Airport 20 to 1 Visual Surface

2014 HERSHEY AIRPORTS CONFERENCE
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20 to 1 Surface Area Criteria

• 14 CFR Part 77; AC 150/5300-13A; & Terminal Instrument Procedures (TERPS / FAAO 8260.3)
  - Each Support and protect airport’s approach surface areas
  - Resources all have different parameters

• Obstructions
  - Hot Item: 20 to 1 penetrations
  - Identify, validate and mitigate
Subpart A—General

§77.1 Purpose.

This part establishes:

(a) The requirements to provide notice to the FAA of certain proposed construction, or the alteration of existing structures;

(b) The standards used to determine obstructions to air navigation, and navigational and communication facilities;

(c) The process for aeronautical studies of obstructions to air navigation or navigational facilities to determine the effect on the safe and efficient use of navigable airspace, air navigation facilities or equipment; and

(d) The process to petition the FAA for discretionary review of determinations, revisions, and extensions of determinations.

Source: http://www.ngs.noaa.gov/AERO/oisspec.html
20 to 1 Approach Surface (Part 77)

Federal Aviation Administration

AC 150/5300-13A

Subject: Airport Design  Date: 9/28/2012  AC No: AC 150/5300-13A
Initiated by: AAS-100  Change:

1. What is the purpose of this advisory circular (AC)?

This AC contains the Federal Aviation Administration’s (FAA) standards and recommendations for airport design.

3. To whom does this AC apply?

The FAA recommends the standards and recommendations in this AC for use in the design of civil airports. In general, use of this AC is not mandatory. The standards and recommendations contained in this AC may be used by certificated airports to satisfy specific requirements of Title 14 Code of Federal Regulations (CFR) Part 139, Certification of Airports, subparts C (Airport Certification Manual) and D (Operations). Use of this AC is mandatory for all projects funded with federal grant monies through the Airport Improvement Program (AIP) and/or with revenue from the Passenger Facility Charges (PFC) Program. See Grant Assurance No. 34, Policies, Standards, and Specifications, and PFC Assurance No. 9, Standards and Specifications.
20 to 1 Approach Surface (150/5300-13A)

Table 3-2. Approach/departure standards table

<table>
<thead>
<tr>
<th>Runway Type</th>
<th>DIMENSIONAL STANDARDSa</th>
<th>Slope OCS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>feet (meter)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>A (0) B (37) C (91) D (152) E (250)</td>
<td>15:1</td>
</tr>
<tr>
<td>2</td>
<td>A (76) B (213) C (350) D (457) E (586)</td>
<td>20:1</td>
</tr>
<tr>
<td>3</td>
<td>A (81) B (122) C (1158) D (3048) E (586)</td>
<td>20:1</td>
</tr>
<tr>
<td>4</td>
<td>A (61) B (244) C (1158) D (3048) E (586)</td>
<td>20:1</td>
</tr>
<tr>
<td>5</td>
<td>A (61) B (244) C (1158) D (3048) E (586)</td>
<td>20:1</td>
</tr>
<tr>
<td>6</td>
<td>A (81) B (1520) C (3048) D (3048) E (3048)</td>
<td>30:1</td>
</tr>
<tr>
<td>7</td>
<td>A (61) B (244) C (3048) D (3048) E (3048)</td>
<td>30:1</td>
</tr>
<tr>
<td>8</td>
<td>A (61) B (244) C (3048) D (3048) E (3048)</td>
<td>30:1</td>
</tr>
<tr>
<td>9</td>
<td>Departure runway ends for all instrument operations.</td>
<td>40:1</td>
</tr>
</tbody>
</table>

Notes:
1. Marking and lighting of obstacle penetrations to this surface or the use of a Visual Guidance Slope Indicator (VGS), as defined by Order 8260.3, may avoid displacing the threshold.
2. 10,000 feet (3048 m) is a nominal value for planning purposes. The actual length of these areas is dependent upon the visual descent point position for 20:1 and 34:1, and DA point for the 30:1.
3. When objects exceed the height of the GQS: an APV (ILS, PAR, LPV, LNAV/VNAV, etc.) is not authorized. Refer to Table 3-4 and its footnote 3 for further information on GQS.
4. Dimension A is measured relative to TODA (to include clearway).
5. Surface dimensions / OCS slope represent a nominal approach with 3 degree Glide Path Angle (GPA), 50 feet (15 m) TCH, < 500 feet (152 m) HAT. For specific cases, refer to Order 8260.3. The OCS slope (30:1) supports a nominal approach of 3 degrees (also known as the GPA). This assumes a TCH of 50 feet (15 m). These degrees are commonly used for ILS systems and VGS, aiming angles. This approximates a 30:1 approach slope that is between the 34:1 and the 20:1 approach surfaces of Part 77. Surfaces cleared to 34:1 should accommodate a 30:1 approach without any obstacle clearance problems.
6. For runways with vertically guided approaches the criteria in row 8 is in addition to the basic criteria established within the table, to ensure the protection of the GQS.
7. For planning purposes, determine a tentative DA based on a 3 degree GPA and a 50-foot (15 m) TCH.

