City of Kansas City, Missouri
Aviation Department
Mark VanLoh, AAE, Director

PROJECT MANUAL

Project Manager: **Lapondzia Jones**
Division: **Planning & Engineering**
Telephone: **(816) 243-3057**

Advertise Date: May 16, 2016

Project No. 62160466

Runway 9-27 Keel 4” Mill and Overlay

Kansas City International Airport

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

CERTIFICATION PAGE

Project Number 62160466

Project Title Runway 9-27 Keel 4" Mill & Overlay

I am responsible for the following specifications and drawings:

Drawings: C01, C02, C03, C04, C05, C06, C07, C08, C09, C10, C11, C12, C13, C14, C15, C16, C17

Specifications: L-125, P-105, P-101, P-~~102~~ P-401, P-410, P-603, P-605, P-606, P-620, P-621

STATE OF MISSOURI
JASON C. FUEHNE
NUMBER PE-2010008951
PROFESSIONAL ENGINEER

_____ (SEAL) 4/27/16

EACH PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS ABOVE ASSUMES RESPONSIBILITY IN THESE BIDDING DOCUMENTS ONLY FOR WHAT IS LISTED ABOVE AND DISCLAIMS (PURSUANT TO SECTION 327.411 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE SIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT.

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Project Title: Runway 9-27 Keel 4” Mill & Overlay

TECHNICAL SPECIFICATIONS

ADVISORY CIRCULAR

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

LIST OF DRAWINGS

Project Number: 62160466

Project Title: Runway 9-27 Keel 4” Mill & Overlay

Item	Set / Title / Description / Designation	Drawing Number(s)	Dated
001	Cover	C01	4/22/16
002	Drawing List, Summary of Quantities, and Abbreviations	C02	4/22/16
003	Access and Safety Plan	C03	4/22/16
004	Access and Operational Safety Notes	C04	4/22/16
005	Overall Work Area Plan	C05	4/22/16
006	Maintenance of Traffic Plan	C06	4/22/16
007	Demolition Plan 1	C07	4/22/16
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014	Pavement Marking Plan 2	C14	4/22/16
015	Pavement Marking Plan 3	C15	4/22/16
016	Pavement Details	C16	4/22/16
017	Pavement Marking Details	C17	4/22/16

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
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INVITATION TO BID

Project Number: 62160466

Project Title: Runway 9-27 Keel 4" Mill & Overlay

The General Services Department of Kansas City, Missouri will receive sealed Bids until 2:00 PM, on June 7, 2016**,** at City Hall, 414 East 12th Street, First Floor, Room 102W, Kansas City, Missouri 64106 for Project No. 62160466 – Runway 9-27 Keel 4" Mill & Overlay. Bids will be opened after that time at the same location.

City desires that Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) have a maximum opportunity to participate in the performance of City contracts. The goals for this specific Project are 10% MBE participation and 5% WBE participation.

Bidding Documents will be available online to all interested parties at the Kansas City Missouri Plan Room, http://www.kcmoplanroom.net. All addenda will be posted at this location. Any document or plan may be viewed or downloaded from this location.

Bidders are requested to attend the Pre-Bid Conference at 10:00 a.m., May 24, 2016, in the Engineering Library located at Kansas City International (KCI) Airport, 601 Brasilia Avenue, Kansas City, Missouri 64153**.**

For persons with disabilities needing reasonable accommodations please contact the City's ADA Specialist at 816-513-6589. If you need to use the Relay Service, please dial 711.

Title VI LEP *For persons with Limited English Proficiency (LEP), please contact the Airport Communications Center (ACC) at 816-243-4000. Interpreters are available.*

The City of Kansas City, Missouri, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

Project Manager: Lapondzia Jones
Phone Number: (816) 243-3037
Fax Number: (816) 243-3071
E-mail: Lapondzia.Jones@kcmo.org

Contract Administrator: _____
Phone Number: _____
Fax Number: _____
E-mail: _____

View all procurement and contracting opportunities at http://www.kcmo.gov.

CITY OF FOUNTAINS
HEART OF THE NATION
CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

INSTRUCTIONS TO BIDDERS

Project Number: 62160466

Project Title: Runway 9-27 Keel 4" Mill & Overlay

1. Sealed Bids for Project No. 62160466 – Runway 9-27 Keel 4" Mill & Overlay will be received by the General Services Department at City Hall, 414 East 12th Street, First Floor, Room 102W, Kansas City, Missouri 64106, until 2:00 P.M., June 7, 2016, at which time bidding will be closed.

a. All Bids will be opened and read aloud. The Bid Envelope must contain all required submissions to be included with the Bid. No Bid may be withdrawn for a period of ninety (90) days after the Bid is opened. Bid security shall likewise continue for the same ninety (90) days unless earlier released by the City. The successful Bidder shall comply with all Bidding and contract requirements. Bids, once opened and read, may not be withdrawn without forfeiture of the Bid security.

b. All Bids shall be addressed to the Manager of Contract Administration, Procurement Services, shall state on the outside of the sealed Bid envelope "Bid Enclosed", title and Project number, and shall be deposited in the locked Bid box. All Bids must comply with the Bidding Requirements of Kansas City, Missouri (CITY).

2. Consideration of Bids

a. The City will determine the lowest and best Bid. The City may reject any or all bids. If the City rejects all Bids, the City may: (1) resolicit Bids following the City's normal solicitation procedure; or (2) solicit Bids only from those Bidders that submitted a Bid pursuant to the original solicitation; or (3) use an expedited Bid submission schedule with or without readvertising or issuing any other public notice when the City determines that the delay from the normal City solicitation procedure would not be in the City's best interests.

b. Alternates. If this solicitation includes Bid Alternates, the City, in its sole discretion, may include any, all or none of the Alternates in determining the lowest and best Bid. In determining lowest and best Bid, the City may include the Alternates in any combination and in any order or priority or choose none of the Alternates. The City may make this determination at any time after Bid Closing and prior to Contract award. The City will act in the best interest of the City in determining whether to include any, all or none of the Alternates and the combination and priority of any Alternates selected. If additional funding becomes available after Contract award, City may add any or all of the Alternates to the Contract by change order.

3. Evidence of Competency to Perform Each bidder shall furnish with the bid satisfactory evidence of Bidder's competency to perform the proposed work. Such evidence of competency shall consist of the following:

a. Completed Form 00410.01 Experience Reference Summary for similar projects performed within the past 5 years including reference information.

4. Waiver of Bid Requirements The City Manager or his delegate at any time may waive any requirements imposed by this solicitation or by any City regulation when failure to grant the waiver will result in an increased cost to the City and the requirement waived would be waived for all Bidders for this solicitation and it is in the best interest of the City to grant the waiver. The City Council at any time may waive any requirements imposed in this solicitation by the City's Code of Ordinances when it finds failure to grant the waiver will result in an increased cost to

the City and the waived requirement would be waived for all Bidders for this solicitation and it is in the best interest of the City to grant the waiver. The City reserves the right to waive any irregularities and/or formalities as deemed appropriate.

5. Late Bids Bids and modifications of Bids received after the exact hour and date specified for receipt will not be considered unless: (1) the Bid is sent via the U.S. Postal Service, common carrier or contract carrier, by a delivery method that guarantees the Bid will be delivered to the City prior to the submission deadline; or (2) if the Bid is submitted by mail, common carrier or contract carrier it is determined by the City that the late receipt was due solely to an error by the U.S Postal Service, common carrier or contract carrier; or (3) the Bid is timely delivered to the City but is at a different City location than that specified in this IFB; or (4) the City extends the time after the deadline for a force majeure event that could potentially affect any or all Bidders meeting the deadline.

6. Interpretations and Addenda All questions about the meaning or intent of the Bidding Documents may be directed to the Project Manager listed at the end of these Instructions to Bidders. Interpretations or clarifications considered necessary by the Project Manager in response to such questions will be issued by Addenda to all parties recorded as having received the Bidding Documents. Questions received less than ten (10) days prior to the date for opening of Bids may not be answered. Only answers issued by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. Addenda may also be issued to modify the Bidding Documents as deemed advisable by the City.

7. Bid Security Requirements All Bids submitted must be accompanied by a Bid deposit in the amount of five percent (5%) of the base Bid which shall be in the form of a Bid Bond (on the form provided in these Bidding Documents), Cashier's Check, Letter of Credit, Certificate of Deposit or other instrument approved in advance by the City. Prior to submittal of the Bid the City Treasurer must approve both the financial institution and text of a Letter of Credit. A Cashier's Check or a Certificate of Deposit shall be payable to the City Treasurer.

8. Forfeiture of Security If a Bidder fails or refuses to execute the Contract when requested by the City, any Bid security given to the City shall immediately become due and payable and forfeited to the City as liquidated damages.

9. Mistake in Bid Security By submitting a Bid, Bidder is agreeing to correct any mistakes on a Bid security submission when requested by the City. When such a mistake occurs and a Bidder fails or refuses to correct the mistake or execute the Contract when requested by the City, any Bid security shall be forfeited to the City and the Bidder shall also be subject to debarment and damages.

10. Bids that Exceed the Engineer's Estimate The City may offer the apparent lowest and best Bidders the option of performing the Work for the Engineer's estimate for the Project with no changes to the Bid requirements or scope of the Project if the Bid is not more than five percent higher than the Engineer's estimate.

11. Post Bid Required Submissions The successful Bidder will be required to submit the following documents with the signed copies of the Bid Form/Contract or within the timeframes specified in the Notice of Intent to Contract letter. Copies of the City's forms that the successful Bidder will be required to sign are bound into this Project Manual for information:

a. Properly signed, dated, and sealed Performance and Maintenance Bond and Payment Bond;

b. Properly completed certificates of insurance;

c. Copies of licenses required by the City to do the Work;

d. A copy of CONTRACTOR's current Certificate of Good Standing or Fictitious Name Registration from the Missouri Secretary of State, or other acceptable proof;

e. Statement regarding all work performed two (2) years immediately preceding the date of the Bid, that contains either (a) a contract by contract listing of any written notices of

violations of any federal or state prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or paid by the Bidder; or (b) a statement that there have been no such written notices of violations or such penalties assessed; and a statement that Bidder is current on payment of Federal and State income tax withholdings and unemployment insurance payments.

12. Indemnification – City of Kansas City. The contract documents contains a requirement that Contractor shall indemnify, defend and hold harmless the City and any of its agencies, officials, officers, or employees from and against all claims, damages, liability, losses, costs, and expenses, including reasonable attorneys' fees, arising out of or resulting from any acts or omissions in connection with the contract, caused in whole or in part by Contractor, its employees, agents, or Subcontractors, or caused by others for whom Contractor is liable, including negligent acts or omissions of the City, its agencies, officials, officers, or employees. The contract requires Contractor to obtain specified limits of insurance to insure the indemnity obligation. Contractor has the opportunity to recover the cost of the required insurance in the Contract Price by including the cost of that insurance in the Bid amount.

13. City's Buy American and Missouri Preference Policies It is the policy of the City that any manufactured goods or commodities used or supplied in the performance of any City contract or any subcontract thereto shall be manufactured or produced in the United States whenever possible. When Bids offer quality, price, conformity with specifications, term of delivery and other conditions imposed in the specifications that are equal, the City shall select the Bid that uses manufactured goods or commodities that are manufactured or produced in the United States. The City shall give preference to all commodities manufactured, produced, or grown within the State of Missouri and to all firms, corporations, or individuals doing business as Missouri firms, corporations or individuals, when quality is equal or better and delivered price is the same or less. It is the bidder's responsibility to claim these preferences.

14. Affirmative Action It is the policy of the City that any person or entity entering into a contract with the City, will employ applicants and treat employees equally without regard to their race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age. Bidder will be required to comply with the City's Affirmative Action ordinance if Bidder is awarded a contract from the City totaling more than $300,000.00. If you have any questions regarding the City's Affirmative Action requirements, please contact HRD at (816) 513-1836 or visit the City's website at www.kcmo.gov.

15. Tax Clearance Bidder will be required to furnish to CITY sufficient proof from City's Commissioner of Revenue, verifying that Bidder is in compliance with the license and tax ordinances administered by City's Revenue Division as a precondition to CITY making its first payment under any CONTRACT over $160,000.00. Bidder will also be required to obtain proof of City tax compliance from all of its Subcontractors prior to the Subcontractors performing any Work.

16. Substitutions or "Or-Equal" Items The procedure for submission of substitutions or "or-equal" items is set forth in the General Conditions and Supplementary Conditions.

17. Prevailing Wage Requirements The successful Bidder shall pay the prevailing hourly rate of wages as determined by the Missouri Annual Wage Order and/or Federal Wage Determination set forth in the Project Manual. In case of a conflict between Missouri and Federal wage rates, the higher rate shall apply.

Successful Bidder shall be required to use City's Internet web based Prevailing Wage Reporting System provided by City and protocols included in that software during the term of this Contract. When requested by the City, Bidder shall submit user applications to City's provided Prevailing Wage Reporting System for all applicable personnel and shall require subcontractors to submit same.

18. MBE/WBE Program Requirements City desires that Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) have a maximum opportunity to participate in the

performance of City contracts. The goals for this specific Project are ten percent (10%) MBE participation and five percent (5%) WBE participation. The City's HRD Forms and HRD Instructions for Construction Projects are incorporated into these Bidding Documents and the Contract Documents. The MBE/WBE Directory is available on the City's website at www.kcmo.gov. Please call the Human Relations Department at (816) 513-1836 for assistance.

Successful Bidder shall be required to use City's Internet web based MBE/WBE Program Reporting System provided by City and protocols included in that software during the term of this Contract. When requested by the City, Bidder shall submit user applications to City's provided MBE/WBE Program Reporting System for all applicable personnel and shall require subcontractors/subconsultants to submit same.

19. Waiver of MBE/WBE Requirements The City Council may waive any and all MBE/WBE requirements imposed by any Bidding Document or the MBE/WBE Ordinance and Contract with the lowest and best Bidder if the City Council determines a waiver is in the best interests of the City.

20. Forfeiture of Bid Bond for Failure to Make MBE/WBE Submissions By submitting its Bid, Bidder is agreeing to the following: (1) Bidder has made by Bid opening a good faith effort to meet the MBE/WBE goals established for the Project; or Bidder will continue to make during the 48 hours after Bid opening a good faith effort to meet the MBE/WBE goals established for the Project; and (2) Bidder will timely submit its 00450 HRD Construction Contractor Utilization Plan/Request for Waiver (HRD Form 8) and 00450.01 Letter of Intent to Subcontract for each MBE/WBE listed on the 00450 HRD Construction Contractor Utilization Plan/Request for Waiver; and (3) Bidder will submit documentation of its good faith efforts to meet the MBE/WBE goals when requested by the City. Failure to meet these requirements in good faith will result in Bidder being debarred and forfeiting its Bid Bond.

