

NOTICE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

N 8260.65

National Policy

Effective Date:
09/14/2007

Cancellation Date:
09/14/2008

SUBJ: Guidelines for Application of Glidepath Qualification Surface (GQS)

- 1. Purpose of This Notice.** 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 provide the current guidance for the evaluation of Glidepath Qualification Surface (GQS) 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. Audience.** The primary audience for this notice is the National Flight Procedures Office personnel, who have the responsibility to develop and review Instrument Approach Procedures. The secondary audience includes Flight Standards and Air Traffic branches and divisions in the regions and in headquarters.
- 3. Where You Can Find This Notice.** Inspectors can access this notice through the Flight Standards Information Management System (FSIMS) at <http://fsims.avr.faa.gov>. Operators and the public can find this notice at <http://fsims.faa.gov>.
- 4. Cancellation.** This notice cancels and supersedes Flight Technology and Procedures Division, AFS-400, policy memorandum on interim criteria for application of the glidepath qualification surface (GQS) for vertically guided approach procedures.
- 5. Disposition.** The criteria and standards provided in appendix A will be published in Order 8260.3B, United States Standard for Terminal Instrument Procedures (TERPS).

ORIGINAL SIGNED By
John M. Allen for

James J. Ballough
Director, Flight Standards Service

Distribution: A-W(AS/ND/AT/AF/IR/FS)-3; A-X(FS/AF/AT/AS)-3; **Initiated By:** AFS-420
AJW-32 (200 Cys); AMA-200 (12 Cys); A-FFS-7 (STD); ZVS-827;
Special Military & Public Addressees

Appendix A. 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.

$$e = TCH - 50$$

$$\text{Example: } 55 - 50 = 5'.$$

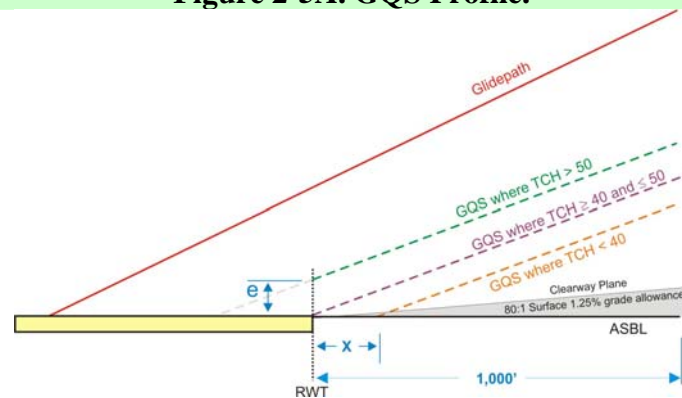
- If the $TCH \leq 50$ and ≥ 40 , the GQS originates at RWT at ASBL elevation.
- If the $TCH < 40$, the GQS originates “x” feet from RWT ($e=0$) at ASBL elevation.

$$x = \frac{40 - TCH}{\tan(\theta)}$$

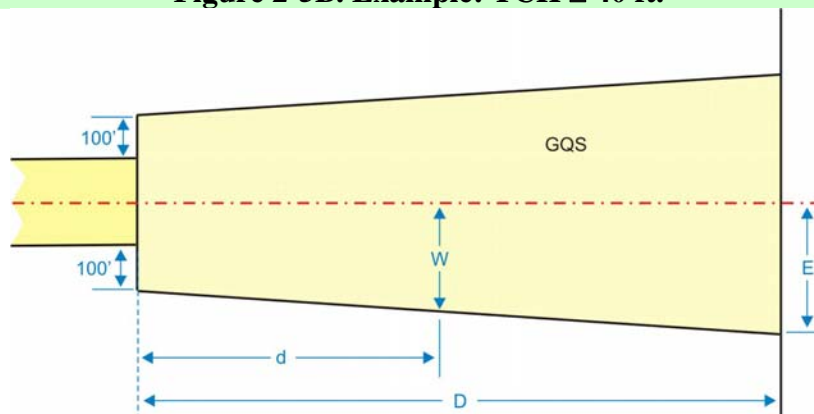
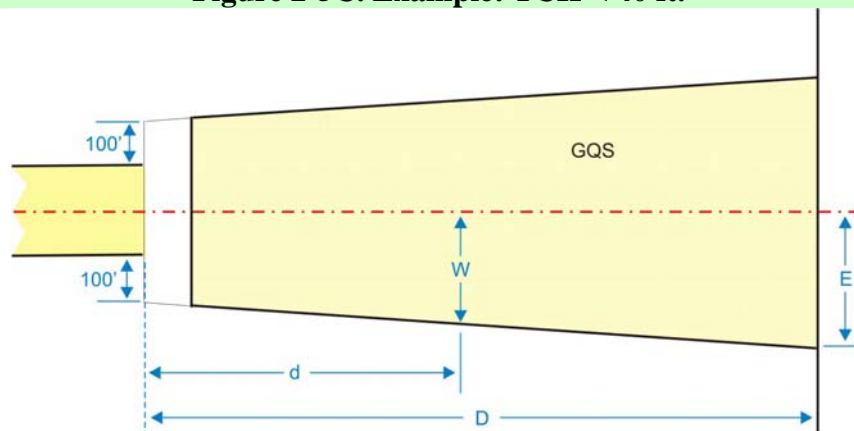
Where θ = glide slope angle

