U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

NOTICE
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12/22/07

SUBJ: PRECISION APPROACH OBSTACLE ASSESSMENT AND CATEGORY II/III REQUIREMENTS

1. PURPOSE. This notice provides Flight Standards' guidance for airport obstacle clearance criteria for precision Category (CAT) I/II/III obstacle free zones (OFZ) and the relationship to glide slope antenna placement and taxiing/parked aircraft. Appendix 1 contains the current criteria and guidance for CAT I/II/III OFZ. The three directives mentioned in paragraph 1 of appendix 1 provide the airport and facility requirements to support approval of CAT I, II, and III precision operations. Appendix 2 contains the Runway/Parallel Taxiway Separation.

2. DISTRIBUTION. This notice is distributed in Washington headquarters to the branch level in the Offices of Airport Safety and Standards, Communications, Navigation, and Surveillance Systems; the Air Traffic Organization (Safety, En Route and Oceanic Services, Terminal Services, System Operations Services, and Technical Operations Services), and Flight Standards Service; to the National Aeronautical Charting Group (AJW-35), Requirements and Technology Team; to the National Flight Procedures Group (AJW-32); to the Regulatory Standards Divisions (AMA-200) at the Mike Monroney Aeronautical Center; to branch level in the regional Flight Standards and Airports Divisions; to the Air Traffic and Technical Operations Service Areas; to Flight Standards District Offices (FSDOs); Special Mailing List ZVS-827; and to special Military and Public addressees. This information is also available on the FAA's Web site at http://fsims.avr.faa.gov/fsims/fsims.nsf.

3. BACKGROUND. This document is a safety initiative to publish current guidance for airport obstacle clearance criteria. This information was published in Advisory Circular (AC) 120-29, Criteria for Approval of Category I and Category II Weather Minima for Approach. However, when it was revised in August 2002, a recommendation was made to remove these criteria and place them in Order 8260.3B, United States Standard for Terminal Instrument Procedures (TERPS). The revision of AC 120.29A did not coincide with Order 8260.3B; therefore, this guidance needs to be made available while it is being processed for inclusion in TERPS.

4. DISPOSITION. The criteria and standards provided in appendixes 1 and 2 will be published in Order 8260.3B.

James J. Ballough
Director, Flight Standards Service

Distribution: A-W(AS/ND/AT/AF/IR/FS)-3; AJW-35 (15 Cys); AJW-32 (200 Cys); AMA-200 (12 Cys); A-X(FS/AF/AT/AS)-3; A-FFS-7 (STD); ZVS-827; Special Military and Public Addressees

Initiated By: AFS-420

APPENDIX 1. PRECISION APPROACH OBSTACLE ASSESSMENT AND CATEGORY II/III REQUIREMENTS

1.0 GENERAL.

General precision obstacle clearance criteria are contained in Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS), Volume 3. Airport and facility requirements to support approval of Category (CAT) I, II, and III precision operations are contained in the latest editions of the following directives:

- AC 120-29, Criteria for Approval of Category I and Category II Weather Minima for Approach.
- AC 120-28, Criteria for Approval of Category III Weather Minima for Takeoff, Landing, and Rollout.
- Order 6750.24, Instrument Landing System (ILS) and Ancillary Electronic Component Configuration and Performance Requirements.
- Order 8400.8 , Procedures For The Approval Of Facilities For Far Part 121 And Part 135 Cat IIII Operations
- Order 8400.13, Procedures for the Approval of Special Authorization Category II and Lowest Standard Category I Operations.

2.0 ACCEPTABLE OBSTACLES.

Some equipment essential to flight operations is permitted in the OFZ and/or specified TERPS surfaces. An obstacle may be considered acceptable when its type is permitted to be excluded in the specific area/surface where it is physically located, and it meets the prerequisites for exclusion described in the following paragraphs and in table 1. Surface penetrations by acceptable obstructions require no adjustment of minima, and the procedure may be considered "unrestricted". Any object "fixed by function" on a runway crossing or adjacent to a CAT II or III runway must also conform to the specified conditions.

2.1 ALL VISUAL AIDS ON FRANGIBLE MOUNTS.

Visual aids (to include visual glide slope indicator (VGSI), taxiway signage, runway distance remaining markers, etc.) installed in accordance with (IAW) the latest editions of Order 6850.2, Visual Guidance Lighting Systems, and Advisory Circular 150/5340-18, Standards for Airport Sign Systems, are acceptable obstacles excluded from TERPS consideration.

2.2 NAVIGATIONAL AID (NAVAID) AND AUTOMATED SURFACE OBSERVING SYSTEM (ASOS) COMPONENTS.

The minimum siting distance for glide slope shelter, precision approach radar (PAR), runway visual range (RVR), and ASOS components (except wind sensor

towers) is specified in AC 150/5300-13, Airport Design and Order 6560.10, Runway Visual Range. In order for one of these components to be considered acceptable for TERPS, it must be located at least 400 ft from runway centerline and must not exceed a height of 15 ft above the elevation of the point on the runway centerline abeam them. ASOS wind sensors exceeding 15 ft above the runway centerline elevation but sited in accordance with the ***Federal Standard for Siting Meteorological Equipment at Airports*** are also considered acceptable obstacles. Obstacles more than 15 ft above the runway centerline elevation may be permitted if the minimum distance from the runway centerline is increased 10 ft for each foot the structure exceeds 15 ft. Frangible PAR reflectors are not considered obstacles.

Table 1. Acceptable Obstructions.