21. Workforce Program Requirements. City desires that minorities and women have a maximum opportunity to practice their trades on city construction projects. The minimum company-wide goals are a ten percent (10%) minority workforce and two percent (2%) women workforce. The City's HRD Forms and HRD Instructions for Construction Projects are incorporated into these Bidding Documents and the Contract Documents.

Successful Bidder shall be required to use City's Internet web based Workforce Program Reporting System provided by City and protocols included in that software during the term of this Contract. When requested by the City, Bidder shall submit user applications to City's provided Workforce Program Reporting System for all applicable personnel and shall require subcontractors to submit same.

22. Subcontractors, Suppliers and Others

a. If the Contract Documents require the identity of certain Subcontractors, Suppliers and other persons and organizations (including those who are to furnish the principal items of material and equipment) to be submitted to CITY, the apparent lowest and best Bidder, and any other Bidder so requested, shall submit to CITY a list of all such Subcontractors, Suppliers and other persons and organizations proposed for those portions of the Work for which such identification is required. An experience statement shall accompany such list with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier or organization if requested by CITY. If CITY has reasonable objection to any proposed Subcontractor, Supplier or other person or organization, CITY may request the apparent lowest and best Bidder to submit an acceptable substitute without an increase in Bid price.

b. By submitting its Bid, Bidder agrees that it has read and understands all the provisions of General Condition No. 6.07, Concerning Subcontractors, Suppliers and Others, and that it will comply with all those provisions including but not limited to mandatory mediation of disputes and the prohibition against paid-if-paid and paid-when-paid contract clauses. It is the City's expectation that all Subcontractors and Suppliers will be treated fairly and in good faith by the

successful Bidders and that the successful Bidder will make all reasonable efforts to resolve contract disputes with a Subcontractor or Supplier in a prompt and fair manner. If the City is notified by a Subcontractor or Supplier of a contract claim with the successful Bidder, City will notify the successful Bidder and will request prompt resolution of the claim. City will provide any such Subcontractor or Supplier information regarding mandatory mediation as well as a copy of the Payment Bond. City may notify the Surety that City has taken cognizance of such claim.

c. In accordance with the Missouri Prompt Payment Act, City reserves the right to withhold payment(s) in good faith from the successful Bidder due to: i)the successful Bidder's failure to comply with any material provision of the contract; ii)third party claims filed or reasonable evidence that a claim will be filed; iii)the successful Bidder's failure to make timely payments for labor, equipment or materials; or iv)for damage to a Subcontractor or Supplier.

d. By submitting its Bid, Bidder agrees it will not deny any Subcontractor subcontracting opportunities solely because the Subcontractor is not a signatory to collective bargaining agreements with organized labor.

e. The provisions of GC 6.07 are a material term of the Contract with the City and failure by the successful Bidder to comply with the provisions of this section will be taken into consideration by City in making the determination of lowest and best bidder in any subsequent City contracts.

23. Pre-Bid Conference The General Services and Aviation Departments will hold a pre-Bid conference on May 24, 2016, at 10:00 AM in the Engineering Library, located at 601 Brasilia Ave., Kansas City, Missouri 64153. Attendance at the pre-Bid conference is encouraged for all Bidders on this Project.

24. On-Site Inspection The Project Site will be available for inspection by Bidders at the Pre-Bid Conference. Bidders visiting the Project Site shall be responsible for their own safety.

25. Signatures Each copy of the Bid Form/Contract must be signed and properly dated by the following, as applicable:

Limited Liability Company:

□ a member of the limited liability Company authorized to sign on behalf of the company.

Partnership:

□ a partner authorized to sign on behalf of the partnership.

Sole Proprietor:

□ the proprietor.

Joint Venture:

□ the parties to the Joint Venture authorized to sign on behalf of each party to the Joint Venture, or a person authorized by each party to the Joint Venture to sign on behalf of all parties to the Joint Venture.

Corporation:

□ a corporate office authorized to sign on behalf of the corporation. Corporation's seal must be attached to the signature.

26. Forward all questions in writing to the following Project Manager. Questions received less than seven (7) days prior to the Bid Date may not be answered. Interpretations or clarifications considered necessary by the Project Manager in response to such questions will be issued by Addenda to all Bidders. Oral or other interpretations or clarifications shall be without legal effect, even if made at a Pre-Bid Meeting.

Lapondzia Jones, Project Manager
Aviation Department
601 Brasilia Avenue
Kansas City, MO 64153
Phone: (816) 243-3057
Fax: (816) 243-3071
E-mail: Lapondzia.Jones@kcmo.org

_____, Contract Administrator
General Services Procurement
1st Floor, Room 102W, 414 East 12th St.
Kansas City, MO 64106
Phone: (816) 513-____
Fax: (816) 513-____
E-mail: _____

For persons with disabilities needing reasonable accommodations please contact the City's ADA Specialist at 816-513-6589. If you need to use the Relay Service, please dial 711.

Title VI LEP *For persons with Limited English Proficiency (LEP), please contact the Airport Communications Center (ACC) at 816-243-4000. Interpreters are available.*

Bidder: _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

BID FORM/CONTRACT

Project Number 62160466

Project Title Runway 9-27 Keel 4" Mill & Overlay

1. Bidder, having examined the Bidding Documents, related documents and the Site of the Work, and being familiar with all the conditions affecting the construction of the proposed Work, including Laws and Regulations and the availability of materials and supplies, agrees, if this Bid is selected by CITY, this Bid Form/Contract will become the Contract between Bidder and CITY for Bidder to furnish all labor and materials, equipment and services necessary for the proper completion of the Work in accordance with the Contract Documents, including general construction work at the price(s) stated below, which stated sums include fees and all other charges applicable to materials, appliances, labor and all things subject to and upon which other charges may be levied.

2. Bidder agrees the Contract Documents will comprise the entire agreement between CITY and Bidder. The Contract Documents are identified in the General Conditions and are incorporated into and made part hereof this Bid Form/Contract by reference.

3. Bidder agrees that if this Bid Form/Contract is executed by CITY, Bidder's offer is accepted and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties. Bidder authorizes the CITY to fill in the Contract Price on this Bid Form/Contract in accordance with Bidder's Bid. Bidder agrees that this Bid Form/Contract may be executed in one or more counterparts, each of which will be deemed an original copy of this Bid Form/Contract and all of which, when taken together, will be deemed to constitute one and the same Bid Form/Contract. This Bid Form/Contract shall be effective upon the execution of counterparts by both parties, notwithstanding that both parties may not sign the same counterpart. The parties' signatures transmitted by facsimile or by other electronic means shall be proof of the execution of this Bid Form/Contract and shall be acceptable in a court of law. A copy of this Bid Form/Contract shall constitute an original and shall be acceptable in a court of law.

4. The Bid Price(s) shall be shown in numeric figures only.

   TOTAL BID IN NUMERIC FIGURES $_____

5. The undersigned Bidder has given CITY'S Project Manager written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the Project Manager or by the DESIGN PROFESSIONAL is acceptable to Bidder.

6. The undersigned Bidder agrees that this Bid shall remain subject to selection by CITY, and may not be withdrawn for ninety (90) days after the day Bids are opened.

7. The undersigned Bidder certifies that this Bid contains no modifications, deviations, riders or qualifications.

8. RESERVED

9. Form 00412 Unit Prices contain prices included in the Base Bid, and are incorporated into this Bid. Form must be completed and returned with this Bid.

10. RESERVED

11. The undersigned Bidder acknowledges receipt of the following addenda listed by number and date appearing on each addendum:

Addendum Number	Dated	Addendum Number	Dated
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)

12. By submitting its bid, Bidder is agreeing to meet or exceed the minimum employment goals of 10% minority and 2% women during the term of its contract with the City, or request a waiver of the goals. If a waiver is requested, Bidder must establish good faith efforts towards meeting the goals as set forth in the HRD Instructions for Construction Contracts and the City's Construction Employment Program Ordinance (commonly known as the "Workforce Ordinance") (City Code Section 3-515). Within forty-eight (48) hours after bid opening, the construction contractor shall submit **HRD Employee Identification Report Form-Rev. 102715** which shall include: the name, home address, job title, sex and race/ethnicity of each person the contractor anticipates will be performing construction labor hours creditable towards the minimum workforce goals applicable to the construction contractor individually.

13. Should Bidder fail to meet or exceed the minimum employment goals or otherwise establish that Bidder is entitled to a waiver under circumstances in which Bidder has previously failed to meet or exceed the goals on one or more occasions with the twenty-four month period immediately preceding the completion of the Work under this Bid Form/Contract, Bidder may be suspended from participating, either as a contractor or subcontractor, on any future contract with the City for a period ranging from thirty days to six months as further specified in the Contract Documents. This program is distinguished from the M/WBE Program in that it is not based on company ownership but rather is based on workforce hours instead of a budgetary allocation of work.

14. By submitting its bid, Bidder warrants that if its bid should exceed $300,000.00 and Bidder employs fifty (50) or more people, Bidder has an affirmative action program in place and will maintain the affirmative action program in place for the duration of its contract with the City. Bidder further warrants that it will comply with the affirmative action requirements contained in the General Conditions as incorporated by reference into this Bid Form/Contract.

15. Section 15 through Section 18 constitutes the Affidavit of Intended Utilization required to be submitted by Bidders.

16. By submitting its bid, Bidder is agreeing to the following: (1) Bidder has made by bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; or Bidder will continue to make during the 48 hours after bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; and (2) Bidder will timely submit its **00450 HRD 08 Contractor Utilization Plan/Request for Waiver** and **00450.01 Letter of Intent to Subcontract** for each MBE/WBE listed on the 00450 HRD 08 Construction Contractor

Utilization Plan/Request for Waiver;; and (3) Bidder will submit documentation of its good faith efforts to meet the MBE/WBE/DBE goals when requested by the City. Failure to meet these requirements in good faith will result in Bidder forfeiting its bid bond.

PROJECT GOALS: 10% MBE 5% WBE

BIDDER PARTICIPATION: _____% MBE _____% WBE

17. To the best of Bidder's knowledge, the following are names of certified MBEs and/or WBEs with whom Bidder, or Bidder's subcontractors, presently intend to contract with if awarded the Contract on the above project: ***(*All firms must currently be certified by Kansas City, Missouri Human Relations Department*)***

A. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

B. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

C. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

D. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

E. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

(List additional MBE/WBEs, if any, on additional pages and attach to this form)

18. By submitting its bid, Bidder is agreeing it will identify and timely submit within 48 Hours after Bid opening those MBE/WBE subcontractors with dollar amounts and scopes of work, which

apply to or exceed the MBE/WBE goals for the Project on the **00450 HRD 08 Contractor Utilization Plan/Request for Waiver.**

19. Bidder agrees that failure to meet or exceed the MBE/WBE Goals for the above project will require the Director of Human Relations to recommend disapproval of the bid unless the Director of Human Relations finds the Bidder established good faith efforts towards meeting the goals as set forth in the HRD Forms and Instructions for Construction Projects and the City's MBE/WBE Ordinance.

Business Entity Type:
(__) Missouri Corporation
(__) Foreign Corporation
(__) Fictitious Name Registration
(__) Sole Proprietor
(__) Limited Liability Company
(__) Partnership
(__) Joint Venture
(__) Other: (Specify)_____

BIDDER
Legal name & address of Bidder, person firm, partnership, corporation, or association submitting Bid:
_____
Phone No: _____
Cell No: _____
Facsimile No: _____
Bidder's E-Mail: _____
_____
Federal ID. No. _____

I hereby certify that I have authority to execute this document on behalf of Bidder, person, firm, partnership, corporation or association submitting Bid.

By: _____
(Signature)

_____
(Print Name)

Title:_____

Date:_____

(Attach corporate seal if applicable)

NOTARY

Subscribed and sworn to before me this _____ day of _____, 20__.

My Commission Expires: _____ _____

Bidder: _____

ACCEPTANCE OF BID

CITY, by executing this Bid Form/Contract, hereby accepts Bidder's Bid and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the Parties.

CITY shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents a maximum amount of _____ and 00/100 Dollars, ($ _____). The Contract Price includes: 00412 Unit Prices, included in the Bid, a copy of which is attached

By executing this Bid Form/Contract, CITY accepts Bidder's offer for the Contract Price stated above and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties

_____

City of Kansas City, Missouri (OWNER or City)

Approved as to form:

_____

Assistant City Attorney

I hereby certify that there is a balance, otherwise unencumbered, to the credit of the appropriation to which the foregoing expenditure is to be charged, and a cash balance, otherwise unencumbered, in the treasury, to the credit of the fund from which payment is to be made, each sufficient to meet the obligation hereby incurred.

_____

Director of Finance Date

EXPERIENCE AND REFERENCE SUMMARY

Project Number: 62160466

Project Title: Runway 9-27 Keel 4” Mill & Overlay

Firm’s Legal Name	
Mailing Address	
Contact – Name & Email	
Contact – Phone & Fax	

NO.	PROJECT & LOCATION	OWNER NAME & ADDRESS CONTACT & PHONE NUMBER	PROJECT DURATION & DATE COMPLETED	$ VALUE
1.				
2.				
3.				
4				
5				
6				
7				
9				
10				

Bidder: _____

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

UNIT PRICES

PROJECT NO. 62160466

PROJECT TITLE: Runway 9-27 Keel 4" Mill & Overlay

NOTE: IN THE EVENT OF DISCREPANCY, UNIT PRICE SHALL GOVERN.

Item No.	Unit	Quantity	Item Description:	Unit Price	Extension
1	LS	1	Mobilization		
2	SY	51,100	Asphalt Surface Course Milling (4")		
3	TON	11,430	Asphalt Surface Course (4")		
4	LF	15,000	Flexible Pavment Crack Sealing		
5	GAL	7,665	Bituminous Tack Coat		
6	SF	25,000	Reflectorized Pavement Marking (White)		
7	SF	10,000	Reflectorized Pavement Marking (Yellow)		
8	SF	12,500	Non-Reflectorized Pavement Marking (Black)		
9	SY	51,100	Saw-Cut Grooving		
10	EA	5	Remove In-Pavement Fixture, Install Blank Cover & Re-Install Fixture		
11	EA	2	Install New Pavement Surface Sensor		
TOTAL UNIT PRICES EXTENSION HERE AND ON BID FORM 00410 AS TOTAL BID					

Note: May be printed for manual fill-in or filled in on electronic excel spreadsheet version.