(150/5300-13A cont)
Obstructions / Identify, Validate & Mitigate

• FAA – responsible for regular airspace reviews using TERPS and AC’s to evaluate effects of existing/proposed obstructions under FAR Part 77
• Airports – responsible to ensure approach surfaces remain clear under applicable grant assurances, as well as 14 CFR Part 139
  - - https://www.faa.gov/air_traffic/flight_info/aeronav/procedures/
• Hot Issue: 20 to 1 visibility surface area
  - - Loss of night time approach capability
  - - Michael O’Donnell letter to all airports

Letter to Airport Sponsors

• Advises on the need to maintain the 20:1 visual area surfaces clear of obstacles
• Notifies that some hazards that are considered “high” risk will require immediate cancellation of procedures
• reminds obligated airports of their “obligations” under grant assurances 20 & 21 , as well as Part 139
• FP Gateway Link: https://www.faa.gov/air_traffic/flight_info/aeronav/procedures/
Steps to review list on gateway:

1. Select the URL (link) to IFP Gateway
2. On the left side of the website, under Instrument Flight Procedure Information Gateway you will see 5 arrows pointing to five different links.
3. Select the first arrow: IFP Announcements & Reports.
4. Now in the center of the page under the header "IFP Announcements/Report Table", click on the link for the “Periodic Review List” and select OPEN.

20 to 1 Approach Surface (TERPS)

Figure 3-2b. Straight-in Visual Area.

Formula 3-3b. Straight-in Visual Area 1/2 width

\[ \frac{1}{2}W = (0.138 \cdot d) + k \]

Where \(1/2W\) = perpendicular distance from RCL (extended) to edge of area
\(d\) = distance (ft) measured along RCL from area origin
\(k\) = 200 for Cat A/B, 400 for Cat C/D/E

\[ 0.138d + k \]
20 to 1 Penetrations

• Can be identified and reported by various offices; EFPT, OKC ANP, State aviation, flight inspection; and soon, GIS tool
  - - Mandatory biennial reviews / OKC ANP

• Result in loss of night time capability

• Daytime visibility restricted to 1 SM

Identified 20 to 1 Penetrations

Typical scenario:

• During biennial review of airport’s procedure(s) OKC development branch identifies unvalidated penetrations.

  - - Specialist’s findings are forwarded to EFPT, assigning each penetration with risk assessment of high, medium or low.

  - - EFPT adds GoogleEarth overlay to the file
20 to 1 penetrations (cont)

- Within 3-business days, file is forwarded to airport requiring sponsor to validate each penetration ASAP, but no more than 30-days / ADO copied

- Airport owner/sponsor must provide a written report and copy ADO

- No response received within prescribed timeframe will result in IAP visibility minima and night capability as required.

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Airport Owner / Sponsor Response

- If 20 to 1 penetrations determined invalid
  - EFPT will notify applicable offices to update airport’s data file(s); no action required to restrict or modify subject IAP.

- If 20 to 1 penetrations determined valid:
  - Submit written compliance plan
  - Remove, light or lower
  - Actions taken per risk Assessment criteria
Attachment 1. 20:1 RISK ASSESSMENT

**HIGH RISK**
(more than 11 feet)
Immediately restrict IAP visibility to at least 1 SM and if unlit night operations (e.g., using a Notice to Airmen (NOTAM) or a Notice of Proposed Amendment). Submit compliance plan as soon as possible but no later than 30 days. IAP restrictions will remain until penetration(s) are mitigated.

**MEDIUM RISK**
(more than 3 feet and up to 11 feet)
- No immediate IAP actions
- Submit compliance plan as soon as possible but no later than 30 days
- Mitigate penetrations as soon as possible but not to exceed 180 days

**LOW RISK**
(3 feet or less)
- No immediate IAP actions
- Submit compliance plan as soon as possible but not later than 30 days
- Mitigate penetrations as soon as possible but not to exceed one year

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Attachment 3. Timelines and IAP Restrictions

<table>
<thead>
<tr>
<th>RISK CATEGORIES</th>
<th>Obstacle Penetrates 20:1 by</th>
<th>Verification Timelines</th>
<th>IAP Restrictions if 20:1 are valid</th>
<th>Compliance Plan Timelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>More than 11 feet</td>
<td>Not to exceed 30 days</td>
<td>Immediately restrict IAP visibility and if unlit restrict night operations (e.g., using a Notice to Airmen (NOTAM) or a Notice of Proposed Amendment)</td>
<td>IAP Restrictions will remain until penetration(s) are mitigated</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>More than 3 feet and up to 11 feet</td>
<td>Not to exceed 30 days</td>
<td>No immediate action</td>
<td>30 days for Compliance Plan &amp; 1 year to light, lower, or remove</td>
</tr>
<tr>
<td>LOW</td>
<td>3 feet or less</td>
<td>Not to exceed 30 days</td>
<td>No immediate action</td>
<td>30 days for Compliance Plan &amp; 1 year to light, lower, or remove</td>
</tr>
</tbody>
</table>