$$\text{Example: } \frac{40 - 37}{\tan(3)} = 57.24'.$$

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 ≥ 40 ft.**Figure 2-5C. Example: TCH < 40 ft.**

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:

$$D = 3200 \quad d = 1800 \quad k = 175 \quad E = 508$$

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

- 2.12.1** c. If the course is offset from the runway centerline more than 3 degrees, 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 **DE**. 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 ft.

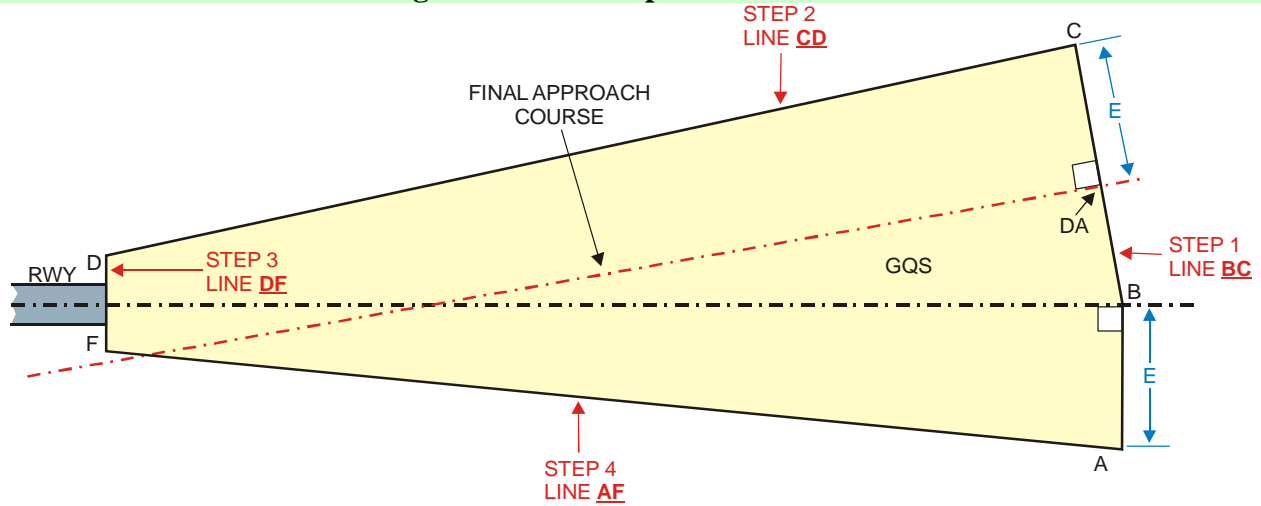
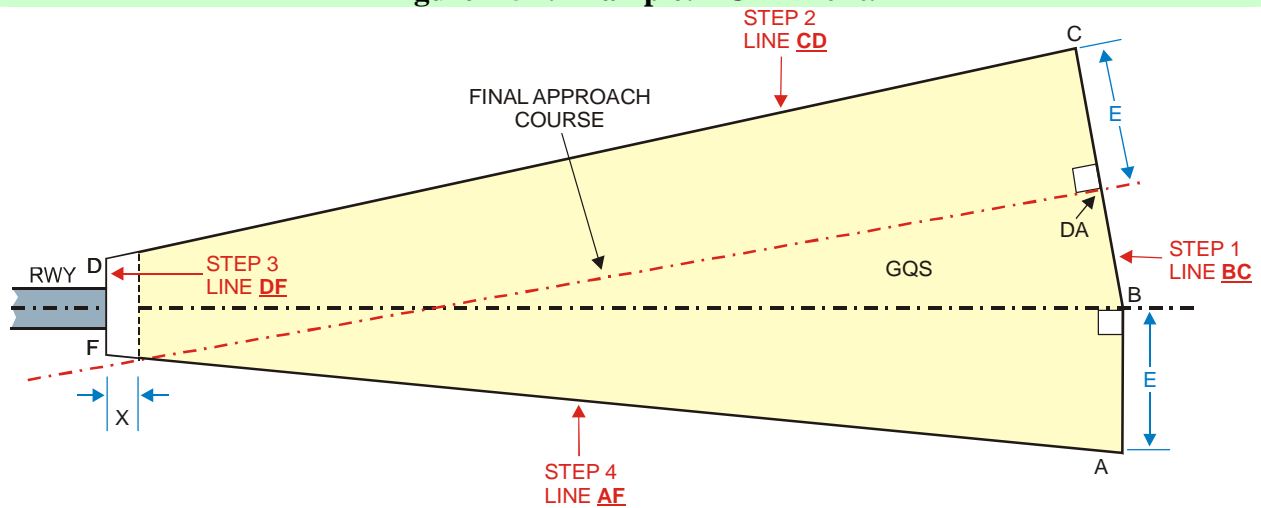


