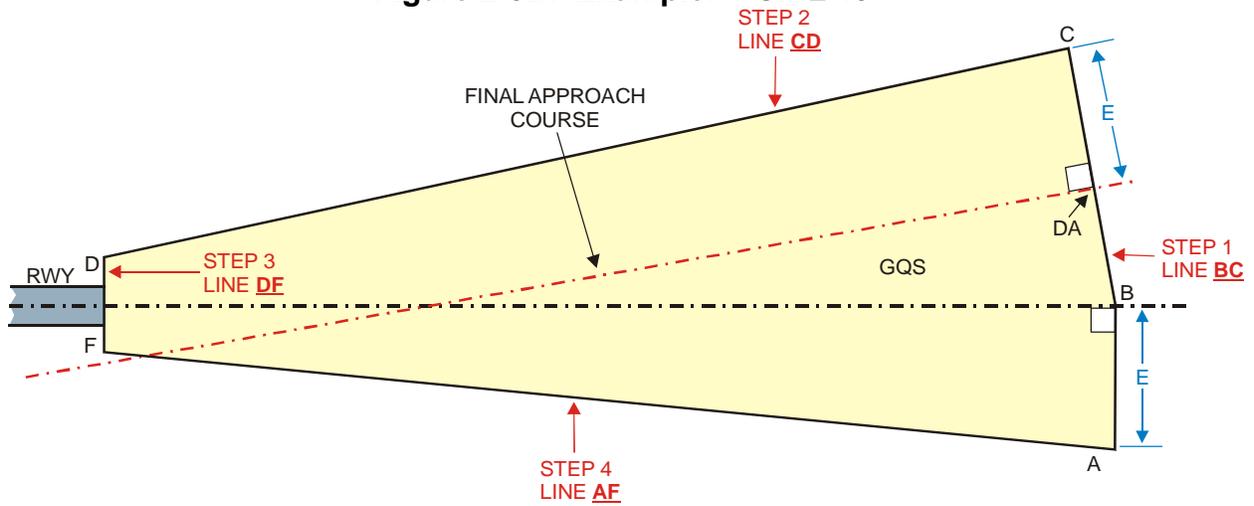
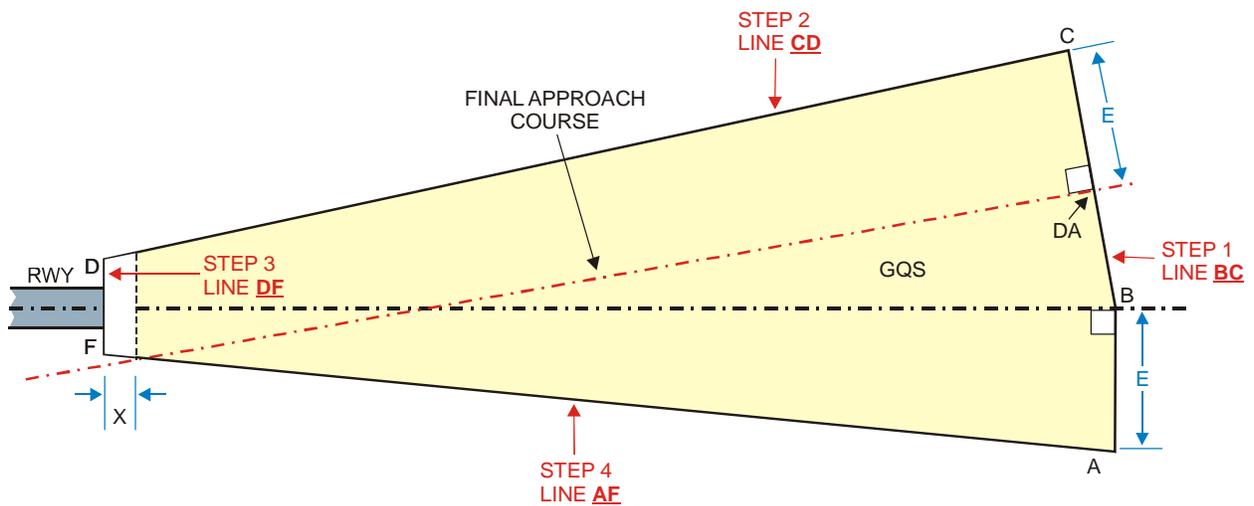