Obstacle type	Location	Prerequisite for Exclusion
Visual Navigation Aids * VGSI (PAPI, PVASI, VASI, etc.) Approach light Systems REILS Airport Beacon Visual Landing Aids (Wind Cone, etc.) Airport Signage	o Final W, X o Inner Approach OFZ o Missed Section 1 A,B,C,D A1	* *only when installed IAW applicable siting standard (i.e., Order 6850.2, AC 150/5340-30, or military equivalent, etc.)*
Electronic NAVAIDs/Components # ILS Glideslope Shelter PAR components Radar reflectors on frangible mounts Glideslope Antenna † Localizer Antenna serving opposite runway £	o Final W, X o Inner Approach OFZ o Missed Section 1 A,B,C,D, A1	# *only when installed IAW applicable siting standards, AC 150/5300-13 or military equivalent* † *only when meets par 2.2.1* £ *only when meets par 4.0*
Meteorological Equipment % Cloud height sensors Visibility sensors Wind sensors Temperature/dew point sensors Lightning Detection sensor Precipitation sensors Pressure sensors AWOS/ASOS components Runway Visual Range components	o Final W, X o Inner Approach OFZ o Missed Section 1 A,B,C,D, A1	% *only when installed IAW Federal Standard for Siting Meteorological Equipment at Airports, other applicable FAA standards or military equivalents*
Taxiing/holding/Parked Aircraft/Ground Vehicles $	o Precision Final OCS (W,X,Y) o POFZ o CAT II/III Missed section 1, B, C, D, A1	$ *only when meets paragraph 2.3*

2.2.1 Glide Slope Antennas.

Glide slope antennas for CAT I procedures are not excluded from TERPS evaluation, and must remain clear of OFZs in accordance with AC 150/5300-13. For CAT II/III evaluations, glide slope antennas meeting the following standards are considered acceptable obstacles. Antenna location is referenced by measurement from the runway threshold along runway centerline (X), perpendicular distance from runway centerline (Y), and height above the runway centerline elevation abeam the antenna (Z). The minimum "Y" value (Ymin) is 250 ft for antenna masts with a "Z" value of 45 ft. For antenna masts with a "Z" value > 45 ft, the Ymin distance from runway centerline is increased 10 ft laterally for each foot the antenna height exceeds 45 ft. Calculate Ymin using the formula below.

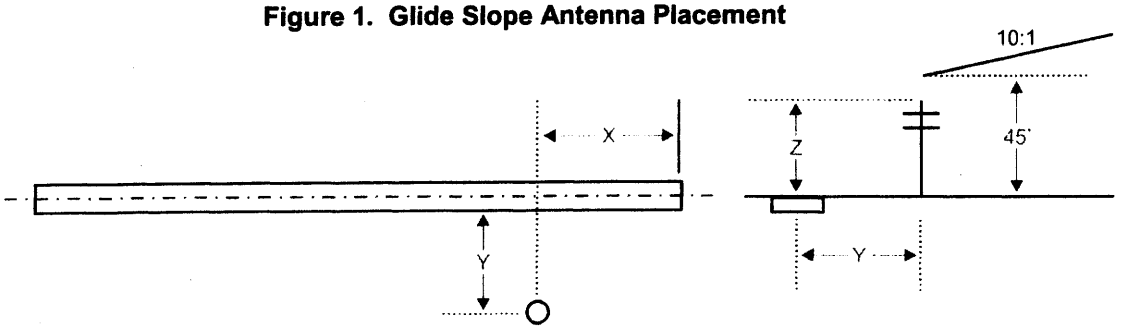
$$Y_{min} = 10Z - 200$$

Simplified from

$$Y_{min} = 250 + 10(Z - 45)$$

Antennas that penetrate a 10:1 rising surface originating 250 ft from runway centerline at a "Z" value of 45 ft require a frangible mast and Flight Technologies and Procedures Division (AFS-400) approval (see figure 1).

Figure 1. Glide Slope Antenna Placement



2.3 AIRCRAFT/GROUND VEHICLE CONSIDERATION AS OBSTACLES.

Taxiing, holding, parked aircraft and ground vehicles are considered obstacles for instrument procedure obstacle clearance. When evaluating aircraft as obstacles, consider the location of the taxiway/ramp and consider the highest aircraft surface that falls within the area (see table 2 for design group tail heights). For ground vehicles consider the road/taxiway/ramp with routine vehicle traffic and apply the appropriate height from Title 14 of the Code of Federal Regulations (14 CFR) Part 77.13(a)(3). In order to achieve the lowest landing minimums, aircraft/vehicles must not penetrate the obstacle free zone (OFZ), final, or missed approach obstacle clearance surfaces (OCS), visual segment OCS, or the precision obstacle free zone (POFZ), except as permitted below:

Table 2 lists the aircraft design group standards applicable to this document.

Table 2. Aircraft Design Groups (ADG)

Group #	Tail Height (ft)	Wingspan (ft)
I	< 20	< 49
II	20 - < 30	49 - < 79
III	30 - < 45	79 - < 118
IV	45 - < 57	118 - < 171
V	57 - < 66	171 - < 214
VI	66 - < 80	214 - < 262

2.3.1 **Precision Final Segment Obstacle Clearance Surfaces.**

Taxiing, holding, and parked aircraft/ground vehicles are considered obstacles in the final segment W, X, and Y OCS surfaces (see figure 2) unless positive controls have been established to keep the surfaces clear when aircraft on approach to the same runway are within 2 nautical miles (NM) of the landing threshold when the reported weather is less than 800 ft ceiling and/or the prevailing visibility is less than 2 statute miles (SM). Positive controls include proper placement of hold markings/signage as specified by FAA Airports Engineering Division and/or establishment of Air Traffic Control (ATC) operating procedures. Private/airport access roads that traverse one or more final segment OCS are considered acceptable when positive controls are established to either keep the surface clear when the reported weather is less than 800 - 2, or controls are in place to restrict access to vehicles necessary for the maintenance of the airport/navigation facilities of less than 10 ft in height. Controls must also prevent vehicles that penetrate the OCS from parking in the surface without being in direct contact with ATC.

2.3.2 **CAT II/III Missed Approach Section 1.**

Aircraft/ground vehicles that penetrate the CAT II/III ***missed approach surface*** may be eliminated from TERPS consideration when compliant with the minimum runway/parallel taxiway standards from AC 150/5300-13 and as described below.

2.3.2 **a. Design Groups I-IV.** Minimum runway/taxiway separation is 400 ft at sea level.

2.3.2 **b. Design Group V.** Minimum runway/taxiway separation is 500 ft at sea level.

2.3.2 **c. Design Group VI.** Minimum runway/taxiway separation is 550 ft at sea level.

2.3.2 **d. Adjust the minimum taxiway separation** described above for airports above sea level as follows:

Determine the values of the following variables:

$Y = 440 + (1.08S) - (0.024E)$
$B = 53 - 0.13S$
$C = B - (0.0022E)$
$X = C + (Y - R/5)$ or 150, whichever is lower
$Z_{SEA} = B + ((D - R)/5)$

Where E = Threshold MSL elevation
R = Runway OFZ half-width
D = Minimum runway/taxiway separation for Design Group
S = Wingspan of most restrictive aircraft (NOT SEMI-SPAN)
A = Adjusted minimum taxiway separation (round to nearest foot)

If $Z_{SEA} \leq X$

$A = D + 0.011E$

If $Z_{SEA} > X$

$A = Y + 6(Z_{SEA} - X)$

Example 1:

Threshold elevation: 841 MSL
Aircraft Design Group: V (D = 500 IAW 2.3.2b)
Wingspan of most restrictive aircraft: 214
Runway OFZ = 400

Step 1. Determine values of variables.