Figure 2-5E. Example: TCH $<$ 40 ft.



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

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

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

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

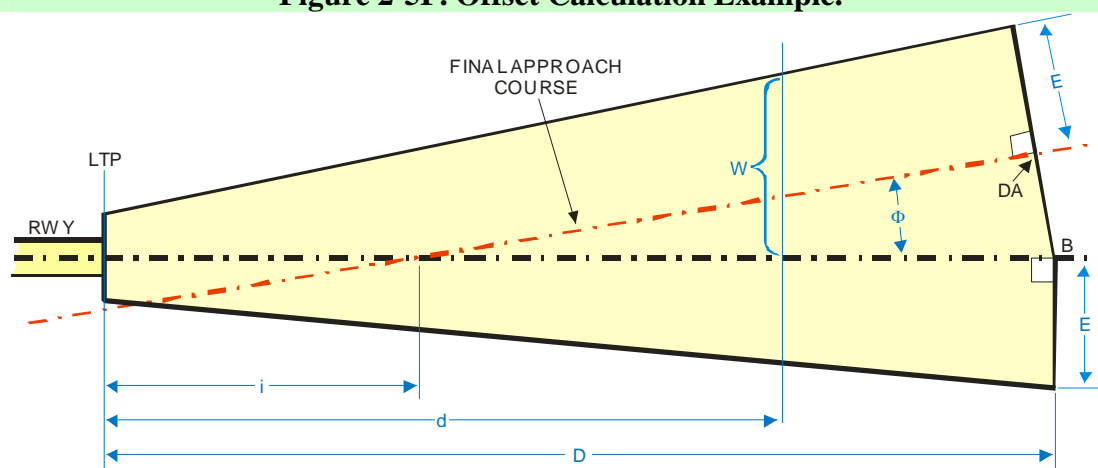
i = distance (ft) from LTP to RWY centerline intersection

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

θ = degree of offset

$$E = 0.036D + 392.8$$

Figure 2-5F. Offset Calculation Example.