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

SUPPLEMENTARY CONDITIONS

Project Number: 62160466

Project Title: Runway 9-27 Keel 4" Mill & Overlay

These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

SC-4.02 Article 4, Paragraph 4.02, Subsurface and Physical Conditions; Subparagraphs A and B are supplemented as follows:

In the preparation of the Contract Documents, no reports of explorations and tests of subsurface conditions at or contiguous to the Site of the Work were utilized or have been prepared.

In the preparation of the Contract Documents, no drawings of physical conditions in or relating to existing surface or subsurface structures which are at or contiguous to the Site of the Work were utilized.

SC-4.06 Article 4, Paragraph 4.06, Asbestos, Lead-Based Paint, PCBs, Petroleum Waste or Radioactive Material, Subparagraphs A and B are supplemented as follows:

In the preparation of the Contract Documents, no reports of explorations and tests of any Hazardous Environmental Condition(s) at the Site of the Work were utilized.

SC- 5.01 A. Article 5, Paragraph 5.01, Performance, Payment and Other Bonds, Subparagraph A, second sentence, is revised as follows:

These Bonds shall remain in effect at least until (2) years after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents.

SC-5.03 A. Article 5, Paragraph 5.03 Certificates of Insurance, Subparagraph A is amended by adding the following Subparagraph 1:

1. CONTRACTOR shall obtain evidence that all Subcontractors have in force the required coverage in the amounts required by these Contract Documents, and evidence that each is current on its unemployment insurance payments before Subcontractors begin Work at the Site. CONTRACTOR shall retain such evidence in its files and make available to CITY within ten (10) days after written request.

SC-5.04 B.1. Article 5, Paragraph 5.04, CONTRACTOR's Liability Insurance, Subparagraph B.1 is amended as follows:

With respect to insurance required by Paragraphs 5.04 A.3 through 5.04 A.5, the following additional individuals or entities shall be listed as additional insureds:

CITY – Kansas City Missouri
Design Professional – Burns & McDonnell Engineering Co., Inc.

SC-5.04 C.2 Article 5, Paragraph 5.04, CONTRACTOR's Liability Insurance, Subparagraph C.2 is amended by adding the following:

2.a. Individuals with an operational need for vehicular access to the Airport Operations Area (AOA) shall be required to obtain Commercial Automobile Liability Insurance with a limit of $5,000,000 combined single limit, covering owned, hired, and non-owned motor vehicles. Coverage provided shall be on an "any auto" basis and written on an "occurrence" basis. This insurance will be written on a Commercial Business Auto form, or acceptable equivalent, and will protect against claims arising out of the operation of motor vehicles on the Airport, as to acts done in connection with the Contract, by Contractor.

SC-5.06 A. Article 5, Paragraph 5.06, Property Insurance, is amended by deleting Subparagraph A and inserting the following:

A. CONTRACTOR shall not be required to purchase and maintain property insurance on the Work at the Site.

SC-6.06 A.1 Article 6, Paragraph 6.06 Substitutes and "Or-Equal" Items, Paragraph A is amended by adding the following at the end of Paragraph A.1:

Proposed "or-equal" items must be submitted to CITY at least 11 days prior to Bid date at the following address:
Kansas City Aviation Department
601 Brasilia Avenue
Kansas City, Missouri 64153
Attn: Lapondzia Jones, Project Manager

Only Bidders may submit proposed "or-equal" items and such items must require no change in related Work. Acceptance by CITY of any proposed "or-equal" items will be made by Addendum only.

SC-6.06 A.2. Article 6, Paragraph 6.06 Substitutes and "Or-Equal" Items, Paragraph A is amended by adding the following at the end of Paragraph A.2:

Proposed substitute items must be submitted to CITY's Representative not later than 7 days prior to the time the item is to be incorporated into the Work. Only CONTRACTOR may submit proposed substitute items, and such items must be submitted to CITY's Representative on the standard City form 016300 - Substitution Request. Acceptance by CITY of any proposed substitute item will be made by Change Order.

SC-6.07 J Article 6, Paragraph 6.07, concerning Subcontractors, Suppliers and Others, is supplemented by adding Subparagraph J as follows:

CONTRACTOR shall perform with its own organization Work amounting to not less than 25% of the total Contract Price. "Its own organization" shall be construed to include only workers employed and paid by the CONTRACTOR and equipment owned or rented by the CONTRACTOR, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the CONTRACTOR.

SC-6.10. Article 6, Paragraph 6.10, Compliance with Laws and Regulations, is amended by adding the following new Subparagraphs immediately following Subparagraph 6.10 I 2:

a. CONTRACTOR will be required to comply with wage rates as follows:

Missouri Wage Order No. 23; Platte County

SC-6.10. Article 6, Paragraph 6.10, Compliance with Laws and Regulations, is amended by adding the following new Subparagraph 6.10 T:

1. "Resident Laborers" means laborers who have been residents of the State of Missouri for at least thirty days and who intend to remain Missouri residents, and residents of Nonrestrictive States.

2. "Nonrestrictive States" means states identified by the Missouri Department of Labor and Industrial Relations Division of Labor Standards that have not enacted state laws restricting Missouri laborers from working on public works projects. A list of Nonrestrictive States can be found on the Division web site at http://www.dolir.mo.gov/ls/index.htm.

3. A period of Excessive Unemployment is declared when the Missouri Department of Labor and Industrial Relations Division of Labor Standards provides notice of such declaration. When in effect, notice will be provided on the Division web site at http://www.dolir.mo.gov/ls/index.htm. It is CONTRACTOR's obligation to determine whether a period of Excessive Unemployment is in effect when this Contract is let.

4. CONTRACTOR agrees to follow the provisions of Section 290.560 - 290.575 RSMo and agrees that if a period of Excessive Unemployment has been declared at any point during the term of this Contract, it will employ and require all Subcontractors of whatever tier to employ only Resident Laborers for the Work to be performed under this CONTRACT. Provided, however, CONTRACTOR may use laborers who are not Resident Laborers when Resident Laborers are not available or are incapable of performing the particular type of work involved if CONTRACTOR so certifies in writing to CITY and CITY issues a written approval. This provision does not apply to regularly employed nonresident executive, supervisory or technical employees.

SC-6.10. Article 6, Paragraph 6.10, Compliance with Laws and Regulations, is amended by adding the following new Subparagraph immediately following Subparagraph 6.10 T:

U. Excavation Permit. CONTRACTOR shall secure from the Aviation Department Engineering Division a signed excavation permit showing the approximate location of known existing utilities in the area prior to any excavation. The Aviation Department does not guarantee that all utilities are shown and, therefore, the Contractor shall assume all risks in protecting and locating the utilities.

SC-6.11 Article 6, Paragraph 6.11, Taxes, is amended by adding the following sentence to Subparagraph 6.11 B:

B. Tax Compliance. The following subparagraphs apply if the Contract is over $160,000.00.

SC-6.12 Article 6, Paragraph 6.12, Use of Site and Other Areas, is amended by adding the following new Subparagraphs immediately following Subparagraph 6.12 D.:

1. Disposal of Waste Materials. Contractor shall remove all waste, trash or demolition debris generated by this contract from CITY's property on a daily basis and legally dispose of them.

a. Contractor shall maintain a record of disposal methods and disposal sites.
b. Contractor shall retain copies of dump receipts or other forms provided by licensed landfills or agreements with property owners on whose property waste materials are placed.
c. Upon written request of the CITY, disposal records shall be made available to CITY. Records shall be made available to the CITY within 10 working days.

2. General: The Contractor shall maintain the premises and work areas in a clean and orderly manner. He shall perform intermediate cleanups, including the removal of dirt and debris from roadways as directed by the Engineer. Roadway pavement cleanliness must be maintained.

3. Periodic Cleanup: The Contractor shall make overall periodic cleanups at least once every day, and remove from Airport Property all rubbish and waste material resulting from construction operations. Construction debris shall not be stored nor will any ready mix concrete wash be permitted in construction area or in designated storage site. Such waste must be hauled off the Airport property daily.

4. Final Cleanup: The Contractor shall remove from the CITY's property and from all public and private property, at his own expense, all temporary structures, tools, and excess construction materials. The final cleanup shall be such that the CITY may occupy and use the completed project without further effort on its part.

SC-9.08 E. Article 9, Paragraph 9.08, Limitations on DESIGN PROFESSIONAL's Authority and Responsibilities, Subparagraph E is supplemented as follows:

DESIGN PROFESSIONAL's Consultant(s), resident Project representative and assistant(s) to the resident Project representative are the following:

Consultant(s): Geotechnology, Inc.

SC-12.01 Article 12, Paragraph 12.01, Time of the Essence is amended by adding the following new Subparagraphs immediately following Subparagraph 12.01 A:

B. Starting and Completion

1. The Work to be performed under this Contract shall begin on the date specified in the written Notice to Proceed issued by the Director of Aviation (at or around July 11, 2016), and the Work shall be substantially complete, in accordance with Section 00700 Paragraph 14.04 within forty-five (45) Calendar Days thereafter. Once the Work starts, CONTRACTOR shall continuously pursue completion of the Work.

2. The Work shall be completed and ready for final payment in accordance with Section 00700 Paragraph 14.07 within thirty (30) Calendar days after the date of Substantial Completion of the Work.

C. Liquidated Damages

1. If the Work is not substantially completed in accordance with Section 00700 Paragraph 14.04, within the period stated in Section 00800 Paragraph 12.01 B.1, CONTRACTOR shall pay to CITY the amount of Two Thousand Dollars ($2,000.00) as liquidated damages and not as a penalty for each Calendar Day until the Work is substantially complete. The amount of liquidated damages shall be deducted from any payments due or to become due CONTRACTOR.

2. If the Work is not completed and ready for final payment in accordance with Section 00700 Paragraph 14.07, within the period stated in Section 00800 Paragraph 12.01 B.2, CONTRACTOR shall pay to CITY the amount of One Thousand Dollars ($1,000.00) as liquidated damages and not as a penalty for each Calendar Day until the Work is completed and ready for final payment. The amount of liquidated damages shall be deducted from any payments due or to become due CONTRACTOR.

SC-13.07 Article 13, Paragraph 13.07, Correction Period, Subparagraph A is amended as follows:

The correction period set forth in Paragraph 13.07 A shall be two (2) years instead of one (1) year, which longer period of time shall also be applicable to the correction period set forth in Paragraph 13.07 C. All other provisions of Paragraph 13.07 remain unchanged except as necessary to accommodate the revised length of the correction period.

SC-14.02 A. Article 14, Paragraph 14.02, Application for Progress Payments, Subparagraph A is amended by deleting Item 2.b and adding the following:

b. a copy of the most recent Audit Report CONTRACTOR has submitted to the CITY's Human Relations Department through the B2G on-line reporting system.

SC-14.02 A. Article 14, Paragraph 14.02, Application for Progress Payments, Subparagraph A is amended by deleting Item 3 and adding the following:

3. CITY shall make payments to CONTRACTOR monthly. Payments to CONTRACTOR will be made on the basis of ninety-five percent (95%) of the value of the Work satisfactorily completed plus ninety-five percent (95%) of the value of properly stored and insured, unused materials on hand on the Site of the Work. CITY shall retain five percent (5%) of each partial payment until completion and acceptance of the Work covered by the Contract and final payment is due. All Work covered by a payment becomes CITY's property, provided that the Work paid for remains the sole responsibility of CONTRACTOR until all terms and conditions of the Contract have been met.

SC-14.04. Article 14, Paragraph 14.04, Substantial Completion, Subparagraph A is supplemented as follows:

A. To be considered substantially complete, the following items of the Work must be operational and ready for CITY's continuous use as intended:

1. Substantial Completion shall include 100% application of markings and 100% completion of asphalt grooving. All work associated with each item of work including any punch list items generated by the CITY or DESIGN PROFESSIONAL.

SC-14.05 Article 14, Paragraph 14.05, Partial Utilization is amended by adding the following new Subparagraph A.3. immediately following Subparagraph 14.05 A.2:

3. CITY at any time may make a written request to CONTRACTOR to permit CITY to take over operation of any part of the Work although it is not substantially complete. A copy of the request will be sent to DESIGN PROFESSIONAL, and within a reasonable time thereafter CITY, CONTRACTOR and DESIGN PROFESSIONAL shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not make written objection to CITY and DESIGN PROFESSIONAL that such part of the Work is not ready for separate operation by CITY, DESIGN PROFESSIONAL will finalize the list of items to be completed or corrected and will deliver such lists to CITY and CONTRACTOR. DESIGN PROFESSIONAL will also make a written recommendation as to the division of responsibilities pending final payment between CITY and CONTRACTOR with respect to security, operation, safety, maintenance, utilities, insurance, warranties and guarantees for that part of the Work, which recommendation will become binding upon CITY and CONTRACTOR at the time when CITY takes over such operation (unless they shall have otherwise agreed in writing and so informed DESIGN PROFESSIONAL). During such operation and prior to

Substantial Completion of such part of the Work, CITY shall allow CONTRACTOR reasonable access to complete or correct items on said list and to complete other related Work.

00800.01 - FEDERAL SUPPLEMENTARY PROVISIONS

1. CIVIL RIGHTS - GENERAL PROVISIONS

The contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the contractor and subtier contractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required of Title VI of the Civil Rights Act of 1964.

2. CIVIL RIGHTS – TITLE VI ASSURANCE

2.1. Title VI Solicitation Notice:

The City of Kansas City, Missouri, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

2.2. Title VI Clauses for Compliance with Nondiscrimination Requirements

Compliance with Nondiscrimination Requirements

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor”) agrees as follows:

A. Compliance with Regulations: The contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts And Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

B. Non-discrimination: The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

C. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor’s obligations under this contract and the Nondiscrimination Acts And Authorities on the grounds of race, color, or national origin.