$Y = 440 + (1.08S) - (0.024E)$
$Y = 440 + (1.08 * 214) - (0.024 * 841)$
$Y = 440 + 231.12 - 20.184$
$Y = 650.936$

$B = 53 - 0.13S$
$B = 53 - 0.13 * 214$
$B = 25.18$

$C = B - (0.0022E)$
$C = 25.18 - (0.0022 * 841)$
$C = 23.3298$

$X = C + ((Y - R)/5)$ or 150, whichever is lower
$X = 23.3298 + ((650.936 - 200)/5)$
$X = 23.3298 + (90.188)$
$X = 113.5178$

Z_{SEA} = B + ((D - R)/5)
Z_{SEA} = 25.18 + ((500 - 200)/5)
Z_{SEA} = 25.18 + (60)
Z_{SEA} = 85.18

Step 2. Determine formula to apply.

Z_{SEA} (85.18) ≤X (113.5178)

A = D + 0.011E
A = 500 + 0.011 * 841
A = 509.25 (round up to 510)

Example 2:

Threshold elevation: 5883 MSL
Aircraft Design Group: II (D = 400 IAW 2.3.2a)
Wingspan of most restrictive aircraft: 78

Step 1. Determine values of variables.

Y = 440 + (1.08S) - (0.024E)
Y = 440 + (1.08 * 78) - (0.024 * 5883)
Y = 440 + 84.24 - 141.192
Y = 383.048

B = 53 - 0.13S
B = 53 - (0.13 * 78)
B = 53 - 10.14
B = 42.86

C = B - (0.0022E)
C = 42.86 - (0.0022 * 5883)
C = 42.86 - 12.9426
C = 29.9174

X = C + ((Y – R)/5) or 150, whichever is lower
X = 29.9174 + ((383.048 - 200)/5)
X = 29.9174 + (36.6096)
X = 66.527

Z_{SEA} = B + ((D - R)/5)
Z_{SEA} = 42.86 + ((400-200/5)
Z_{SEA} = 42.86 + (40)
Z_{SEA} = 82.86

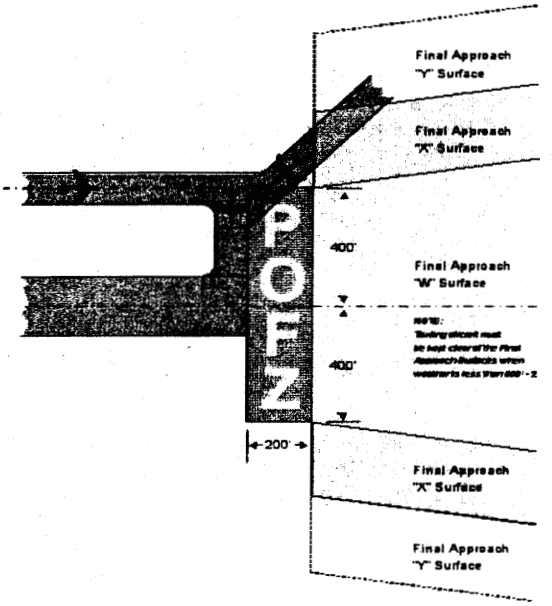
Step 2. Determine formula to apply.

Z_{SEA} (82.86) > X (66.527)

$A = Y + 6(Z_{SEA} - X)$
$A = 383.05 + 6(82.86 - 66.527)$
$A = 383.05 + 6(16.333)$
$A = 383.05 + 97.998$
$A = 481.048$ (round to 482)

2.3.3 **Precision Obstacle Free Zone (POFZ).** Applicable to any runway served by a vertically-guided approach with landing minimums less than 250 ft height above touchdown (HAT) and/or prevailing visibility less than 3/4 SM or RVR 4000. Taxiing, holding, and parked aircraft/ground vehicles are considered obstacles in the POFZ (see figure 2), unless positive controls have been established to keep the surface clear when aircraft on approach are within 2 NM of the landing threshold when the reported weather is less than 300 ft ceiling and/or the prevailing visibility is less than 3/4 SM/RVR 4000. The area is considered clear when the tail and/or fuselage of a taxiing aircraft does not penetrate the POFZ. Additionally, the wing of aircraft holding on a perpendicular taxiway, waiting for runway clearance, may penetrate the POFZ, however, the fuselage or tail must not infringe the area. Positive controls include proper placement of hold markings/signage as specified by FAA Airports Engineering Division and/or establishment of Air Traffic Control operating procedures. Private/airport access roads, that traverse the POFZ, are considered acceptable when positive controls are established to either keep the surface clear when the reported weather is less than 300 - 3/4, or restrict access to vehicles necessary for the maintenance of the airport/navigation facilities of less than 10 ft in height. Controls must also prevent vehicles from parking in the POFZ without being in direct contact with ATC.

Figure 2. POFZ/Final Segment Obstacle Clearance Surfaces



2.4 FAILURE TO MEET STANDARDS AS AN ACCEPTABLE OBSTACLE.

Where the above standards cannot be met, consider the following actions to eliminate, limit, or mitigate a breach of the standards under paragraph 2.3.

2.4.1 Remove the obstacle.

2.4.2 Increase the HAT/visibility.

2.4.3 Modify aircraft taxi routes, limit access to private roads, or establish positive controls to keep the applicable surfaces clear.