Example

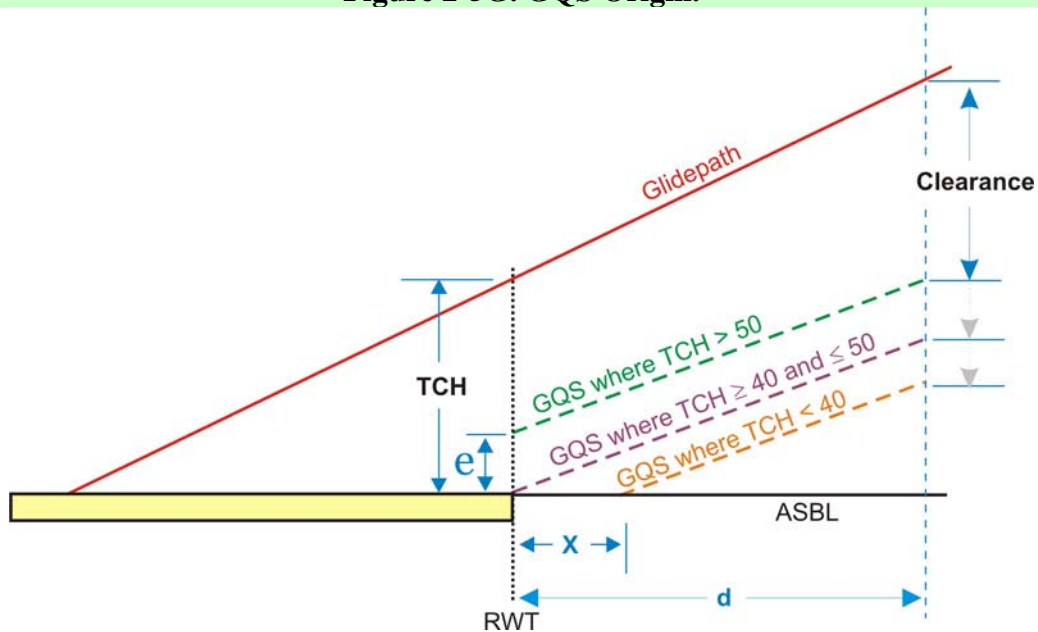
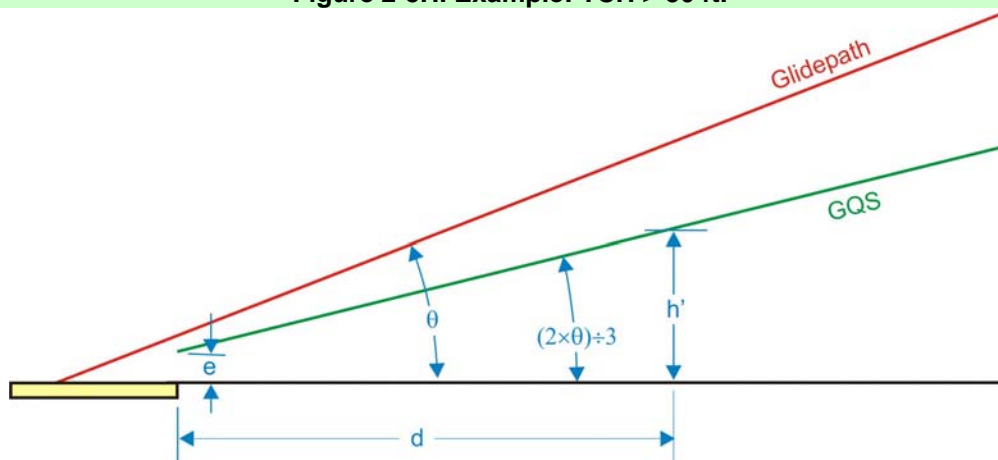
$$d = 2,300 \quad i = 1,800 \quad D = 3,200 \quad RW = 150 \quad \phi = 5^\circ \quad e = 508 \quad k = 175$$

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

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:

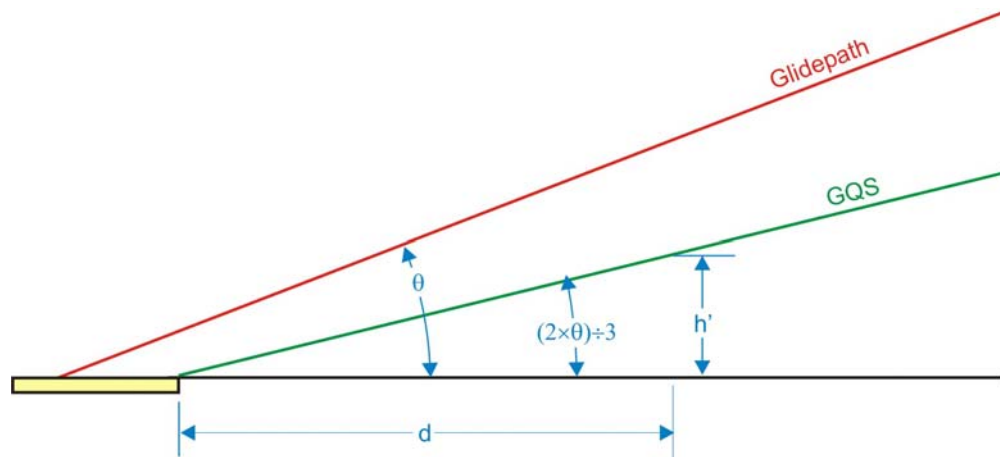
$$h = (d - x) \tan\left(\frac{2\theta}{3}\right) + e$$

Figure 2-5G. GQS Origin.**Figure 2-5H. Example: TCH > 50 ft.**

Example:

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

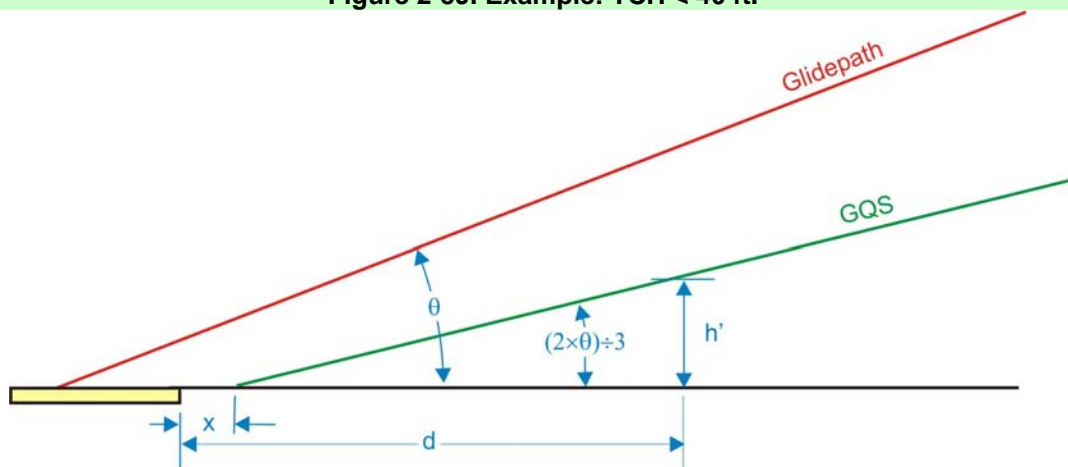
Figure 2-5I. Example: TCH ≥ 40 ft and ≤ 50 ft.



Example:

$$(3,000 - 0) \times \tan\left(\frac{2 \times 3}{3}\right) + 0 = 104.76'$$

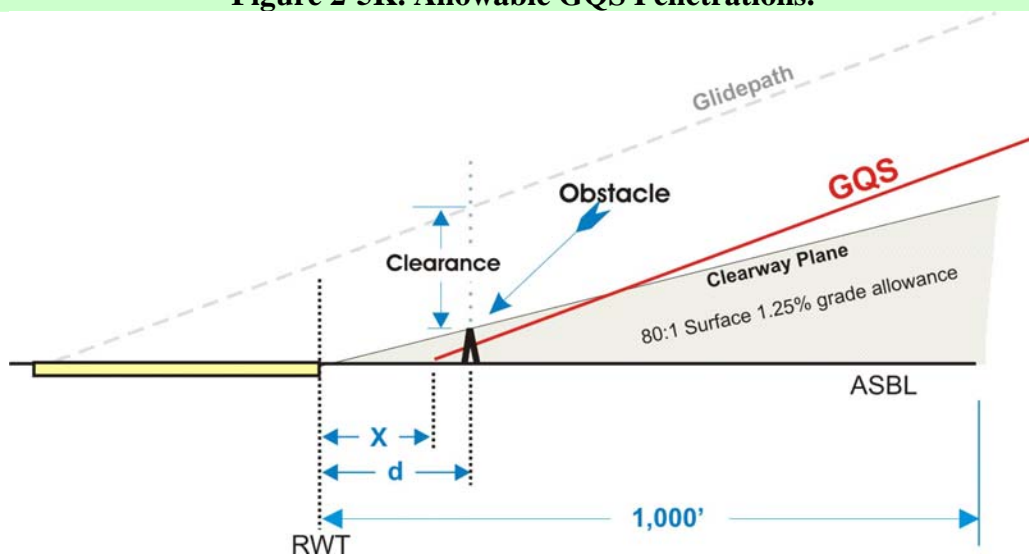
Figure 2-5J. Example: TCH < 40 ft.



Example:

$$(3,000 - 57.24) \times \tan\left(\frac{2 \times 3}{3}\right) + 0 = 102..76'$$

- 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.

Appendix B. Administrative Information

1. Distribution. We will distribute this notice to the branch level in Offices of Airport Safety and Standards and Communications, Navigation, and Surveillance Systems; Air Traffic Organization, Aircraft Certification, and Flight Standards Services in Washington Headquarters, including the National Flight Procedures Office and the Regulatory Standards Divisions at the Mike Monroney Aeronautical Center; to branch level in the regional Flight Standards and Airports Divisions; and to all Flight Standards District Offices (FSDOs).

2. 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), localizer performance with vertical guidance (LPV), transponder landing system (TLS), precision approach radar (PAR), and localizer-type directional aid (LDA) with glide slope. Three-dimension 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.