D. Information and Reports: The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts And Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or

the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

E. Sanctions for Noncompliance: In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

1. Withholding payments to the contractor under the contract until the contractor complies; and/or

2. Cancelling, terminating, or suspending a contract, in whole or in part.

F. Incorporation of Provisions: The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

2.3. Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq*., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination In Federally-Assisted Programs of The Department of Transportation—Effectuation of Title VI of The Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 *et seq*.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 *et seq*.), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and

private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38;

- The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

3. FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers.

The Contractor has full responsibility to monitor compliance to the referenced statute or regulation. The Contractor must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division

4. OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). Contractor must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

CHANGE ORDER

Project Number 62160466

Project Title Runway 9-27 Keel 4" Mill & Overlay

Change Order No: _____ Date of Issuance: _____

Ordinance No: _____ Ordinance Effective Date: _____

Contract Notice To Proceed Date: _____

To CONTRACTOR: *NAME*

The Contract is changed as follows:

This Change Order constitutes compensation in full on behalf of the Contractor and its subcontractors and suppliers for all costs, including impact costs and extended general conditions, and markups directly and indirectly attributable to the Work changes ordered herein, for all delays related thereto and for performance of the changes within the time stated. Contractor hereby releases all claims for delay, interruption, extended general conditions, impact and cumulative impact claims for this Work.

[Note: Identify the specific attachments; example:"Attachment A, Additional Scope of Services."
Delete all notes before printing final]

☐ See Attached Document(s).

[Note: If the CO does not change the Contract Price, use "Director" instead of "Director of Finance"]

Not valid until signed by the Director of Finance.

The original Contract Price was	$0.00
Net change by previously authorized Change Orders	$0.00
The Contract Price prior to this Change Order was	$0.00
The Contract Price will be (☐ increased by) (☐ decreased by) (☐ unchanged)	$0.00
The new Contract Price including this Change Order will be	$0.00
[Note: If revised, establish and enter new dates. If unchanged, enter current contract dates.	
If you are only changing the Final Completion date, add the following reference:	
"The Contract Time for Final Completion will be . . ."]	
The Contract Time will be (☐ increased by) (☐ decreased by) (☐ unchanged)	( ) calendar days
The date of Substantial Completion as of the date of this Change Order therefore is	Enter Date
The date of Final Completion as of the date of this Change Order therefore is	Enter Date

Project No. & Title
Change Order No.

DESIGN PROFESSIONAL:	**By:** **Title:**	**Date:**
CONTRACTOR:	**By:** **Title:**	**Date:**
CITY: Kansas City, Missouri	**By** **Title: Project Manager**	**Date:**
	By **Title: Deputy Director of Aviation**	**Date:**
	By **Title: Director of Aviation**	**Date:**

Approved as to form: _____
Assistant City Attorney

I certify there is a balance otherwise unencumbered to the credit of the appropriation to which the above amount is chargeable, and a cash balance otherwise unencumbered in the treasury to the credit of the fund from which payment is to be made, each sufficient to meet the above obligation.

_____ _____
Director of Finance Date

Distribution: ❑ CITY ❑ CONTRACTOR ❑ DESIGN PROFESSIONAL

REMINDER: CONTRACTOR is responsible for considering the effect this Change Order may have on its ability to meet or exceed the D/M/WBE participation amounts in its Contractor Utilization Plan (CUP) as amended by any previously approved Request for Modification/Substitution. If CONTRACTOR will not be able to achieve the approved participation amounts in performing the work included within this Change Order, or if CONTRACTOR needs to retain the services of additional D/M/WBEs not previously listed in its CUP, CONTRACTOR is advised to submit a Request for Modification/Substitution.

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Section 011500 Security Control Procedures.

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Work phases.
4. Work under other contracts.
5. Use of premises.
6. Work restrictions.
7. Specification formats and conventions.

B. Related Sections include the following:

1. Division 01 Section "Multiple Contract Summary" for division of responsibilities for the Work.
2. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of CITY's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Runway 9-27 Keel 4” Mill & Overlay

1. Project Location: Kansas City International Airport, Kansas City, MO.

B. CITY: Kansas City Aviation Department, 601 Brasilia Avenue, Kansas City, MO 64153

1. CITY's Representative: Ms. Lapondzia Jones, Project Manager, 601 Brasilia Avenue, Kansas City, MO 64153

C. Design Professional: Burns & McDonnell Engineering Company, Inc., 9400 Ward Parkway, Kansas City, MO 64114

D. Construction Manager: Burns & McDonnell Engineering Company, Inc. 9400 Ward Parkway, Kansas City, MO 64114

1. Construction Manager has been engaged for this Project to serve as an advisor to CITY and to provide assistance in administering the Contract for Construction between CITY and Contractor, according to a separate contract between CITY and Construction Manager.

E. Project Coordinator: Ms. Lapondzia Jones has been appointed by CITY to serve as Project Coordinator.

F. The Work consists of the following:

1. The Work includes milling four inches of asphalt pavement in the keel section (center 62 feet in width at the surface) of Runway 9-27 at Kansas City International Airport. Four inches of asphalt will be placed in the removed area to match previous and existing grades. Work will take place between the Runway 9 threshold and Taxiway F. Portions of the connector taxiways will be included in the work area. Work includes airfield striping and saw cut grooving for completion.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.5 WORK PHASES

A. The Work shall be conducted in one (1) phase.

1. Phase 1: Four inches of asphalt will be milled from the keel of Runway 9-27, west of Taxiway F. Four inches of new asphalt paving will replace in the removed area to match previous and existing grades. Work of this phase shall be substantially complete and ready for occupancy within 45 calendar days after the Notice to Proceed. Substantial Completion includes 100% application of airfield striping and 100% completion of sawcut grooving.

B. Before commencing Work, submit a schedule showing the sequence, commencement and completion dates, and move-out and -in dates of CITY's personnel for the Work.

1.6 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1. Rehabilitate Runway 1R-19L – Package 2: A separate contract has been awarded to Ideker, Inc. for rehabilitation work on Runway 1R-19L.

B. Concurrent Work: CITY has awarded separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Rehabilitate Runway 1R-19L – Package 2: A separate contract has been awarded to Ideker, Inc. for rehabilitation work on Runway 1R-19L.

1.7 USE OF PREMISES

A. General: The Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to the Contractor's staging area and limits of construction as shown on the drawings.

C. Kansas City International Airport - Security Control Procedures and Security Identification Display Area (SIDA) Access Policy: In compliance with Part 1542 of the Transportation Security Regulation, the Airport has adopted and put into use facilities and procedures designed to provide for the safety of persons and property traveling in air transportation and intrastate air transportation against acts of criminal violence and aircraft piracy. CONTRACTOR, and each of its Subcontractors, shall comply with all Kansas City International Airport Security Control Procedures and the Security Identification Display Area (SIDA) Access Policy. Security Control Procedures are identified in Section 011500. Section 011500 is a part of these Contract Documents and will be strictly enforced throughout the duration of the Work.

D. Kansas City Aviation Department Vehicle Inspection And Safety Program

The Kansas City Aviation Department has developed a Vehicle Inspection and Safety Program administrated by the Airport Operations Division. The program establishes guidelines and procedures for issuing permanent and temporary Airport Operations Area (AOA) permit decals for all non-escorted motorized driven vehicles and all aircraft fuel carts governed by National Fire Protection Agency (NFPA) 407 operating on the AOA. The Vehicle Inspection and Safety Program is identified in Section 011501 and will be strictly enforced throughout the duration of the Work.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7 a.m. to 5 p.m., Monday through Friday, except otherwise indicated or approved by the KCAD.

1. Weekend Hours: Shall be coordinated with the KCAD.
2. Early Morning Hours: Shall be coordinated with the KCAD.
3. Hours for Utility Shutdowns: Shall be coordinated with the KCAD and appropriate utility company.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by CITY or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify the KCAD not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without the KCAD’s written permission.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

011500 - AIRPORT SECURITY CONTROL PROCEDURES

KANSAS CITY INTERNATIONAL AIRPORT (KCI)

Term Definitions

Air Operations Area (AOA) means a portion of an airport, specified in the airport security program, in which security measures specified in Transportation Security Regulations (TSR) Part 1542 are carried out. This area includes aircraft movement areas, aircraft parking areas, loading ramps, and safety areas, for use by aircraft regulated under TSR Part 1544 or 1546, and any adjacent areas (such as general aviation areas) that are not separated by adequate security systems, measures, or procedures. This area does not include the Secured Area.

Aircraft Operator means a person who uses, causes to be used, or authorizes to be used an aircraft, with or without the right of legal control (as owner, lessee, or otherwise), for the purpose of air navigation including the piloting of aircraft, or on any part of the surface of an airport. In specific parts or sections, "aircraft operator" is used to refer to specific types of operators as described in those parts or sections.

Airport Operator means a person that operates an airport serving an aircraft operator or a foreign air carrier required to have a security program under TSR Part 1544 or 1546.

Airport Security Program means a security program approved by TSA under TSR 1542.101.

Airport Tenant means any person, other than an aircraft operator or foreign air carrier that has a security program under TSR Part 1544 or 1546 that has an agreement with the airport operator to conduct business on airport property.

Airport Tenant Security Program means the agreement between the airport operator and an airport tenant that specifies the measures by which the tenant will perform security functions, which is approved by TSA under 152.113.

Cargo means property tendered for air transportation accounted for on an air waybill. All accompanied commercial courier consignments, whether or not accounted for on an air waybill, are also classified as cargo. Aircraft operator security programs further define the term "cargo".

Checked baggage means property tendered by or on behalf of a passenger and accepted by an aircraft operator for transport, which is inaccessible to passengers during flight. Accompanied commercial courier consignments are not classified as checked baggage.

Escort means to accompany or maintain constant visual contact with an individual who does not have unescorted access authority into or within a Secured Area or SIDA.

Exclusive area means any portion of a Secured Area, AOA or SIDA, including individual access points, for which an aircraft operator or foreign air carrier that has a security program under TSR Part 1544 or 1546, has assumed responsibility under TSR Part 1542.111 of said chapter.

Exclusive area agreement means an agreement between the airport operator and an aircraft operator or a foreign air carrier that has a security program under TSR Parts 1544 or 1546 that permits such an aircraft operator or foreign air carrier to assume responsibility for specified security measures in accordance with TSR Part 1542.111 of said chapter.

FAA means Federal Aviation Administration.

Screening function means the inspection of individuals and property for weapons, explosives, and incendiaries.

Screening location means each site at which individuals are inspected for the presence of weapons, explosives, and incendiaries.

Secured area means a portion of an airport, specified in the airport security program, in which certain security measures specified in TSR Part 1542 are carried out. This area is where aircraft operators and foreign air carriers that have a security program under TSR Part 1544 or 1546 enplane and deplane passengers and sort and load baggage and any adjacent areas that are not separated by adequate security measures.

Security Identification Display Area (SIDA) means a portion of an airport, specified in the airport security program, in which security measures specified in TSR Part 1542 are carried out. This area includes the Secured Area and may include other areas of the airport.

Sterile area means a portion of an airport defined in the airport security program that provides passengers access to boarding aircraft and to which the access generally is controlled by TSA or by an aircraft operator under TSR Part 1544 or a foreign air carrier under TSR Part 1546, through the screening of persons and property.

Transportation Security Administration (TSA) means the Transportation Security Administration.

Transportation Security Regulation TSRs (TSR) means the regulations issued by the Transportation Security Administration, in Title 49 Code of Federal Regulations, Chapter XII, which includes parts 1500 through 1699.

Unescorted access authority means the authority granted by an airport operator, aircraft operator, foreign air carrier, or airport tenant authorized under TSR Part 1542, 1544, or 1546, to individuals to gain entry to, and be present without an escort in, Secured Areas and SIDA's of airports.

AIRPORT SECURITY RESPONSIBILITIES

A. Tenant / Contractor Responsibility

All Airport Tenants and KCI Airport Contractors – Each tenant / contractor and employees are responsible for challenging unidentified persons and/or ground vehicles which are not displaying proper signage or identification medium in their respective areas, and promptly reporting such incidents to the Airport Police in accordance with the procedures in the KCI Airport Security Program.

Each tenant should immediately notify the Airport Operator when security-related facilities and equipment within their areas are malfunctioning or no longer adequate to perform the control function for which it was intended.

B. Individual Responsibility

Under the provisions of TSR 1540.101, individuals will be held accountable for all security violations described in TSR 1540.103, 1540.105 and the KCI Airport Security Program. Violators may be subject to civil and/or local penalties. No person may tamper or interfere with, compromise, modify, attempt to circumvent, or cause a person to tamper or interfere with, compromise, modify, or attempt to circumvent any security system, measure, or procedure implemented under TSR Part 1540 or the KCI Airport Security Program.

No person may enter or be present within, a Secured Area, AOA, SIDA or sterile area without complying with the systems, measures, or procedures being applied to control access to, or presence or movement in, such areas. No person may use, allow to be used, or cause to be used, any airport-issued or airport-approved identification medium that authorizes the access, presence, or movement of persons or vehicles in Secured Areas, AOAs, or SIDAs in any other manner than that for which it was issued by the appropriate authority under TSR Parts 1542, 1544, 1546 or the KCI Airport Security Program.

KCI will provide information regarding individual responsibilities to each employee granted unescorted access authority to the Secured Area, SIDA, and/or AOA. (**Attachment 1)**

C. Falsification

No person may make, or cause to be made any fraudulent or intentionally false statement in any application for any security program, access medium, or identification medium, or any amendment thereto, under TSR Part 1540 and the KCI Airport Security Program. No person may make, or cause to be made any fraudulent or intentionally false entry in any record or report that is kept, made, or used to show compliance or exercise any privileges under TSR Part 1540 or the KCI Airport Security Program. No person may make, or cause to be made any reproduction or alteration, for fraudulent purpose, of any report, record, security program, access medium, or identification medium under TSR Part 1540 and the KCI Airport Security Program.

All suspected or known violations listed above will be reported to the airport ASC as soon as possible. The ASC may notify the TSA for possible enforcement action.

AIRPORT SECURITY OPERATIONS

General – Through systems, measures, and procedures contained in the KCI Airport Security Program, KCI will ensure all of the Secured Area and AOA of the airport have adequate access control under the provisions of TSR Part 1542.207(b) and provide an overall level of security equal to the performance standards of TSR Part 1542.207(a). Access control for the Secured Area and AOA is a combination of either automated access for designated vehicle post gates, lock and chain for tenant and perimeter post gates or computerized Access Control System, lock and key for doors as described in the KCI Airport Security Program.

A. Secured Areas

Description – The Secured Area at KCI is where aircraft operators and foreign air carriers that have a security program under TSR Part 1542 or 1544 enplane and deplane passengers, sort and load baggage, and includes any adjacent areas that are not separated by adequate security systems, measures, or procedures. Boundaries of the Secured Area are recognized by fences/walls, buildings, controlled access points, CCTV (vehicle access points), pavement markings and warning signs. The boundaries of the Secured Area at KCI include all the pavement areas between the terminals, aircraft operator ramps adjacent to the terminal buildings, and then extend out to where the active taxiways begin. The Secured Area also includes all areas beyond the access points controlled under TSR Part 1542.207(b) including all baggage make-up areas and other areas identified in the Airport Security Program.