2.4.4 Increase the Hold Line distance.

3.0 INSTRUMENT LANDING SYSTEM/MICROWAVE LANDING SYSTEM (ILS/MLS) CRITICAL AREA.

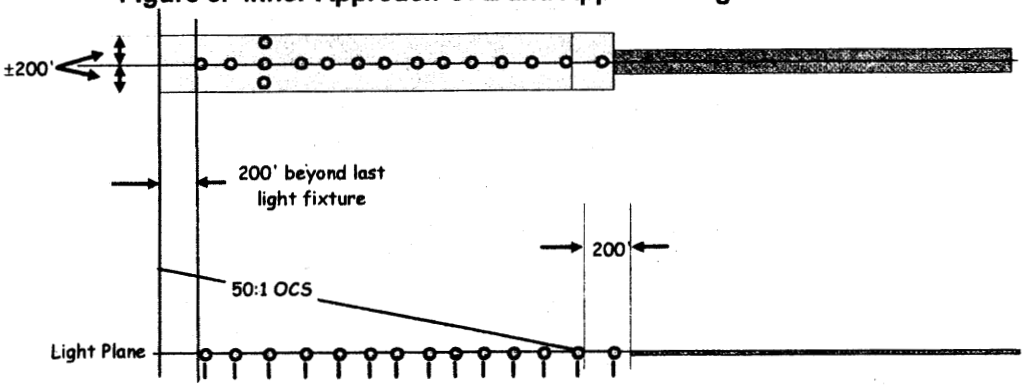
Precision approach system critical areas are described in Orders 6750.16, Siting Criteria for Instrument Landing Systems, and 6830.5, Criteria for Siting Microwave Landing Systems. CAT II/III ILS glide slope, localizer, and obstacle critical areas will be marked and lighted to ensure that ground traffic does not violate these areas during CAT II or III operations (except as allowed in Order 7110.65, Air Traffic Control).

4.0 APPROACH LIGHT AREA.

Airports operators are responsible for maintaining obstruction requirements associated with airport visual aids. Obstructions must not penetrate the approach light plane (see figure 3) or the inner-approach OFZ in accordance with AC 150/5300-13 and other applicable directives (Order 6850.2, AC 150/5340-30). For approach light plane clearance purposes, consider all roads, highways, vehicle parking areas, and railroads as vertical solid objects. Make the clearance required above interstate highways 17 feet, for railroads 23 feet, and for all other roads, highways, and vehicle parking areas 15 feet. Measure the clearance for roads and highways from the crown and edges of the road and make measurements for railroads from the top of rails. Make measurements for vehicle parking areas' clearances from the grade in the vicinity of the highest point. Airport service roads, where vehicular traffic is controlled in any manner that would preclude blocking the view of the approach lights by landing aircraft, are not considered as obstructions in determining the approach light plane.

NOTE: The OFZ clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible **visual NAVAIDs that need to be located in the OFZ because of their function. A localizer antenna serving the opposite runway end may penetrate the approach light plane if it does not obscure the approach lights or penetrate the inner-approach OFZ.*

Figure 3. Inner Approach OFZ and Approach Light Area Plane



5.0 REQUIREMENTS FOR CAT I PRECISION OPERATIONS.

5.1 OBSTACLE FREE ZONE (OFZ) REQUIREMENTS.

The OFZ requirements contained in AC 150/5300-13 appropriate for precision runways must be met to enable CAT I landing operations.

5.2 LIGHTING REQUIREMENTS.

See Order 8260.3, Volume 3.

5.3 MINIMUMS.

See Order 8260.3, Volume 3, table 2-2B.

5.4 FINAL AND MISSED APPROACH EVALUATIONS.

See Order 8260.3, Volume 3, chapters 1-3.

6.0 REQUIREMENTS FOR CAT II PRECISION OPERATIONS.

The CAT I requirements of paragraph 5 apply. In addition, the following criteria apply.

6.1 OFZ REQUIREMENTS.

Apply the OFZ standards described in AC 150/5300-13.

6.2 LIGHTING REQUIREMENTS (USN/USAF: apply appropriate military directives).

CAT II required lighting includes the following:

6.2.1 **United States (U.S.) Standard** ALSF-1 or ALSF-2 approach lights;

6.2.2 **U.S. Standard** touchdown zone lights;

6.2.3 **U.S. Standard** runway centerline lights; and

6.2.4 **U.S. Standard** high intensity runway lights.

NOTE: Exceptions to lighting criteria may be authorized only if an equivalent level of safety can be demonstrated by an alternate means. Examples of exceptions are: substitution for required approach lighting components due to an approved specific aircraft system providing equivalent information or performance (such as an autoland system, head up display (HUD) with inertial augmented flight path vector display), or availability of redundant, high integrity, computed or sensor based runway information (e.g., high resolution radar or approved enhanced flight vision systems (EFVS)), suitably displayed to a pilot.

6.3 SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM (SMGCS).

Approved SMGCS operation per AC 120-57, Surface Movement Guidance and Control System, as required.

6.4 MARKING AND SIGNS.

Develop CAT II procedures only when the airport/runway meets applicable standards for taxiway markings and airport surface signs for CAT II precision operations (or ICAO equivalent at Non-United States airports). CAT II hold lines should be marked in accordance with 14 CFR Part 139.311 and AC 150/5340-1, Standards for Airport Markings. Runway markings must meet applicable standards to allow CAT II precision operations unless approved by AFS-400. Other guidance, such as Order 6750.24, Instrument Landing System and Ancillary Electronic Component Configuration and Performance Requirements, OpSpecs, and an approved SMGCS plan, may permit operational contingencies or exceptions. Examples of these actions are: snow removal, rubber deposit removal on runway touchdown zone markings or centerline markings, critical area hold line or runway centerline marking repainting, runway hold line sign snow removal, etc.

6.5 AN UNRESTRICTED CAT I PROCEDURE.

The CAT I final approach segment obstacle evaluation applies to the CAT II approach authorization. The CAT I procedure must support a 200-ft HAT and lowest possible visibility (no restrictions incurred by lack of infrastructure or obstacle surface penetrations).

NOTE: The final course alignment must be coincident with the runway centerline.

6.6 OPERATIONAL AIR TRAFFIC CONTROL TOWER (ATCT).

An operating on-airport ATCT must support CAT II ground and flight operations. If the ATCT does not provide continuous service, publish a note on the chart indicating the procedure is not authorized when the tower is closed.

6.7 APPROACH MINIMUMS.

CAT II procedures require special authorization from the FAA. AC 120-29 contains equipment and flight crew qualifications. Operators desiring lower than CAT I minimums require OpSpecs authorization for air carrier operations or a Letter of Authorization (LOA) for Part 91 operations. Table 3 lists lowest authorized minimums allowed by Order 8260.3. Higher minimums may be necessary based on environmental factors in the vicinity of the airport or other Flight Standards requirements. Class II/T/2 is the minimum class of performance authorized for CAT II operations. For public Part 97 procedures, the lowest CAT II HAT/RVR values in feet are 100/1200. Table 2 lists RVR values for HAT values greater than 100.