Figure 2-5E. Example: $TCH < 40'$



Calculate the half-width of the offset side of the GQS trapezoid using the following formula (see figure 2-5F):

$$W_{\text{offset}} = d \left(\frac{\cos(\phi) [\sin(\phi)(D-i) + E] - k}{D - \sin(\phi) [\sin(\phi)(D-i) + E]} \right) + k$$

where d = distance (ft) from LTP to point in question

D = distance (ft) along RCL from LTP to point B

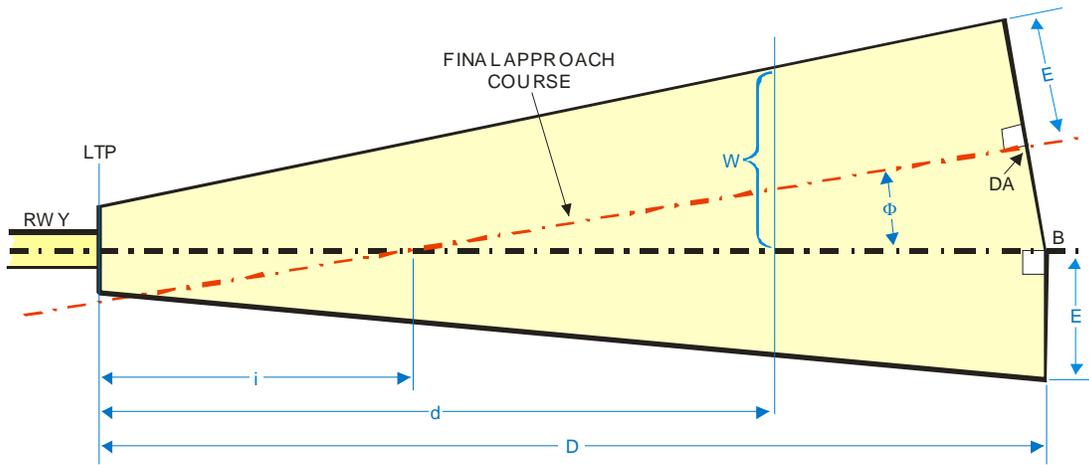
i = distance (ft) from LTP to RWY centerline intersection

$$k = \frac{\text{RWY width}}{2} + 100$$

ϕ = degree of offset

$$E = 0.036D + 392.8$$

Figure 2-5F. Offset Calculation Example



Example

$d = 2,300$ $i = 1,800$ $D = 3,200$ $RW = 150$ $\phi = 5^\circ$
 $E = 508$ $k = 175$

$$W_{\text{offset}} = 1800 \left(\frac{\cos(5) [\sin(5)(3200 - 1800) + 508] - 175}{3200 - \sin(5) [\sin(5)(3200 - 1800) + 508]} \right) + 175 = 506.00$$

2.12.1

d. OCS. Obstructions must not penetrate the GQS (see paragraph 2.12.1d(1) exception). Calculate the height of the GQS above ASBL at any distance “d” measured from **runway threshold (RWT)** along runway centerline (RCL) extended to a point abeam the obstruction (see figures 2-5G through 2-5J) using the following formula:

$$h = (d - x) \cdot \tan\left(\frac{2\theta}{3}\right) + e$$

Figure 2-5G. GQS Origin

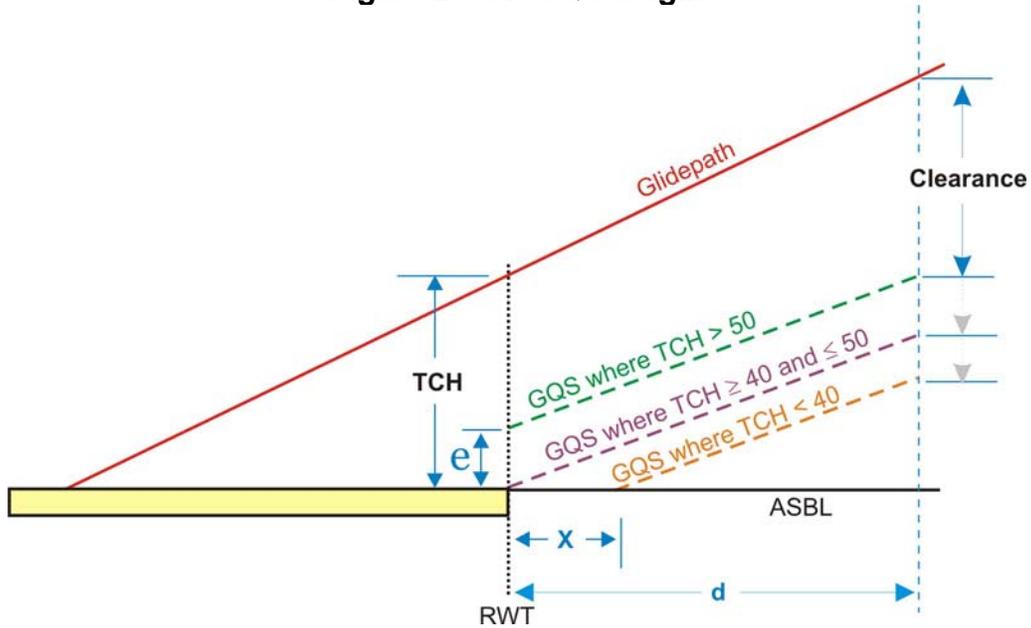
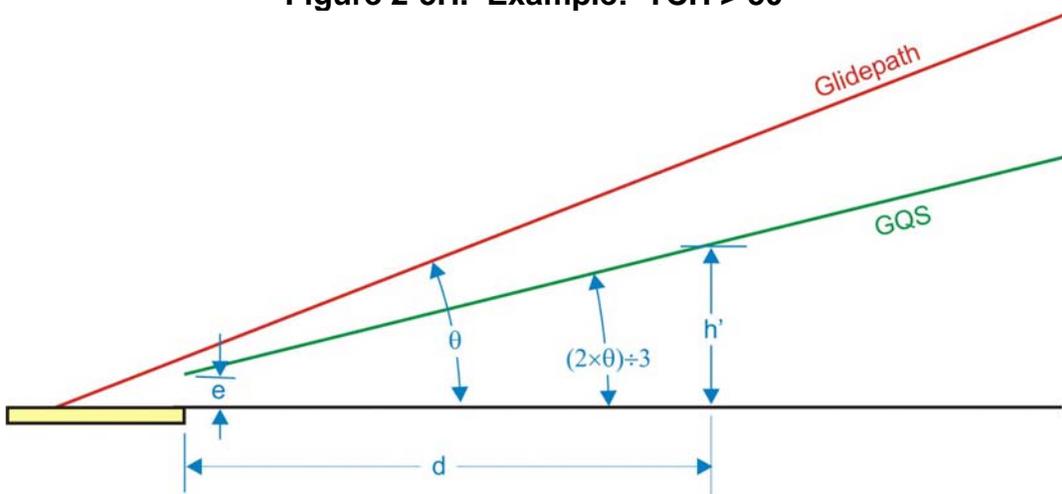


Figure 2-5H. Example: TCH > 50'



$$\text{Example: } (3,000 - 0) \times \tan\left(\frac{2 \times 3}{3}\right) + 5 = 109.76'$$

Figure 2-5I. Example: TCH ≥ 40' and ≤ 50'

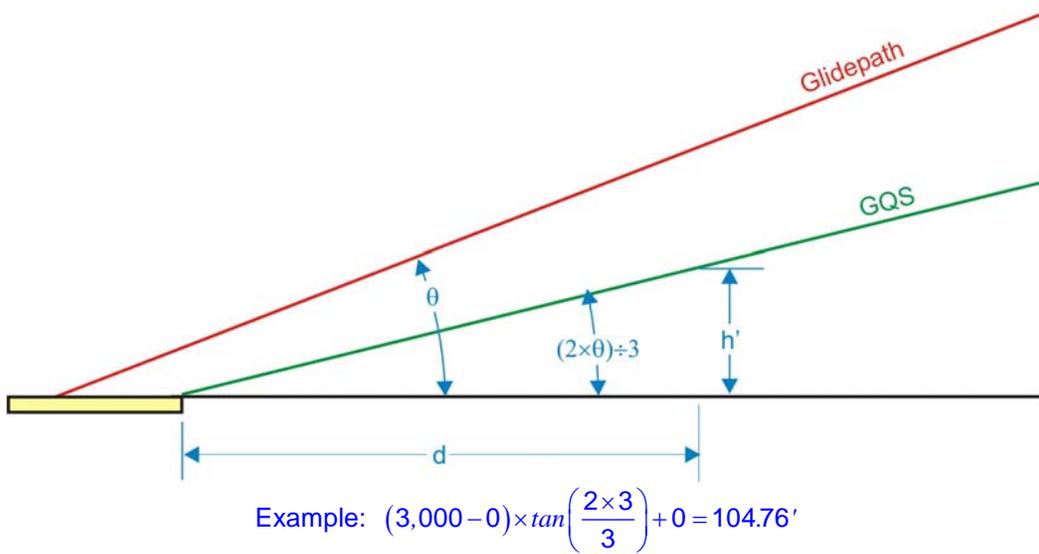
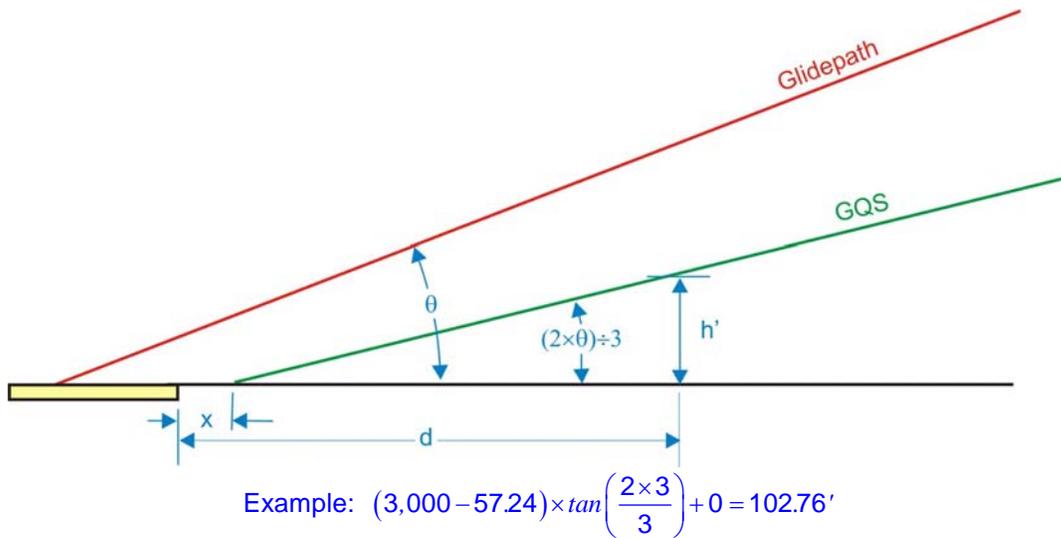