Access Control System

The computerized system, badging, and control monitoring process is operated by the Airport Identification Office and located in the Airport Police Building. Airport Police Customer Service Representatives are trained to operate the computer terminals and have the capability to delete the access authorization of any individual upon proper verification of a report of a lost or stolen badge or employee termination or change of authorization.

The system is a computer driven, software controlled, access system utilizing an encoded prox-type airport-issued identification/access badge to prevent unauthorized access through vehicle post gates leading to the Secured Area. Access is either denied or granted in accordance with criteria residing within the computer software. The system controls vehicle post gates with direct access to the Secured Area as well as other access points to portions of the AOA. Upon entering and exiting the post gate, all vehicles must stop and wait upon immediately passing through the gate to ensure the post gate is closed before proceeding and to preclude "tailgating" and/or unauthorized entry.

The access system identifies an encoded airport-issued identification/access badge when proxed at the card reader at vehicle post gate access points. The system is designed to allow access for one vehicle or connected train of vehicles at a time. The operation of the sliding gates involves the movement back and forth across the entrance. The sliding gate movement is no less than one foot per second, and closes in 15 seconds. An airport-issued identification/access badge must be proxed at the card reader for each vehicle.

KCI uses a special series of restricted keys and blank keys designed by the Best Lock Company. The keys and blank keys are not available to the public and are stamped with the statement “Duplication Prohibited”. Locks and keys for access points, except those controlled by tenants for their leaseholds, are controlled by the Aviation Department. The Aviation Department’s designated locksmith is charged with maintaining possession of all blank keys and padlocks, along with preparing them for use. The locksmith will cut keys as required and stamp them with a control number and an individual serial number. The control number identifies the lock or padlock they operate. The serial number is an individual key identification and identifies to whom the key was issued. The locksmith will also prepare padlocks for securing the AOA Perimeter post gates that are

not controlled by card readers. After the keys and padlocks are prepared, they will be charged out to the Airport ID Office. The Airport ID Office will then assume control, accountability, and responsibility of the keys and padlocks.

Key Custodian – An Authorized Signature Form, **Attachment 2**, must be on file in the ID Office prior to the issuance of any access control keys. The individuals listed on the form are designated as the Key Custodian and are authorized by the tenant, company or Aviation Department to request keys and/or padlocks. The Key Custodian must have a valid airport-issued identification/access badge authorized for the specific area of which the keys are requested.

Escort Procedures – Persons who do not have unescorted access authority and have a need to enter the Secured Area, must be under "positive" escort by a person who has a valid authorized identification/access badge for the Secured Area. "Positive" escort means the individual providing the escort must be in the proximity of the individual(s) being escorted to the extent capable of controlling the movement of the individual(s) and ensure the individual(s) under escort is engaged in only activities for which escorted access was granted. Should the individual(s) attempt to engage in unauthorized activity, the person providing the escort should conduct a verbal challenge. Should the person providing the escort become endangered, or the escorted individual(s) is unresponsive to the verbal challenge, ACC should be notified immediately by radio or telephone. ACC will dispatch an Airport Police Officer to the reported location for appropriate action and follow-up. ***No person may be escorted onto the Secured Area who has been granted unescorted access authority and does not have their badge in their possession. Secured Area media must be properly displayed at all times.***

Vehicle Identification – All vehicles operating on the Secured Area must be properly marked and lighted. It will be the driver's responsibility to ensure the vehicle is in compliance, violators will be denied access or removed.

- Markings – vehicles operating on the Secured Area be clearly marked with company name, symbols, words, and/or number so as to be easily identified as belonging to a particular tenant, organization, the City, or contractor.
- Lighting – all vehicles operating on the Secured Area will be lighted with an amber flashing or rotating beacon mounted on the uppermost part of the vehicle when possible and reasonable or equipped with lighting visible from all sides.

Personally-owned vehicles are not authorized on the Secured Area.

Access Media – ID badges for Secured Area access are issued by the Airport Identification Office after completion of a finger-print based Criminal History Records Check (CHRC), or Certification by the employer that they have completed the CHRC and after completion of a Security Threat Assessment (STA). ID badges serve as both access and identification indicating authorized access to specific areas on the Airport and are color-coded for definition.

B. Air Operations Area (AOA)

Description – the AOA at KCI is any other area within the perimeter fence that is not included in the Secured Area. Boundaries of the AOA are recognized by fences, buildings, controlled access points, pavement markings, and warning signs. The boundaries and pertinent features of the AOA at KCI include three runways, taxiways, ARFF, United States Postal Service, cargo ramp areas, General Aviation, north Aviation Field Maintenance Facility, and the American Airlines Aircraft Maintenance and Engineering Base.

Access Control System

Reference Secured Areas, Access Control System, Paragraphs 1-6. In addition, access control systems for the AOA include the following: Vehicle Post Gates not electronically controlled will be secured with chain and padlocks. Separate padlocks and key sets will be issued by the Airport ID Office to each organization requiring access to specific AOA post gates. These post gates may have one or any combination of padlocks on it from different organizations, however, only up to four padlocks per each post gate are allowed. These organizations include: Aviation Department, FAA, Kansas City Power and Light, Kansas City Health Department, USDA Wildlife Services, and Missouri Public Works (MoPub). Keys will be issued to employees of these organizations on an individual basis only. All padlocks required will be issued to one individual from each organization. To receive a key or padlock, the individual must have a valid airport-issued identification/access badge authorized for the specific area of which the padlock and keys are requested. An AOA Post Access Key/Padlock Request Form, **Attachment 5,** must be presented to the Airport ID Office and include an authorized signature. The Key Custodian will use the KCI Airport AOA Access Key Issue Log, **Attachment 6**, to record keys issued to employees for the padlocks.

The Aviation Department will be notified when there is no longer a need for access to a specific area or post gate by an organization before removing the issued padlock. An Aviation Department representative will accompany the organization's individual when the padlock is removed and ensure the AOA Post Gate is secured. All keys and padlocks will be returned to the Airport ID Office. At a minimum of once a shift, the Airport Police will check all post gates to verify all padlocks and post gates are secured. Any discrepancies found will be reported immediately to Airport Police supervision. The unsecured padlock will be secured by the Airport Police officer, who will ensure it is secured with an Aviation Department padlock. A formal report will be made by the Airport Police Officer.

Escort Procedures – Persons who do not have unescorted access authority and have a need to enter the AOA, must be under "positive" escort by a person who has a valid authorized identification/access badge for the AOA. "Positive" escort means the individual providing the escort must be in the proximity of the individual(s) being escorted to the extent capable of controlling the movement of the individual(s) and ensure the individual(s) under escort is engaged in only activities for which escorted access was granted. Should the individual(s) attempt to engage in unauthorized activity, the person providing the escort should conduct a verbal challenge. Should the person providing the escort become endangered, or the escorted individual(s) is unresponsive to the verbal challenge, ACC should be notified immediately by radio or telephone. ACC will dispatch an Airport Police Officer to the reported location for appropriate action and follow-up. ***No person may be escorted onto the AOA who has been granted unescorted access authority and does not have their badge in their possession.***

Vehicle Identification – All vehicles operating on the AOA must be properly marked and lighted. It will be the driver's responsibility to ensure the vehicle is in compliance, violators will be denied access or removed.

- Markings – vehicles operating on the AOA will be clearly marked with company name, symbols, words, and/or number so as to be easily identified as belonging to a particular tenant, organization, the City, or contractor.
- Lighting – all vehicles operating on the AOA will be lighted with an amber flashing or rotating beacon mounted on the uppermost part of the vehicle when possible and reasonable or equipped with lighting visible from all sides.

Personally-owned vehicles are not authorized on the Air Operations Area.

Perimeter Post Gates – The number of outlying vehicle Post Gates in the perimeter fencing are low throughput and limited to the minimum required for the safe and efficient operation of the airport. The Post Gates are designated by number with the same corresponding number affixed to the gate. All perimeter Post gates are secured with lock and chain and controlled by the Aviation Department under the Airport's Lock and Key Procedure outlined in the KCI Airport Security Program. Other locks may be added in conjunction with the Aviation Department locks only after approval of the Aviation Department.

Vehicle Access Post Gates – Vehicle post gates allowing access to the Secured Area and AOA are controlled under the provisions of TSR Part 1542.203. An airport-issued identification/access badge is required to enter the AOA through the vehicle post gates.

C. Security Identification Area (SIDA)

Description – The SIDA at KCI has the same boundaries as the Secured Area. It also includes the inside of the buildings and the ramp areas of ARFF, United States Postal Service, cargo facilities, FBO, and Field Maintenance located north of the terminal buildings. Individuals are subject to a fingerprint – based Criminal History Records Check or CHRC Certification from their employer, as well as a Security Threat Assessment (STA) performed by the Transportation Security Clearinghouse through the Kansas City Aviation Department. The employer must verify a CHRC has been performed and verify that the individual has received security training.

KCI has one general aviation tenant located north of the terminal buildings among the cargo facilities. Though the general aviation facility is described in the KCI Airport Security Program as a SIDA, it is unrealistic to badge all private aviation customers. The general aviation tenant will be responsible for the security of their leasehold and escort of their respective customers, and challenging of apparent unauthorized persons. All customers must check in at the customer service desk prior to entering the SIDA. Customers arriving by aircraft may be monitored as they proceed from their aircraft to the general aviation facility. Customers of general aviation are restricted to those areas on the general aviation ramp necessary to conduct their business. The general aviation tenant is responsible to ensure their customers are adequately monitored or escorted, and do not deviate to other non-authorized areas. Tenant employees should challenge unescorted/unidentified persons on the SIDA, or contact the Airport Police for response.

Escort Procedures – Persons who do not have unescorted access authority and have a need to enter the SIDA, must be under "positive" escort by a person who has a valid authorized identification/access badge for the SIDA. "Positive" escort means the individual providing the escort must be in the proximity of the individual(s) being escorted to the extent capable of controlling the movement of the individual(s) and ensure the individual(s) under escort is engaged in only activities for which escorted access was granted. Should the individual(s) attempt to engage in unauthorized activity, the person providing the escort should conduct a verbal challenge. Should the person providing the escort become endangered, or the escorted individual(s) is unresponsive to the verbal challenge, ACC should be notified immediately by radio or telephone. ACC will dispatch an Airport Police Officer to the reported location for appropriate action and follow-up. ***No person may be escorted onto the SIDA who has been granted unescorted access authority and does not have their badge in their possession.***

D. Accountability

When a key has been lost, reported stolen, or not returned by terminated or transferred employees, the tenant / contractor, organization manager, or Key Custodian will immediately notify the Airport ID Office or the Airport Communication Center at 243-4000. The tenant manager / contractor and the Aviation Department will take immediate action to monitor those access points compromised, to include the associated general ramp area. If appropriate, a physical description of the individual

will also be provided to the Airport Police. The Airport Police will make additional patrols in the area and challenge any suspicious individuals or activity until all affected locks are changed.

Any lock or padlock that is compromised must be replaced or decommissioned in one (1) hour. A sufficient number of locks, padlocks, cores, and keys will be available so that, if compromised, the entire lock and key system may be replaced within 24 hours. Locks controlling access to the AOA (TSR Part 1542.203) are deemed compromised when 5% of the keys are unaccounted for.

E. Fingerprint Based Criminal History Records Check

General – KCI will follow the procedures in 49 CFR 1542.209 for those persons requiring unescorted access authority to the Security Identification Display Area (SIDA), Secured Area and/or AOA. Maintenance of the criminal history record will be the responsibility of the airport or agency authorized to request, receive and review criminal history. It will be the responsibility of the airport to destroy this information at the appropriate time. These responsibilities will not be further delegated. KCI will ensure no individual is granted unescorted access to the SIDA, Secured Area or AOA unless the individual has undergone a fingerprint based Criminal History Records Check (CHRC), or provided a Certification, from their employer, that does not disclose the individual has been convicted, or found not guilty by reason of insanity of any of the disqualifying crimes in any jurisdiction during the 10 years before the date of the individual's application. Additionally, individuals requiring unescorted access to the SIDA must successfully complete a Security Threat Assessment (STA) performed by the Transportation Security Clearinghouse through the Kansas City Aviation Department.

For List of Disqualifying Crimes, see **Attachment 7**.

Exemptions: KCI will authorize the following individuals unescorted access authority upon receipt of a Certification form, **Attachment 9**:

- Any employee of the Federal, state, or local government (including a law enforcement officer) who, as a condition of employment, has been subjected to an employment investigation that includes a criminal records check.

Notwithstanding the requirements of TSR Part 1542.209, KCI may authorize the following individuals unescorted access authority upon receipt of a Certification form, **Attachment 9**, signed by an authorized individual:

- An individual who has been continuously employed in a position requiring unescorted access authority by another airport operator, airport user, or aircraft operator, or contractor to such an entity, provided the grant for his or her unescorted access authority was based upon a fingerprint based CHRC through TSA or FAA.
- An individual who has been continuously employed by an aircraft operator or aircraft operator contractor, in a position with authority to perform screening functions, provided the grant for his or authority to perform screening functions was based upon a fingerprint based CHRC through TSA or FAA.

KCI has 2 'Visionics' electronic fingerprint machines located in the Airport ID Office at the Airport Police Building. The Airport ID Office personnel have received adequate training to collect fingerprints and transmit the data with these machines.

Procedures – At the time of fingerprinting, KCI will provide the individual to be fingerprinted a Fingerprint Application, **Attachment 7**, acknowledging the individual does not have a disqualifying offense as well as disclosure responsibilities.

Each individual must complete and sign the Fingerprint Application prior to submitting his or her fingerprints.

The Airport ID Office personnel must verify the identity of the individual through 2 forms of identification prior to fingerprinting and ensure the printed name on the application is legible. At least one of the two forms of identification must have been issued by a government authority, and at least one must include a photo.

One set of legible and classifiable fingerprints will be collected by Airport ID Office personnel and processed electronically to the FBI through AAAE as required by the TSA.

Results of a CHRC will be electronically received by an ASC. The criminal record information provided by the FBI will not be disseminated to anyone other than:

- The individual to whom the record pertains, or that individual's authorized representative;
- Officials of other airport operators who are determining whether to grant unescorted access to the individual;
- Aircraft operators who are determining whether to grant unescorted access to the individual; or
- Others designated by the TSA.