Table 3. Lowest Public CAT II Minimums*

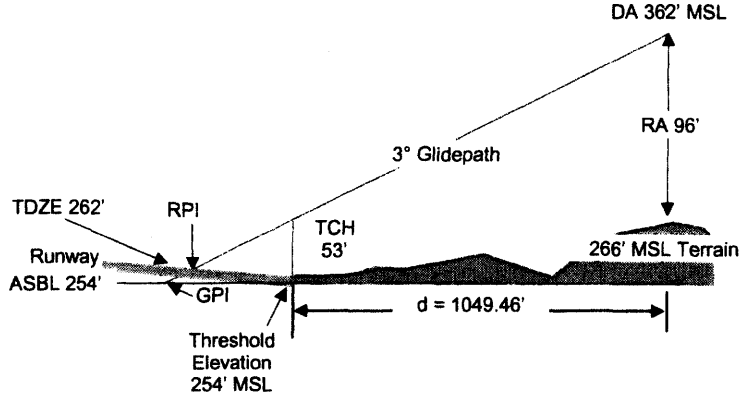
HAT (ft)	RVR (ft)
101-140 (01 - 40 adjustment)	1200
141-180 (41 - 80 adjustment)	1600
181-199 (81 - 99 adjustment)	1800

**NOTE: Chart only one set of minimums indicating the lowest authorized CAT II HAT.*

6.7.1 Calculation of Radio Altimeter (RA) Height.

To determine RA height, determine the distance (d) from landing threshold point (LTP) to the point decision altitude (DA) occurs. Obtain the terrain elevation on final approach course at distance (d) feet from LTP. Subtract the terrain elevation from the DA to calculate the RA (see figure 4).

Figure 4. Calculating RA



$$d = \frac{DA - (\text{Threshold Elev} + TCH)}{\tan(GPA)} \qquad d = \frac{362 - (254 + 53)}{\tan(3)} \qquad d = 1049.46 \text{ from LTP}$$

RA = DA - terrain elevation RA = 362 - 266 RA = 96 ft

6.8 ADJUSTMENT OF CAT II MINIMUMS.

The HAT is measured in feet from the highest elevation of the runway in the touchdown area (first 3,000 ft of runway), and visibility in RVR reported in feet. The lowest attainable values are a HAT of 100 ft and RVR of 1,200 ft. Application of CAT II obstacle clearance criteria may identify objects that exceed the allowable height in surface "A" (see paragraph 6.9.1) or penetrate the approach light surface (except allowable localizer antenna, see paragraph 4.0 Note). In such cases, adjustment to the HAT must be made as follows:

NOTE: If the adjusted HAT is greater than or equal to 200, revert to CAT I criteria.

6.8.1 Penetrations of the Final Approach Surface.

6.8.2 Penetrations of the primary (W, X) surfaces are not authorized.

Taxiing, holding, and parked aircraft are obstacles in the final segment analysis. Apply Order 8260.3, Volume 3, paragraph 3.6.3 to obstacle penetrations in the "Y" surface, except paragraph 3.6.3c is not applicable (see paragraph 6.5 Note).

6.8.3 Inner-Approach OFZ and Missed Approach Surface "A, B, C, or D."

For penetrations of the inner-approach OFZ or missed approach surface A, when an obstacle is not considered acceptable, adjust the HAT upward one foot for each foot of surface penetration and adjust the RVR, as specified in table 3. For obstacle penetrations of the missed approach surface B, C, or D, increase the RVR, as specified in table 3, as if the HAT was adjusted, but do not raise the HAT.

6.9 MISSED APPROACH SEGMENT.

6.9.1 Section 1.

The area begins at the end of the final OCS trapezoid and is aligned with a continuation of the final approach course, continuing in the direction of landing for a distance of 9,200 excluding extensions. It is comprised of 5 surfaces: surface A, surface B, surface C, surface D, and surface A1 (see figure 5). Surface A, B, C, or D must not be penetrated unless the obstacle is either deemed acceptable IAW paragraph 2.0 or the minima is adjusted (see paragraph 6.8). Surface A1 or A1 extended must not be penetrated, unless the obstacle is either deemed acceptable IAW paragraph 2.0 or the procedure is published as a Special and mitigated with a non-standard climb gradient (see paragraph 6.9.2c). Use the following formulas to calculate the MSL height of the OCS at any given distance (**X**) from threshold and (**Y**) from runway centerline:

h = MSL height of OCS
X = distance (ft) from runway threshold measured parallel to runway centerline
Y = perpendicular distance (ft) from runway centerline
e = MSL elevation of the runway centerline at distance **X**
f = MSL elevation of the runway centerline 3,000 ft from threshold

k = increase in surface width due to altitude:

If airport elevation ≤1000 MSL then $k = 0$ or

if airport elevation >1000 MSL then $k = 0.01(airportelev - 1000)$

CASE 1. Where **X** ≤ 3000' and:

Y < (200+k): $\mathbf{h} = \mathbf{e}$ A Surface

Y ≥ (200+k): $\mathbf{h} = \frac{11(\mathbf{Y} - (200 + \mathbf{k}))}{40} + \mathbf{e}$ B Surface

Y > (400+k): $\mathbf{h} = \frac{7(\mathbf{Y} - (400 + \mathbf{k}))}{40} + 55 + \mathbf{e}$ C Surface

Y > (600+k): $\mathbf{h} = \frac{\mathbf{Y} - (600 + \mathbf{k})}{10} + 90 + \mathbf{e}$ D Surface

CASE 2. Where **X** > 3000' and:

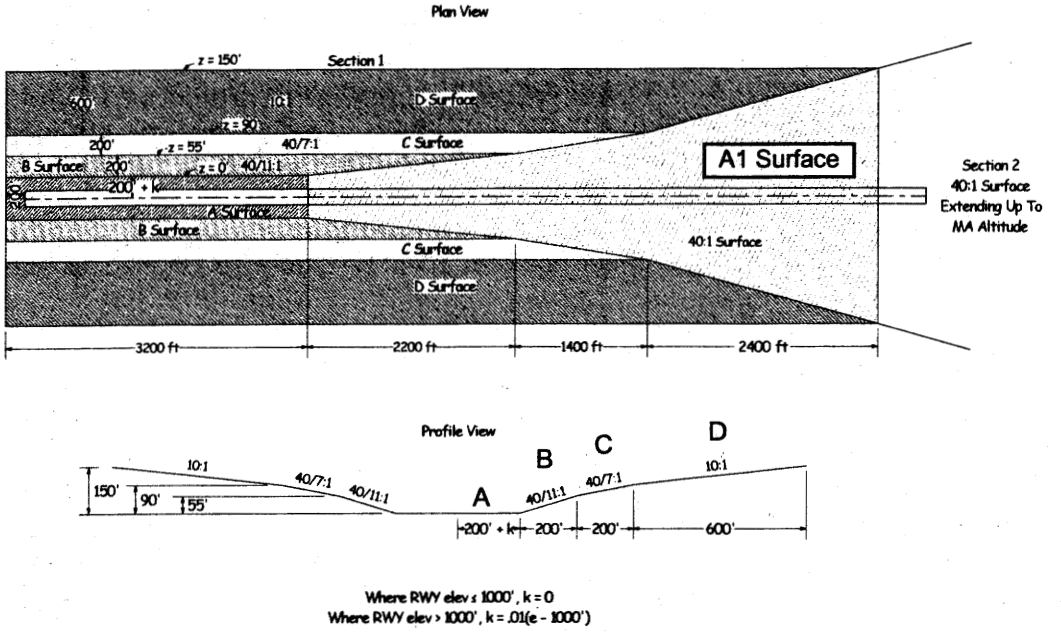
(Calculate h using the following formulas, select highest value of the 2 results)

Y > (200+k): $\mathbf{h} = \frac{11(\mathbf{Y} - (200 + \mathbf{k}))}{40} + \mathbf{e}$ (B surface), $\mathbf{h} = \frac{\mathbf{X} - 3{,}000}{40} + \mathbf{f}$ (A1 Surface)

Y > (400+k): $\mathbf{h} = \frac{7(\mathbf{Y} - (400 + \mathbf{k}))}{40} + 55 + \mathbf{e}$ (C surface), $\mathbf{h} = \frac{\mathbf{X} - 3{,}000}{40} + \mathbf{f}$ (A1 Surface)

Y > (600+k): $\mathbf{h} = \frac{\mathbf{Y} - (600 + \mathbf{k})}{10} + 90 + \mathbf{e}$ (D surface), $\mathbf{h} = \frac{\mathbf{X} - 3{,}000}{40} + \mathbf{f}$ (A1 Surface)

Figure 5. CAT II/III Missed Approach Section 1

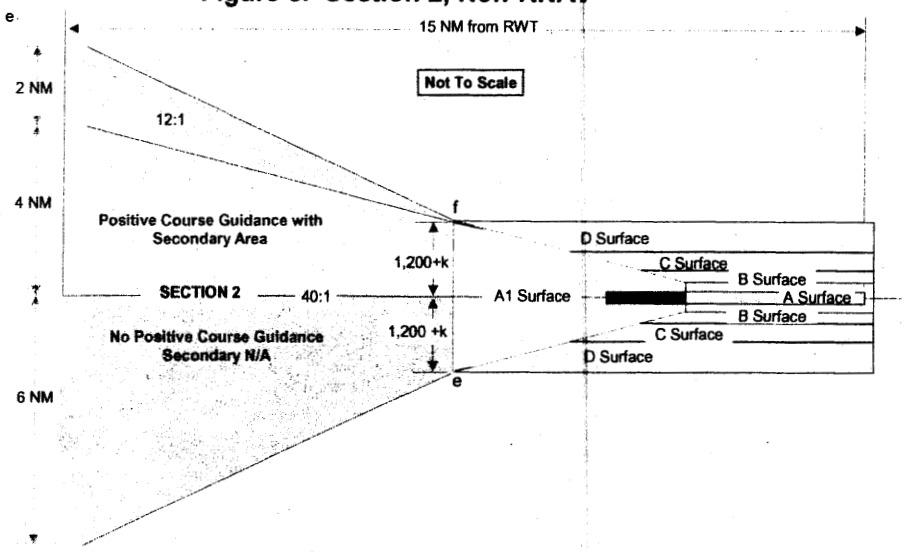


6.9.2 Section 2.

See figure 6.

6.9.2 a. Straight-Ahead Missed Approach Area (applies to turns 15 degrees or less). This area starts at the end of the A1 surface and is centered on the specified missed approach course. The width increases uniformly from +/- (1200 + k) feet at the beginning to en route width at a point 15 miles from the runway threshold. When positive course guidance is provided for the missed approach procedure, secondary reduction areas that are zero miles wide at the point of beginning and increase uniformly to initial secondary width may be added to section 2 (see figure 6).

Figure 6. Section 2, Non-RNAV



6.9.2 b. Turning Missed Approach Area. (Applies to turns of more than 15°). See figures 7, 8, and 9. Missed approach section 1 obstacle clearance surface is based on the assumption that aircraft will be 200 ft above the runway elevation at the end of the A surface at the nominal end of the A1 surface. However, the design of the turning missed approach area must consider that aircraft executing a missed approach will climb straight ahead until reaching a height of at least 400 ft above the TDZE. The A1 surface area must be extended longitudinally using the following formula:

$$d = (T_{MSL} - (A_{MSL} + 200)) * Slope$$

d = A1 surface extension distance in feet
A_{MSL} = Runway elevation at end of A surface
T_{MSL} = Turn height (as a minimum, TDZE + 400)
Slope = 6076.11548/CG.

NOTE: For special procedures requiring a climb gradient A1 surface extended may be shortened (see figure 10).

The A1 surface extended OCS will continue to slope at 40:1 and the area will splay at 15 degrees from the nominal end of A1 surface width until reaching the turn altitude/point. Apply the applicable turning flight track/outer boundary radius (see Order 8260.3 Volume 1, chapter 2, table 5) both originating on the line marking the end of A1 surface extended. Unless a fix/facility identifies the turn point, the inner boundary line must commence at the inside turn edge of the D surface opposite the end of the touchdown area (A surface). When the turn point is marked by a fix/facility, the inside tieback may be constructed relative to the end of the A1 surface extended (see Order 8260.3 Volume 1, paragraph 277). When the point on the inside turn side of section 2 area abeam the clearance limit is past an imaginary line extended perpendicular to the edge of section 1 abeam the end of the touchdown zone on inside turn side, the inner boundary line commences on the outside turn edge of the D surface opposite the end of the touchdown area (A surface). See figure 9. The outer and inner boundary lines extend to points each side at flight track at the clearance limit at a rate that achieves initial segment width 15 miles from the runway threshold. Where secondary areas are required, they must commence after completion of the turn at the point where PCG is achieved.