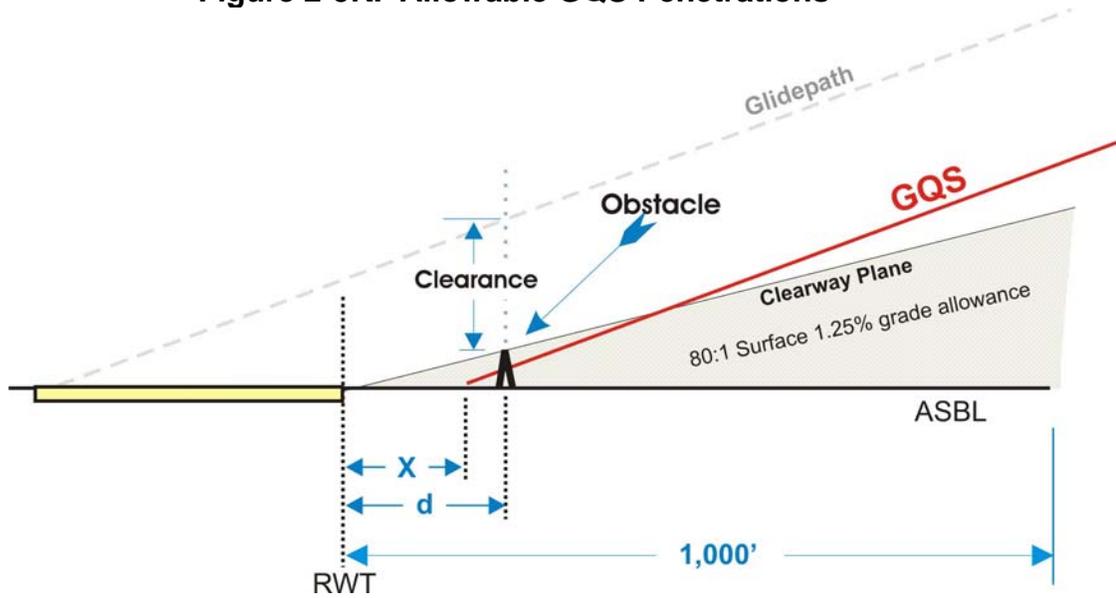
Figure 2-5J. Example: TCH < 40'



2.12.1

d. (1) Terrain under the clearway plane (1st 1,000 ft off the approach end of the runway) is allowed to rise at a slope of 80:1 (grade of 1.25%) or appropriate military equivalent (see figure 2-5K). Terrain and obstacles under the 80:1 slope are not considered obstructions.

Figure 2-5K. Allowable GQS Penetrations



Additionally, frangible radar reflectors and other objects required for Category I/II/III instrument landing operations are allowed to penetrate the GQS.