When a CHRC on an individual seeking unescorted access authority discloses an arrest for any disqualifying criminal offense, without indicating a disposition, KCI will determine after investigation, the arrest did not result in a disqualifying criminal offense before granting that authority.

KCI will accept certification from aircraft operators for each individual seeking unescorted access authority for the aircraft operator employees and contractors under the provisions of TSR Part 1544.229. Individuals seeking unescorted access authority under these provisions must present a completed Certification form, **Attachment 9**, signed by an individual listed on the Authorized Signature form. **Attachment 2**.

Each individual with unescorted access authority who has a disqualifying criminal offense must report the offense to the airport operator and surrender their KCI Airport-issued identification/access badge to the Airport ID Office within 24 hours of the conviction or finding of not guilty by reason of insanity.

If information becomes available to the airport operator indicating that an individual with unescorted access authority has a disqualifying criminal offense, the ASC will determine the status of the conviction. If a disqualifying offense is confirmed, KCI will immediately revoke any unescorted access authority.

The airport user must report to KCI information, as it becomes available, that indicates an individual with unescorted access authority may have a disqualifying criminal offense.

Unclassifiable Fingerprints – In instances where fingerprints are unclassifiable or unattainable due to physical impairment, KCI will utilize the following procedure to clear an individual and grant unescorted access authority to the Secured Area/SIDA:

- KCI or an aircraft operator will conduct a full 10-year employment verification on the individual. An individual will not be considered "cleared" under this investigation if there is an unexplained gap of 30 days or more pertaining to the individual's whereabouts during this 10-year period.
- The individual must present, with his or her application for unescorted access authority, a certified birth certificate (along with a certified translation if the birth certificate is not in English).

- The individual must present, with his or her application for unescorted access authority, a current government issued identification card with a photo of the individual.
- If the individual is a foreign national, the individual must present, with the application for unescorted access authority, a valid and current work visa or other equivalent document (which must be verified with the Immigration and Naturalization Service).
- KCI or an aircraft operator will request, through the TSA, a manual FBI criminal history records check (CHRC) based on personal information contained in the procedure described above.

Fees – KCI will charge the following fees for each fingerprint taken at the Airport ID Office:

- $31 – fingerprints taken using the Airport's Submitting Office Number (SON).
- $29 – fingerprints taken for TSA screeners.

Audit – Each airport user must provide KCI with either the name or title of the individual acting as custodian of the files, the address, of the location where the files are maintained, and the phone number of that location. The airport user must provide KCI and TSA with access to these files. KCI will conduct an annual audit under the provision set forth by TSA.

F. Identification Systems

General – No person will be allowed within the Secured Area, SIDA, or AOA of KCI Airport without the possession of a valid airport-issued ID badge authorized for access into these areas or under direct escort by a properly-badged person. Any person found in the Secured Area, SIDA or AOA without proper identification as described herein, will be considered unauthorized, immediately removed from the Secured Area, SIDA or AOA, and subject to prosecution.

Display – All persons within the Secured Area, SIDA or AOA of KCI Airport will display on their person, at all times while in the area, a valid identification badge issued or approved by KCI Airport. Individuals in the Secured Area, SIDA or AOA must continuously display the identification badge issued to that individual on the outermost garment, above waist level, or be under escort by a properly badged individual. KCI Airport will provide a map of these boundaries to individuals with unescorted access authority. **Attachment 14.**

Authorized Identification – The following means of identification are authorized on the airport by KCI:

- Airport-issued identification/access badges described herein;
- FAA Form 110A is recognized as authorizing FAA Aviation Safety Inspectors unescorted presence and movement to those portions of a Security Identification Display Area (SIDA) as necessary to the conduct of his/her assigned duties.
- The use of aircraft operator identification media issued to flight and cabin crew members of U.S. certificated aircraft operators is authorized for unescorted movement in the following portions of the Secured Area: The immediate vicinity of the aircraft to which flight crew is assigned; flight crew operations/flight office, or the equivalent; and points in between, as defined in the KCI Airport Security Program.

  Flight crewmembers must be in uniform and wear an aircraft operator issued identification medium, readily visible at waist level or above. Such ID must be worn by the crewmember to whom it was issued.
- Airline Temporary Badges – Temporary badges are issued to KCI Airline Managers for the purpose of providing non-KCI based airline employees temporary access to the Secured Area.

The airline temporary badge must be worn in conjunction with the aircraft operator ID medium and will be issued on a day-to-day basis to the non-KCI based employees needing temporary access to a specified area within the Secured Areas of the airline's leased premises. The Airline Manager will provide site-specific training for non-KCI based employees.

Each Airline Manager is required to complete an Application form, **Attachment 10,** for each temporary badge assigned to them. The Airline Manager is responsible for the control and accountability of the airline temporary badges assigned their respective airline.

Airline temporary badges are valid for one calendar year. If at anytime while in the possession of an airline temporary badge, the authority of that individual is questioned, the holder's access authority can be verified by contacting the associated Airline Manager. All airline temporary badges will be returned to the associated Airline Manager at the conclusion of the workday.

- Law Enforcement Temporary Badges – Temporary badges are issued by KCI to supplemental Law Enforcements Agencies identified in the KCI Airport Security Program in the event emergency security measures are mandated by TSA requiring Law Enforcement support in excess of the number of available Airport Police Law Enforcement Officers. These temporary badges do not authorize unescorted access to the Secured Area, SIDA, or AOA however, must be worn at all times when the individual is acting as an agent of the Airport Police. Temporary badges are issued on a day-to-day basis and returned to the Airport Police at the conclusion of assignment.

* Contractor badges are issued to individuals who are providing contractor or construction work on the airport. Individuals may only be in the areas of their assigned construction activity. Primary contractors will be issued the appropriate color-coded badge required for the area in which they are working. All other personnel associated with each project will be under positive escort at all times while working within the Secured Area, SIDA, or AOA. A deposit of $100 is required for each contractor badge issued and reimbursed when the badge is returned.

Application – Prior to the issuance of any KCI Airport identification/access badge, each tenant/company must have an Authorized Signature Form, **Attachment 2,** on file in the Airport ID Office. The following documents are required to be presented at the Airport ID Office as specified:

- Airport ID Office personnel must verify the identity of the individual through 2 forms of identification prior to fingerprinting and ensure the printed name on the application is legible. At least one of the two forms of identification must have been issued by a government authority, and at least one must include a photo.

- Application form, **Attachment 10** - must be completed, and signed by the applicant and an individual listed on the respective Authorized Signature Form. The employer of the individual for whom the badge is being requested must make applications for badges. Please refer to the instructional document entitled, "Step-by-Step Procedures for the Completion of the KCI Airport ID Badge / Proximity Card Application (Attachment 10)", which is located at the end of this document.

- Fingerprint Application, **Attachment 7** - must be completed and signed by the applicant or present a Certification form, **Attachment 9**, signed by an individual listed on the Authorized Signature Form.

- Certificate for Reassigned or Temporarily Assigned Airline or Tenant Employees form, **Attachment 12** - must be completed and signed by those individuals who have received Secured Area/SIDA training at another airport and desire to waive the training at KCI. This form includes a map and description of the Secured Area/SIDA and contains contact information for law enforcement.

- Tenant and Contractor Letter of Agreement, **Attachment 13** - must be completed and signed by both the tenant company and the contractor company and must be on file in the Airport ID Office before any badge is issued to contract employees. This form ensures the contractor is authorized to provide services for a tenant company. The form describes requirements for deposits, badges not returned, and badge renewals. The project completion date listed on the form will be the badge expiration, not to exceed 24 months.

Accountability – Identification/access badges will be issued on an individual basis. Each badge will be numbered and this number will be assigned to an individual. Any individual losing a badge will report the loss immediately to the Airport ID Office. Replacement of a lost, stolen, or expired badge will only be issued if an individual declares in writing that the medium has been lost or stolen and a $50 charge assessed. The payment will be made prior to a new badge being issued unless the company has an agreement, beforehand, to pay for any lost badges. The company is responsible for the immediate reporting of a lost badge.

When an individual no longer has a need for a badge, the company will be responsible to ensure the Airport ID Office is notified immediately and the badge physically returned to the Airport ID Office. The company will be billed $50 for badges not returned. Aviation Department contractors must return all badges at the completion of their project. The $100 deposit will be withheld for each badge that is expired, lost, or not returned.

For ongoing audit purposes, the Airport ID Office supervision prepares monthly Active Badge Reports, which are mailed out to each active company on the 1st day of the month. Each company is instructed, by an accompanying letter, to return the Active Badge Report no later than the 15th of the month, or their service is discontinued pending receipt of the report. In addition, random monthly "spot checks" will be conducted physically – or by way of facsimile request – to the active companies' management by the ID Office manager that will include all identification/access badge holders. Each active company will be "spot checked" at least one annually.

G. Training

All applicants for an airport-issued identification/access badge at KCI will receive training through a computer-based learning system using verbal, visual, and written material to ensure understanding. Each employee, tenant employee, or other authorized individual issued an airport identification/access badge allowing access to the Secured Area/SIDA and AOA, is required to successfully complete the airport security training curriculum approved by the TSA, in accordance with TSR Part 1542.213.

Individual Responsibilities
Identification / Access Badges
Kansas City International Airport (MCI)

Under the provisions of TSR 1540.101, individuals shall be held responsible and personally accountable for all security violations described in TSR 1540.103, 1540.105 and the MCI Airport Security Program. Violators may be subject to civil and/or local penalties.

- No person may tamper or interfere with, compromise, modify, attempt to circumvent, or cause a person to tamper or interfere with, compromise, modify, or attempt to circumvent any security system, measure, or procedure implemented under TSR Parts 1540 and 1542 or the MCI Airport Security Program.
- No person may enter or be present within, a Secured Area, AOA, or SIDA or sterile area without complying with the systems, measures, or procedures being applied to control access to, or presence or movement in, such areas.
- No person may use, allow to be used, or cause to be used, any airport-issued or airport-approved identification medium that authorizes the access, presence, or movement of persons or vehicles in Secured Areas, AOAs, or SIDAs in any other manner than that for which it was issued by the appropriate authority under TSR Parts 1540, 1542, 1544, and 1546 of the MCI Airport Security Program.
- Individuals in the Secured Area, AOA, SIDA or sterile area must continuously display the identification badge issued to that individual on the outermost garment, above waist level, or be under escort by a properly badged individual.

- Escort Procedures – Persons who do not have unescorted access authority and have a need to enter a restricted area, must be under "positive" escort by a person who has a valid authorized identification/access badge. "Positive" escort means the individual providing the escort must be in the proximity of the individual(s) being escorted to the extent capable of controlling the movement of the individual(s) and ensure the individual(s) under escort is engaged in only activities for which escorted access was granted. Should the individual(s) attempt to engage in unauthorized activity, the person providing the escort should conduct a verbal challenge. Should the person providing the escort become endangered, or the escorted individual(s) is unresponsive to the verbal challenge, ACC should be notified immediately by radio or telephone. ACC will dispatch an Airport Police Officer to the reported location for appropriate action and follow-up. When an individual fails to successfully complete a Security Threat Assessment (STA) or Criminal History Records Check (CHRC), or is subsequently disqualified due to an STA or CHRC disqualifying offense, where required, the Airport may not grant the individual escorted or unescorted access to the SIDA, Secured Area, Sterile Area, or AOA.

  No person may be escorted into the Secured Area, AOA, SIDA, or sterile area that has been granted unescorted access authority and does not have their identification/Access card in their possession.

- Challenge – Each airport employee, airport tenant or contractor who has been issued an airport identification/access badge has the responsibility to challenge any person(s), whether in uniform or not, who is not displaying an airport approved identification badge within the Secured Area/SIDA of MCI in a manner prescribed herein, or a person displaying an identification badge with unauthorized color-code for the area, or the badge is expired, or the badge was not issued to the individual displaying it, and immediately report the incident to Airport Police. The challenge should be accomplished in a non-threatening manner. Non-security/law enforcement personnel are not expected to place themselves or others in a dangerous situation if it is suspected that a challenge would result in such. The challenge requirement may also be satisfied when Airport Police are immediately notified at the time a person is found to be in the Secured Area, AOA, SIDA or sterile area without a badge or proper authorization. When a verbal challenge is not made, the continuous location, name, and/or description of the person should be relayed to Airport Police. Persons found to be without a badge, or in an unauthorized area, shall be immediately escorted from the area and Airport Police notified. Airport Police will take deliberate and appropriate action following investigation on each incident.

- In the event an identification/access badge is lost or stolen, individuals must immediately notify the Airport ID Office at 243-5211 or the Airport Communications Center at 243-4000. The replacement fee is $50 for regular employees and $100 for contractors.

- All identification/access cards remain the property of MCI Airport and must be surrendered upon termination of employment. Failure to return an identification/access media card can result in a warrant being issued for the individual's arrest.

I have read and understand the above responsibilities.

Employee Signature _____

Employee Telephone Number _____

Employer _____

Date _____

TSA APPROVED Angela Bustin DATE SEP 25 2014

"SENSITIVE SECURITY INFORMATION/FOR OFFICIAL USE ONLY WARNING: This document contains Sensitive Security Information that is controlled under 49 CFR Part 1520. No part of this document may be released to persons without a need to know, as defined in 49 CFR 1520, except with the written permission of the Administrator of the Transportation Security Administration, Arlington, VA. Unauthorized release may result in civil penalty or other action. For U.S. Government agencies, public release is governed by 5 U.S.C.552."

AUTHORIZED SIGNATURES
FOR
MCI AIRPORT ID / ACCESS BADGES, KEYS, and/or PADLOCKS

_____
Company Name (Print)

To request Identification / Access badges, keys, and/or padlocks, the following are the only Authorized Signatures for the above company:

Printed Name:	Signature:	Title:	Telephone:	E-Mail:

Manager's Printed Name: _____

Manager's Signature: _____

Mailing Address: _____

_____

Telephone Number: _____

Fax Number: _____

E-Mail Address: _____

Revised: April 2009

MCI AVIATION DEPARTMENT

SECURED AREA & STERILE AREA ACCESS KEY REQUEST (KEY CUSTODIANS)

KEYMARK #_____ **COMPANY**_____

ID BADGE #_____ **SSN** _____

Control of a key is as significant as the control of the KCI Airport Identification / Access badge. Loss of a key compromises the security of the airport. Lost keys MUST be reported to Airport Police at 243-5219 immediately.