Figure 7. Turning Missed Approach Detail

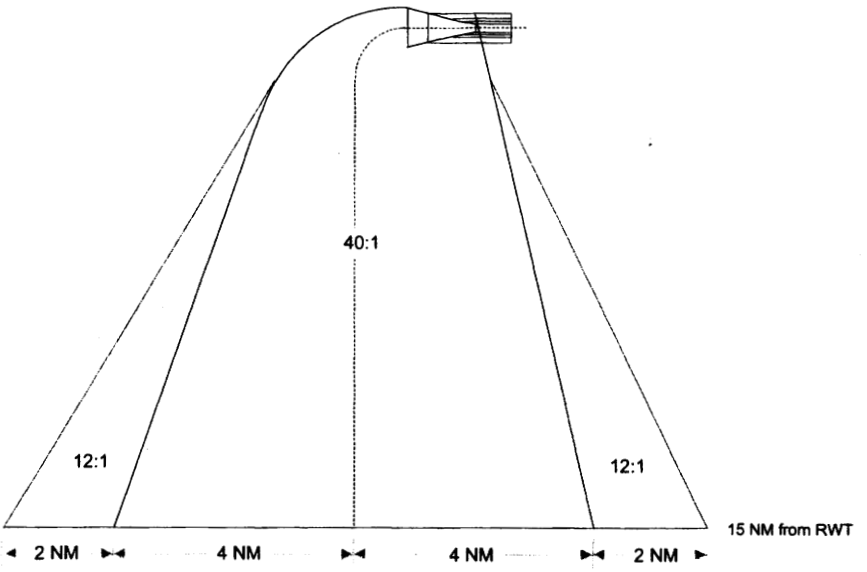


Figure 8. Turning Missed Approach (Section 1 Extended)

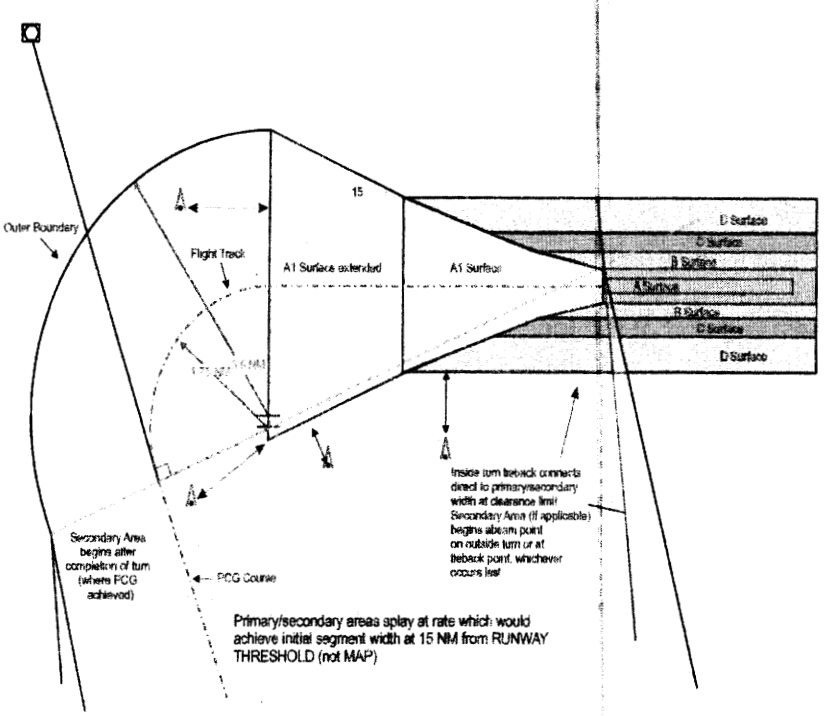
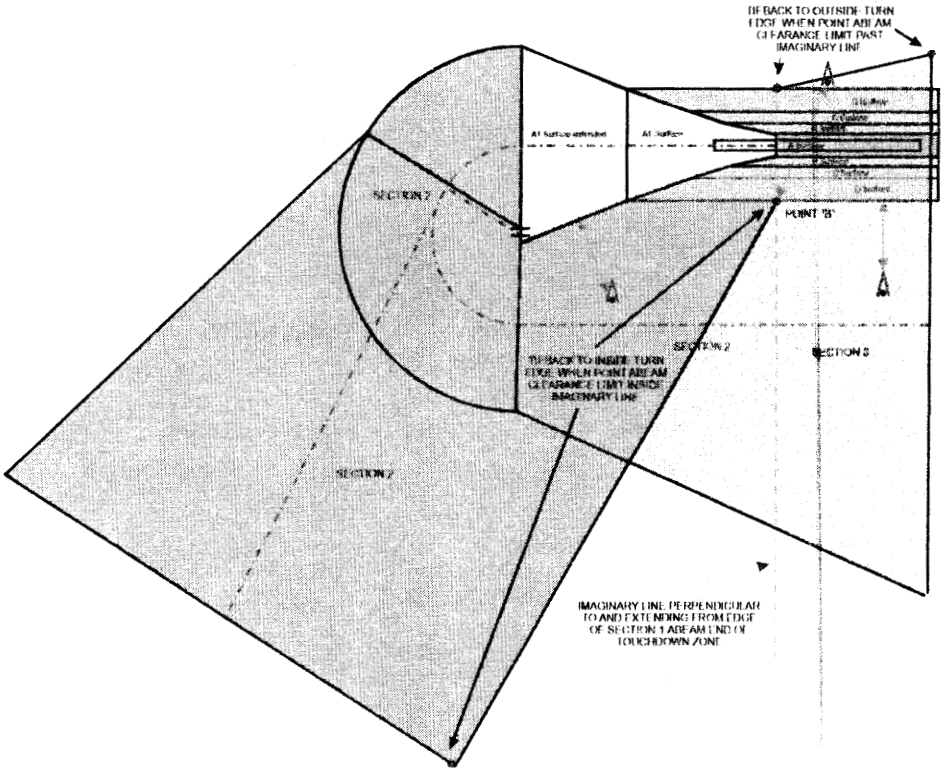


Figure 9. Turning Missed Approach Detail - Continued



6.9.2 c. Section 2, Obstacle Clearance.