NOTE: Verification and compliance timelines should be completed as soon as possible but not to exceed the specified time frames. If any of the IAP restrictions are not met, the obstruction cannot be approved.
Alternate Mitigation

- Actions specified by Risk Assessment don’t preclude application of currently approved methods:
  - Visual Glideslope Indicator (VGSI)
  - Application of ILS / LOC / LPV / LP Full-Scale Deflection
  - If applicable, restriction of only the effected aircraft category; restrict CAT C/D vs CAT A/B

VGSI Mitigation Checklist

- EFPT provides, sponsor fills out and returns
- VGSI / must be sited IAW FAA JO 6850.2B
- Owner of VGSI must ensure that a commissioning flight inspection was performed and meets the current tolerance IAW FAAO 8200.1B, Ch 7
- VGSI must be under a current Recurring Maintenance program IAW AC 150/5340-26B, para 5.7.
VGSI Mitigation / Temporary

- Temporary waiver good for 30 days; if permanent waiver applied for within the 30 days, temporary is automatically extended additional 30 days

- VGSI: no restrictions; clear OCS; angle equal to or less than IAP’s angle; TCH no more than 15 FT higher than IAP TCH; VDP not published and visibility no lower than 1 SM

- Must be flight inspected for permanent waiver

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Full-Scale Deflection

Attachment 2. Temporary Mitigation of Unlighted 20:1 Obstacle Penetrations Associated with ILS, Localizer, LPV, and LP Instrument Approach Procedures

A temporary waiver to Order 8260.3, volume 1, chapter 3, paragraph 3.3.2c(2)(b) is approved for ILS, localizer, LPV, or LP IAPs to be used at night provided:

a. The final course is aligned within 0.03 degrees of the runway centerline (RCL) extended and the course passes through the landing threshold point (LTP) within +/- 5 feet. This attachment does not apply to localizer back course procedures.

b. A Visual Descent Point is not published and visibility is not lower than one statute mile/5000 RVR.

c. The unlighted obstacle is located outside the full-scale deflection of the ILS, localizer, LPV, or LP final approach. Determine deflection as follows:

(1) ILS and localizer. Calculate full-scale deflection of the localizer course at the obstacle’s distance from LTP using formula 2-1. See Figure 2-1.
Formula 2-1. Localizer Deflection at Obstacle's Distance From LTP

\[
\text{DEFLECTION} = \frac{(d+OBS_x) \times \tan \left( \theta \times \frac{\pi}{180} \right)}{2}
\]

Where
- \( \theta \) = commissioned width of localizer in degrees
- \( d \) = distance (feet) of localizer antenna to LTP
- \( OBS_x \) = distance (feet) LTP to point on RCL extended abeam obstacle

Figure 2-1. Localizer Deflection

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(2) LPV and LP.

(a) Determine the lateral guidance sector angle (LGSA) to be used in calculations for full scale deflection of the LPV/LP signal using formula 2-2. Refer to the procedure’s Final Approach Segment (FAS) data block to obtain the course semi-width at LTP and the location of the Flight Path Alignment Point (FPAP).

Formula 2-2. LGSA

\[
\text{LGSA} = \tan \left( \frac{\text{CW}_{TP}}{d_{\text{LTP}}} \right) \times \frac{180}{\pi}
\]

Where
- \( \text{CW}_{TP} \) = Semi-width of the lateral course at the LTP (converted to feet)
- \( d_{\text{LTP}} \) = Distance from the LTP to the FPAP, plus an additional 1000 feet

(b) Calculate full scale deflection of the LPV/LP signal at the obstacle’s distance from LTP using formula 2-3. See figure 2-2.
Mitigate by Aircraft Category

- Most common GA 20 to 1 issue
  - Runway type often, e.g., BII
  - Charted minima CAT C/D
  - CAT A/B begins at +/- 200 FT
  - CAT C/D begins at +/- 400 FT

- Airport cannot clear larger surface area
  - Other mitigation N/A (VGSI/Deflection)
  - Restrict CAT C/D minima only
HZL R28
Type 2
Threshold
Siting
Surface

HZL R28
CAT A & B
in red
What is in the works?

- Revision to the Airports GIS site to include a Surface Analysis and Visualization (SAV) “20:1” tool
- will allow running analysis, generating surfaces, and visualizing the penetrations
- Currently in pilot phase in Alaska Region. Anticipate roll out in the near future.
Questions?

THANK YOU!

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