_____ _____

Signature of Individual Requesting Key Date

_____ _____

Signature of Authorized Signatory / Key Custodian Date

FOR AIRPORT ID OFFICE USE ONLY

Keymark #_____

Number of Keys Issued_____

From Key Serial #_____ To Key Serial #_____

Key Returned

Keymark #_____ Date_____

From Key Serial #_____ To Key Serial #_____

_____

Signature of Individual Returning Keys

_____

Signature of ID Office Customer Service Representative Accepting Keys

TSA APPROVED DATE SEP 20 2012

SECURED AREA & STERILE AREA ACCESS KEY ISSUE LOG

Kansas City International Airport (MCI)

(Please Print)

TENANT / AGENCY_____KEYMARK #_____

KEY CUSTODIAN_____DATE_____

EMPLOYEE NAME	MCI BADGE #	KEYMARK #	ISSUE DATE	RETURN DATE

TSA APPROVED

DATE SEP 20 2012

AOA ACCESS KEY/PADLOCK REQUEST

Kansas City International Airport (MCI)

EMPLOYEE'S NAME _____ SPONSOR _____

COMPANY NAME _____ PROJECT # _____

KEY CONTROL # _____ COMPLETION DATE _____

ID/ACCESS BADGE# _____ SSN _____

There is a $50.00 fee for each key or padlock lost. There is no refund on keys reported lost or missing, then later returned. Padlocks will not be removed without prior coordination with the Aviation Department. Control of this key and/or padlock is as significant as the control of the MCI Airport ID Access badge. Loss of this key and/or padlock compromises the security of the airport. Loss of this key and/or padlock will be reported to the Airport ID Office immediately. Padlock will be confiscated if found unsecured.

_____ _____

Signature of Authorized Individual | Employee's Signature

_____ _____

Printed Name of Authorized Individual | Date

FOR AIRPORT ID OFFICE USE

Key Serial # _____ Padlock # _____ Quantity of padlocks issued _____

Key Returned: Control # _____ Date _____

Serial # _____ Signature _____

Rev.7/13/2006

AOA ACCESS KEY ISSUE LOG
Kansas City International Airport (MCI)

(Please Print)

TENANT / AGENCY_____KEY CONTROL #_____

KEY CUSTODIAN_____DATE_____

EMPLOYEE NAME	MCI BADGE #	KEY SERIAL #	ISSUE DATE	RETURN DATE

Attachment 6

Rev.6/1/04

CRIMINAL HISTORY RECORDS CHECK
FINGERPRINT APPLICATION

Kansas City International Airport (MCI)

Name (Print) _____

Last First Middle

Disqualifying criminal offenses as defined in TSR Part 1542.209(d) and TSR 1544.229(d):

1. Forgery of certificates, false marking of aircraft, and other aircraft registration violation; 49 U.S.C. 46306.
2. Interference with air navigation; 49 U.S.C. 46308.
3. Improper transportation of a hazardous material; 49 U.S.C. 46312.
4. Aircraft piracy; 49 U.S.C. 46502.
5. Interference with flight crew members or flight attendants; 49 U.S.C. 46504.
6. Commission of certain crimes aboard aircraft in flight; 49 U.S.C. 46506.
7. Carrying a weapon or explosive aboard aircraft; 49 U.S.C. 46505.
8. Conveying false information and threats; 49 U.S.C. 46507.
9. Aircraft piracy outside the special aircraft jurisdiction of the United States; 49 U.S.C. 46502(b).
10. Lighting violations involving transporting controlled substances; 49 U.S.C. 46315.
11. Unlawful entry into an aircraft or airport area that serves air carriers or foreign air carriers contrary to established security requirements; 49 U.S.C. 46314.
12. Destruction of an aircraft or aircraft facility; 18 U.S.C. 32.
13. Murder.
14. Assault with intent to murder.
15. Espionage.
16. Sedition.
17. Kidnapping or hostage taking.
18. Treason.
19. Rape or aggravated sexual abuse.
20. Unlawful possession, use, sale, distribution, or manufacture of an explosive or weapon.
21. Extortion.
22. Armed or felony unarmed robbery.
23. Distribution of, or intent to distribute a controlled substance.
24. Felony arson.
25. Felony involving a threat.
26. Felony involving
    a. Willful destruction of property;
    b. Importation or manufacture of a controlled substance;
    c. Burglary;
    d. Theft;
    e. Dishonesty, fraud, or misrepresentation;
    f. Possession or distribution of stolen property;
    g. Aggravated assault;
    h. Bribery; or
    i. Illegal possession of a controlled substance punishable by a maximum term of imprisonment of more than 1 year.
27. Violence at international airports; 18 U.S.C. 37.
28. Conspiracy or attempt to commit any of the criminal acts listed in this paragraph.

By signing this application, I officially state I have not been convicted or found not guilty by reason of insanity of any disqualifying criminal offense in any jurisdiction during the 10 years prior to the date of this application.

Individuals have a continuing obligation to disclose to the airport operator, within 24 hours, if he or she is convicted of any disqualifying criminal offense that occurs while he or she has unescorted access authority under 49 CFR 1542.209.

The information I have provided on this application is true, complete, and correct to the best of my knowledge and belief and is provided in good faith. I understand that a knowing and willful false statement on this application can be punished by fine or imprisonment or both (See section 1001 of Title 18 United States Code.)

Signature: _____ Date:_____

Employee Telephone Number_____ **Rev.6/1/04**

CHRC CASE # _____

CERTIFICATION
For
Fingerprint Based Criminal History Records Check/Criminal Records Check
Kansas City International Airport (MCI)

_____ _____
Employee's Name Social Security Number

_____ _____
Employer Date

☐ AIRCRAFT OPERATORS:
MCI shall accept certification from Aircraft Operators for each aircraft operator employee and contractor seeking unescorted access authority to the Secured Area and SIDA under the provisions of TSR Parts 1542.209 and 1544.229.

☐ FEDERAL, STATE, and LOCAL GOVERNMENT:
As a condition of employment, the employee has been subjected to an employment investigation which included a criminal records check.

☐ CONTINUOUS EMPLOYMENT – UNESCORTED ACCESS:
The employee has been continuously employed in a position requiring unescorted access authority by another airport operator, airport user, aircraft operator, or contractor to such an entity, and the employee's grant for unescorted access authority was based upon a fingerprint based CHRC through TSA or FAA.

☐ CONTINUOUS EMPLOYMENT – SCREENERS:
The employee has been continuously employed by an aircraft operator or aircraft operator contractor in a position with authority to perform screening functions, and the employee's grant for unescorted access authority was based upon a fingerprint based CHRC through TSA or FAA.

By my signature: I certify that in accordance with TSR Parts 1542 and 1544, the applicant has undergone a criminal records check as a condition of employment or a fingerprint based criminal history records check that did not disclose the individual has been convicted or found not guilty by reason of insanity of any of the disqualifying crimes in any jurisdiction during the 10 years before the date of the individual's application. A written record of this information will be maintained until 180 days after the employee's authority for unescorted access has been terminated. I further understand and stipulate the employer assumes responsibility for all fines imposed by the Transportation Security Administration upon the City of Kansas City, Missouri Aviation Department for any violation of this employee's criminal history records check.

_____ Date_____
Authorized Signature

LISTS OF ACCEPTABLE DOCUMENTS

All documents must be unexpired

LIST A Documents that Establish Both Identity and Employment Authorization	OR	LIST B Documents that Establish Identity	AND	LIST C Documents that Establish Employment Authorization
1. U.S. Passport or U.S. Passport Card		1. Driver's license or ID card issued by a State or outlying possession of the United States provided it contains a photograph or information such as name, date of birth, gender, height, eye color, and address		1. Social Security Account Number card other than one that specifies on the face that the issuance of the card does not authorize employment in the United States
2. Permanent Resident Card or Alien Registration Receipt Card (Form I-551)				2. Certification of Birth Abroad issued by the Department of State (Form FS-545)
3. Foreign passport that contains a temporary I-551 stamp or temporary I-551 printed notation on a machine-readable immigrant visa		2. ID card issued by federal, state or local government agencies or entities, provided it contains a photograph or information such as name, date of birth, gender, height, eye color, and address		3. Certification of Report of Birth issued by the Department of State (Form DS-1350)
4. Employment Authorization Document that contains a photograph (Form I-766)		3. School ID card with a photograph		
		4. Voter's registration card		4. Original or certified copy of birth certificate issued by a State, county, municipal authority, or territory of the United States bearing an official seal
5. In the case of a nonimmigrant alien authorized to work for a specific employer incident to status, a foreign passport with Form I-94 or Form I-94A bearing the same name as the passport and containing an endorsement of the alien's nonimmigrant status, as long as the period of endorsement has not yet expired and the proposed employment is not in conflict with any restrictions or limitations identified on the form		5. U.S. Military card or draft record		
		6. Military dependent's ID card		
		7. U.S. Coast Guard Merchant Mariner Card		5. Native American tribal document
		8. Native American tribal document		6. U.S. Citizen ID Card (Form I-197)
		9. Driver's license issued by a Canadian government authority		
		For persons under age 18 who are unable to present a document listed above:		7. Identification Card for Use of Resident Citizen in the United States (Form I-179)
6. Passport from the Federated States of Micronesia (FSM) or the Republic of the Marshall Islands (RMI) with Form I-94 or Form I-94A indicating nonimmigrant admission under the Compact of Free Association Between the United States and the FSM or RMI		10. School record or report card		8. Employment authorization document issued by the Department of Homeland Security
		11. Clinic, doctor, or hospital record		
		12. Day-care or nursery school record		

Illustrations of many of these documents appear in Part 8 of the Handbook for Employers (M-274)

NCIC 2-Character Abbreviations
for
Place of Birth Country / Citizenship Code Country / Passport Country

Code:	Description:	Code:	Description:	Code:	Description:	Code:	Description:
AA	Albania	CC	Cuba	EU	Ecuador	IE [2]	Ireland
AB	Alberta	CD [1]	Canada	EY	Egypt	II	India
AD	Andorra	CE	Campeche	EZ	Czech Republic	IL	Illinois
AE	Anguilla	CF	Chad	FA	Falkland Islands	IM	Madeira Islands
AF	Afghanistan	CG	Caroline Islands	FC	Fond du Lac	IN	Indiana
AG	Aguascalientes	CH	Chihuahua	FD	Finland	IO	Indonesia
AH	Ashmore & Cartier Islands	CI	Chiapas	FG	French Guiana	IQ	Iraq
AI	Antigua & Barbuda	CJ	Cambodia	FJ	Fiji	IR	Iran
AJ	Aruba	CL	Colima	FL	Florida	IS	Israel
AK	Alaska	CM	Cameroon	FN	France	IT	Italy
AL	Alabama	CO	Colorado	FO	Faroe Islands	IU	Niue
AM	American Samoa	CP	Cayman Islands	FP	French Polynesia	IW	Iowa Tribe
AN	Algeria	CQ	Chile	FR	French Southern & Antartic Lands	IX	Menominee
AO	Angola	CR	Costa Rica	FS	Federated States of Micronesia	IY	Cote d'Ivoire (Ivory Coast)
AP	Armenia	CS	Cyprus	FX	Sac & Fox	JA	Japan
AQ	Azores Islands	CT	Connecticut	GA	Georgia	JE	Jersey
AR	Arkansas	CU	Coahuila	GB	Gabon	JI	Johnston Island
AS	Australia	CV	Cape Verde Islands	GC	Greece	JL	Jalisco
AT	Argentina	CW	Central African Republic	GD	Georgia	JM	Jamaica
AU	Austria	CY	Ceylon (Now Sri Lanka)	GE	Germany	JN	Jan Mayen
AV	Azerbaijan	CZ	Canal Zone	GF	Guernsey	JO	Jordan
AX	Apache Tribe	DA	Cheyenne & Arapaho Tribes	GG	Ghana	JR	Jarvis Island
AZ	Arizona	DB	Clipperton Island	GI	Guinea	JU	Juan de Nova Island
BA	Baja California (Northern Section)	DC	District of Columbia	GJ	Grenada	KB	Gilbert Islands (Now Kiribati)
BB	Barbados	DD	Cocos Islands	GK	Gambia, The	KC	Croatia
BC	British Columbia	DE	Delaware	GM	Guam	KE	Kenya
BD	Bahamas, The	DF	Distrito Federal (Mexico, D.F.)	GN	Greenland	KH	Manahiki Island
BE	Bahrain/Bahrein	DG	Comoros (or Comoros Islands)	GO	Glorioso Islands	KI	Kingman Reef
BF	Bassas Da India	DH	Benin (formally Dahomey)	GP	Guadeloupe	KK	Kickapoo Tribe
BG	Belgium	DI	Cook Islands	GR	Guerrero	KN	North Korea
BH	Belize	DJ	Coral Sea Islands	GS	South Georgia & South Sandwich Islands	KO	South Korea
BI	Burundi	DK	Denmark	GT	Guatemala	KP	Shakopee
BJ	Baja California (Southern Section)	DL	Devil's Lake Sioux Tribe	GU	Guanajuato	KS	Kansas
BK	Baker Island	DM	Dominica	GY	Guyana	KT	Kazakhstan
BL	Bangladesh	DN	Djibouti	GZ	Gaza	KU	Kuwait
BM	Bermuda	DO	Durango	HD	Honduras	KW	Kiowa
BN	Bhutan	DP	Comanche Nation	HE	Heard Island & McDonald Island	KY	Kentucky
BO	British Indian Ocean Territory	DR	Dominican Republic	HI	Hawaii	KZ	Kyrgyzstan
BP	Bosnia & Hercegovenia	DS	Miami Tribe	HK	Hong Kong	LA	Louisiana
BQ	Bouvet Island (Norwegian Territory)	DT	Muscogee (Creek) Tribe	HL	Hidalgo	LB	Liberia
BR	Burma	DV	Seneca-Cayuga Tribes	HN	New Hebrides (now Vanuatu)	LC	Mille Lacs
BS	British Solomon Islands (now Solomon Islands)	DW	Citizen Band Pottawatomie Tribe	HO	Howland Island	LD	Moldovia
BT	Botswana	EE	Absentee Shawnee	HR	Christmas Island	LE	Lesotho
BU	Bulgaria	EK	Equatorial Guinea	HS	Saint Helena	LF	Slovakia
BV	Bolivia	EL	El Salvador	HT	Haiti	LH	Lithuania
BW	Balearic Islands	EN	England	HU	Hungary	LI	Liechtenstein
BX	Brunei	EO	Ethiopia	IA	Iowa	LL	Leech Lake Band of Chippewa
BY	Brazil	ER	Europa Island	IB	Isle of Man	LN	Lebanon
CA	California	ES	Estonia	IC	Iceland	LO	Slovenia
CB	Colombia	ET	Eretria	ID	Idaho	LP	Lac du Flambeau Band of Lake Superior Chippewa