Section 2 OCS is a 40:1 inclined plane originating at the end of section 1. Beginning height is equivalent to the end of the A1 surface height on centerline. When the A1 surface is extended for turning missed approach, section 2 originates at the end of the A1 surface extended and the beginning height is equivalent to the A1 extended surface height on centerline. Obstacles in section 2 are measured to the nearest edge of section 1 (or to the A1 surface extended). Section 3 is necessary for turns more than 90° as described in Order 8260.3 Volume 1, paragraph 276b, except point "B" is defined as the point of the inside of turn edge of section 1 abeam the end of the A surface regardless of the location of the inside tieback point (see paragraph 6.9.2b). When an object penetrates the 40:1 surface in the A1 surface extended or section 2, a **public** procedure is not authorized. A **special** procedure (see Order 8260.19 chapter 4, section 4) with a missed approach climb gradient > 200 ft/NM may be constructed consistent with Order 8260.3 Volume 3, paragraph 3.9.3. The missed approach procedure will contain a note specifying the minimum rate of climb required to clear the obstruction by the number of feet determined by the following formula:

$$c = \frac{h - e}{0.76d} \quad \text{Example: } \frac{619 - 112}{0.76 \times 2} = 333.55 \text{ ft/NM round up to } 334 \text{ ft/NM}$$

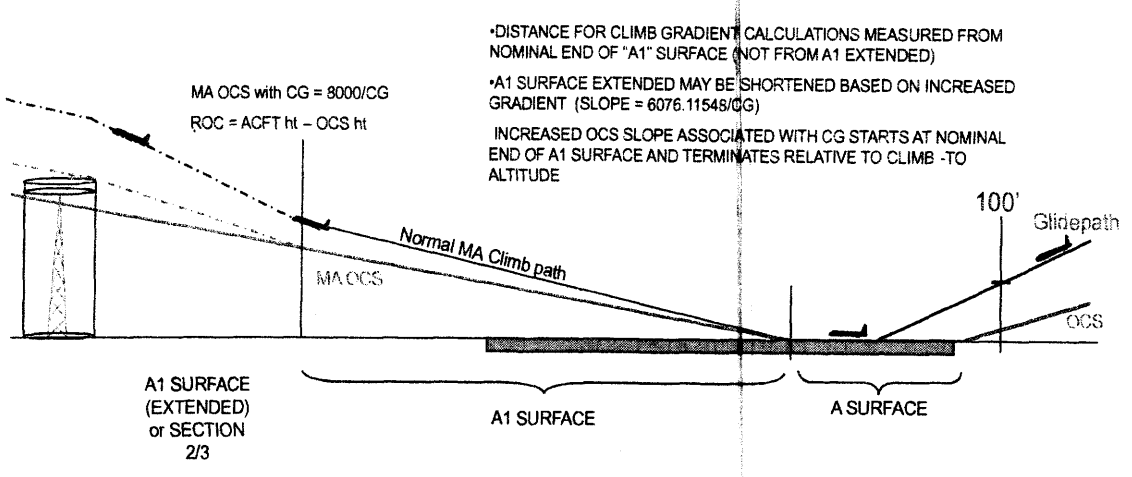
Where c = climb gradient (ft/NM)
h = obstruction MSL elevation - elevation of runway at end of A surface
e = centerline height at nominal end of A1 surface
d = in A1 surface extended, shortest distance in NM to line marking nominal end of A1 surface. In section 2/3, distance in NM from nominal end of A1 surface to A1 surface extended + distance to nearest edge of section 1 (to include A1 surface extended).

The climb gradient is effective until reaching the hundred-foot (3100; 1600; etc.) altitude equal to the height of the obstacle + ROC. Do not publish climb gradients less than 200 ft per NM.

Example:

Chart planview note: "Missed approach obstructions require a minimum climb gradient of (number) ft/NM to (altitude)."

Figure 10. Missed Approach Climb Gradient (Special Procedures)



7.0 REQUIREMENTS FOR CAT III PRECISION.

AC 120-28 refers to use of ICAO Annex 10 criteria, Order 6750.24, and the applicable NAVAID classification for CAT III operations. NAVAID use is predicated on applicable ILS, MLS, or GLS performance classifications; e.g., ILS III/E/3, GLS II/D/3, or equivalent classification at non-U.S. facilities. For GLS, an appropriate equivalent performance classification to ILS, as specified by FAA or the ICAO, may also be used; e.g., Performance Level/Coverage/Integrity as in "II/T/2." Threshold crossing height (TCH) requirements contained in Order 8260.3, Volume 3, paragraph 2.6 applies. Except as noted below, the above criteria for CAT II precision applies.

7.1 REQUIREMENTS FOR LOWER THAN CAT II (RVR 1200) OPERATIONS.

7.1.1 Lighting Requirements.

Lead on/off lights are required to approve operations below RVR 600.

7.1.2 Surface Movement Guidance and Control System (SMGCS).

Approved SMGCS operation per AC 120-57, as required.

7.2 MINIMUMS.

Publish the lowest authorized CAT III RVR when the runway supports unrestricted CAT II operations. When CAT II operations for a runway are restricted, CAT III minimums for the runway must be determined by collision risk analysis. The following minimum RVR standards are applicable to published Part 97 CAT III Standard Instrument Approach Procedures (SIAP) based on equipment performance class (see Order 6750.24):

7.2.1 **Class III/D/3 -** RVR ≥ 700.

NOTE: CAT III procedures with facility class III/D/3 performance require the notation "Localizer not suitable for Electronic Rollout Guidance."

7.2.2 **Class III/E/3 -** RVR ≥ 600.

7.2.3 **Class III/E/4 -** RVR < 600.

APPENDIX 2. RUNWAY/PARALLEL TAXIWAY SEPARATION

Parallel Taxiway Separation Required to Remain Clear of TERPS CAT II/III ILS Missed Approach Surfaces

Step 1: Enter Airport elevation (MSL) = 1000

Surface "Y" distance adjusted for elevation ("k") = 200

Step 2: Taxiway "X" distance from threshold** = -3000

Step 3: Enter Aircraft Design Group Tail height = 55

Required Taxiway separation to clear TERPS surfaces *400*

** - Distances prior to the "Y" axis (line perpindicular to centerline at runway threshold) are positive "X", distances after "Y" axis are negative "X"