NCIC 2-Character Abbreviations
for
Place of Birth Country / Citizenship Code Country / Passport Country

Code:	Description:	Code:	Description:	Code:	Description:	Code:	Description:
LS	Laos	NT	Northwest Territories	RI	Rhode Island	TU	Tunisia
LT	Latvia	NU	Nicaragua	RL	Red Lake	TV	Ellice Islands
LU	Saint Lucia	NV	Nevada	RR	Montserrat	TW	Taiwan, Republic of China
LX	Luxembourg	NW	Norway	RS	Spanish Sahara	TX	Texas
LY	Libya	NX	Bonaire (Netherlands Antilles)	RU	Romania	TY	Turkey
MA	Massachusetts	NY	New York	RV	Socialist Republic of Vietnam	TZ	Tanzania, United Republic of
MB	Manitoba	NZ	New Zealand	RW	Rwanda	UC	Turtle Mtn. Band of Chipewa
MC	Michoacan	OA	Oaxaca	RY	Republic of Yemen	UG	Uganda
MD	Maryland	OC	Macao	SA	Sierre Leone	UK	Ukraine
ME	Maine	OF	Norfolk Island	SB	Saudi Arabia	UM	Mauritius
MF	Malawi	OG	Osage Nation	SC	South Carolina	UR	Turkmenistan
MG	Mongolia	OH	Ohio	SD	South Dakota	US	United States of America
MH	Marshall Islands	OI	Okinawa	SE	Seychelles	UT	Utah
MI	Michigan	OK	Oklahoma	SF	South Africa	UV	Burkina Faso
MJ	Monaco	OM	Oman	SG	Senegal	UY	Uruguay
MK	Mariana Islands	ON	Ontario	SH	San Marino	UZ	Uzbekistan
ML	Mali	OO	Otoe-Missouria Tribe	SI	Sinaloa	VA	Virginia
MM [3]	Mexico	OR	Oregon	SJ	Namibia	VB	British Virgin Islands
MN	Minnesota	OS	Oglala Sioux	SK	Seminole Nation	VC	Veracruz
MO	Missouri	OT	Oneida Tribe of Indians of Wisconsin	SL	San Luis Potosi	VI	U.S. Virgin Islands
MP	Madagascar	PA	Pennsylvania	SM	Somalia	VL	Navassa Island
MQ	Morocco	PB	Puebla	SN	Saskatchewan	VT	Vermont
MR	Morelos	PC	Pitcairn, Henderson, Ducie, & Oeno Islands	SO	Sonora	VV	Saint Vincent & the Grenadines
MS	Mississippi	PD	Palau, Rebublic of	SP	Spain	VY	Vatican City
MT	Montana	PE	Prince Edward Island	SQ	Sweden	VZ	Venezuela
MU	Mauritania	PF	Parcel Islands	SR	Singapore	WA	Washington
MV	Maldives	PG	Guinea-Bissau	SS	Scotland	WB	West Bank
MW	Midway Islands	PI	Philippines	SU	Sudan	WD	Wyandotte Tribe
MX	Mexico (State)	PK	Pakistan	SV	Svalbard	WE	White Earth
MY	Malta	PL	Palmyra Atoll	SW	Swaziland	WF	Wallis & Futuna
MZ	Malaysia	PM	Panama	SY	Syria	WI	Wisconsin
NA	Nayarit	PN	Ponca Tribe	SZ	Switzerland	WK	Wake Island
NB	Nebraska	PO	Poland	TA	Tamaulipas	WL	Wales
NC	North Carolina	PQ	Quebec	TB	Tabasco	WN	West Indies
ND	North Dakota	PR	Puerto Rico	TC	Trucial States (Now United Arab Emirates)	WS	Western Samoa
NE	Holland (Netherlands)	PS	Saint Pierre & Miquelon	TD	Trust Territory of the Pacific Islands	WT	Wichita Tribe
NF	Newfoundland	PT	Portugal	TE	Spratly Islands	WV	West Virginia
NG	Nigeria	PU	Peru	TF	Tuamotu Archipelago	WY	Wyoming
NH	New Hampshire	PV	Paraquay	TG	Tonga	XX	Unknown Place of Birth
NI	Northern Ireland	PW	Pawnee Tribe	TH	Thailand	YG	Yugoslavia
NJ	New Jersey	QA	Qatar	TJ	Tajikistan	YO	Mayotte
NK	New Brunswick	QR	Quintana Roo	TK	Tokelau	YT	Yukon (Territory)
NL	Nuevo Leon	QU	Queretaro	TL	Tlaxcala	YU	Yucatan
NM	New Mexico	RA	Russia	TM	Tromelin Island	YY	All Others
NN	Nigeria	RB	Republic of Congo	TN	Tennessee	ZA	Zacatecas
NO	New Guinea	RC	People's Republic of China	TO	Togo	ZB	Martinique
NP	Nepal	RE	Reunion	TP	Sao Tome & Principe	ZC	Surinam
NQ	New Caledonia	RF	Russian Federation	TR	Turks & Calcos Islands	ZD	Macedonia
NR	Nauru	RG	Gibraltar	TS	Nevis & Saint Christopher "Kitts"	ZI	Canary Islands
NS	Nova Scotia	RH	Rhodesia (now Zimbabwe)	TT	Trinidad & Tobago	ZM	Zambia

NCIC 2-Character Abbreviations
for
Place of Birth Country / Citizenship Code Country / Passport Country

Code:	Description:	Code:	Description:	Code:	Description:	Code:	Description:
ZO	Mozambique						
ZR	Congo Kinshasa, now Zaire						

[1] See separate list of Canadian Provinces; Use code CD only when province is unknown.
[2] Does not include Northern Ireland; See Northern Ireland contained in main listing.
[3] See separate list of Mexican States; Use code MM only when state is unknown.

Canadian Provinces

Code:	Province:	Code:	Province:	Code:	Province:	Code:	Province:
AB	Alberta	NF	Newfoundland	ON	Ontario	YT	Yukon Territory
BC	British Columbia	NK	New Brunswick	PE	Prince Edward Island		
CN	Canada	NS	Nova Scotia	PQ	Quebec		
MB	Manitoba	NT	Northwest Territories	SN	Saskatchewan		

Mexican States

Code:	Description:	Code:	Description:	Code:	Description:	Code:	Description:
AG	Aguascalientes	DO	Durango	NL	Nuevo Leon	TB	Tabasco
BA	Baja California	GR	Guerrero	OA	Oaxaca	TL	Tlaxcala
BJ	Baja California Sur	GU	Guanajuato	PB	Puebla	VC	Veracruz
CE	Campeche	HL	Hidalgo	QR	Quintana Roo	YU	Yucatan
CH	Chihuahua	JL	Jalisco	QU	Queretaro	ZA	Zacatecus
CI	Chiapas	MC	Michoacan	SI	Sinaloa		
CL	Colima	MR	Morelos	SL	San Luis Potosi		
CU	Coahuila	MX	Mexico (State)	SO	Sonora		
DF	Distrito Federal	NA	Nayarit	TA	Tamaulipas		

EMPLOYER:

APPLICATION
IDENTIFICATION / PROXIMITY CARD
Kansas City International Airport (MCI Category I)

CONTRACTOR:

SUB:

Once the KCI Airport ID Badge Application is signed by the Authorized Signatory, the individual has 5 working days to respond to the ID Office to obtain a badge.

Select One: **NEW** ○ **RENEWAL** ◉ **LOST** ○ **DAMAGED** ○ **NAME CHANGE** ○ **ADDITIONAL CATEGORY** ○

Full Legal Name _____
(Last) (First) (Middle Name) (Full Initials)

Former / Other Names_____
(Provide the Given and Surname; for example: Joseph Robert Doe and Joe Bob Doe)

Current Mailing Address_____

City _____ State_____ Zip_____ Address **Country** (NCIC 2 character abbr.) ☐☐
(Please refer to Attachment 10 Handout - NCIC 2-Character Abbreviations for complete listing.)

Daytime Telephone Number _____ Gender: **Male** or Female
Work Number Home Number ◉ ○

Place of Birth **Country** (NCIC 2-character abbr.) ☐☐ Citizenship **Country** Code (NCIC 2-character abbr.) ☐☐

(Please refer to Attachment 10 Handout - NCIC 2-Character Abbreviations for complete listing.)

Social Security Number: ☐☐☐☐☐☐☐☐☐ Date of Birth: ☐☐☐☐☐☐☐☐
(9 digits) (MMDDYYYY)

Please note: Providing the SSN to TSA is voluntary on the part of the applicant; however, failure to provide it may delay or prevent completion of the Security Threat Assessment.

For individuals who are not U.S. citizens, provide the:

Alien Registration # ☐☐☐☐☐☐☐☐☐ I-94 Arrival / Departure Form # ☐☐☐☐☐☐☐☐☐☐☐
(9 digits) (11 digits)

For individuals who hold a non-immigrant visa, provide the visa control number, which appears in the top right-hand corner of the visa and is labeled "Control Number."

Non-Immigrant Visa Control Number:_____

For individuals who are U.S. citizens born abroad or naturalized U.S. citizens, provide:

Passport Number _____ Passport Country (NCIC 2-character abbr.) ☐☐

(Passport information is voluntary but may expedite the adjudication process for applicants who are U.S. citizens born abroad.)

OR

Certificate of Naturalization Number ☐☐☐☐☐☐☐☐☐
(9 digits) Appears on right side of the document and may be called ARN or INS number.

OR

Certification of Birth Abroad_____
(Form DS-1350 or 10-digit document number, which appears in top right-hand corner of document. Precede the 10-digit Number with DS. For example, DS 1234567890. Do not include dashes.)

Type of Badge (select one): ○ Permanent ○ Contractor ◉ Temporary

Employer's Company Name: _____
(If the individual holds multiple identification media, a separate badge application must be completed for each employer.)

Contractor (if needed)_____ Project Number: _____

Project End Date:_____

Company – Selected Door Category Access:_____
(Please refer to Attachment 10 Handout - Door Category Access for complete listing – indicate coded areas of access needed.)

Check One	Access Level	Badge Type
☐	AOA, Secured Area, SIDA (Unescorted access to Secured Area and AOA.)	Blue
☐	AOA, Secured Area, SIDA, Sterile Area (Unescorted access to Secured Area, AOA, & Sterile Area.)	Blue Sterile
☐	AOA, SIDA (Unescorted access to SIDA – cargo ramps, Post Office ramp, General Aviation ramp.)	Green
☐	Sterile Area (Unescorted access to Sterile Areas.)	Violet
☐	Public Areas (No access to Secured Area, SIDA, AOA, or Sterile Area.)	White
☐	Airport Police Staff Only (ACC,TCO's,ID Office,Taxi,UniGuard(contract Security).)	Gray
☐	Secured Area, SIDA (Unescorted access to Secured Area.)	Yellow
☐	Secured Area, Sterile Area (Unescorted access to Secured Area and Sterile Area.)	Yellow Sterile
☐	Overhaul Base Only	Red

Check All That Apply	Additional Authorities
☐	Armed Law Enforcement (includes unescorted access in a sterile area)
☐	Contractor
☐	AOA Non-Movement Driver***(Valid Driver's License Required)**
☐	AOA Movement Driver***(Valid Driver's License Required)**
*Driver's License #_____State:_____Expiration:_____	
☐	Authorized to Escort **(based on operational need, job duties, history of any local security violations**) "E"
☐	Authorized to Inspect (**Concessionaires**) "I"
☐	U.S. Customs and Border Protection FIS Authorization _____

CBP Authorized Signature (Attachment 2 on File) & Date

IDENTITY AND WORK AUTHORIZATION

******This Section Completed by ID Office Personnel Only – Authorized Signatories Do Not Complete ******

For all individuals holding or applying for a KCI Airport-issued personnel identification badge, identity and work authorization must be verified. Authorized Signatories, please refer to accompanying handout for a list of acceptable documents. **The original documents must be presented to the KCI Airport ID Office for inspection.** KCI Airport ID Office Trusted Agent personnel will verify these acceptable documents and provide their signature.

1. Document that Establish **Both Identity** and **Employment** Eligibility (from Identity & Work Authorization Handout, **List A**):

_____Verified By:_____
(Document Type) (Document Number) (Full Name)

OR

2. Document that Establish **Identity** (from Identity & Work Authorization Handout, **List B**):

_____Verified By:_____
(Document Type) (Document Number) (Full Name)

AND

3. Document that Establish **Employment** Eligibility (from Identity & Work Authorization Handout, **List C**):

_____Verified By:_____
(Document Type) (Document Number) (Full Name)

The information I have provided is true, complete, and correct to the best of my knowledge and belief and is provided in good faith. I understand that a knowing and willful false statement can be punished by fine or imprisonment or both. (See Section 1001 of Title 18 of the United States Code.)

I authorize the Social Security Administration to release my Social Security Number and full name to the Transportation Security Administration, Office of Transportation Threat Assessment and Credentialing (TTAC), Attention: Aviation Programs (TSA-19)/Aviation Worker Program, 601 South 12th Street, Arlington, VA 22202. I am the individual to whom the information applies and want this information released to verify that my SSN is correct. I know that if I make any representation that I know is false to obtain information from Social Security records, I could be punished by a fine or imprisonment or both.

I understand and verify through my signature below there is a ***$50 charge for each badge not returned, expired or lost.*** If a lost badge is returned within 30 days after being reported lost or stolen and before its expiration date, the charge will be refunded. No refunds will be provided without a receipt.

I understand and verify through my signature below a $100 deposit is required for each contractor badge prior to obtaining the badge at the Airport ID Office. ***The $100 deposit will be withheld for all contractor badges not returned, expired, or lost. If a contractor badge is lost or stolen, a $100 charge will be assessed before the contractor badge is replaced.*** If a lost contractor badge is returned within 30 days after being reported lost or stolen and before its expiration date, the charge will be refunded. No refunds will be provided without a receipt.

Print Employee Full Name | Employee Signature | Date

SSN (9 digits)

Date of Birth (MMDDYYYY)

The Privacy Act of 1974 5 U.S.C 552a(e)(3)

Privacy Act Notice

Authority: 6 U.S.C § 1140, 46 U.S.C § 70105; 49 U.S.C §§ 106, 114, 40103(b) (3), 401113, 44903, 44935-44936, 44939 and 44105; the implementing Recommendations of the 9/11 Commission Act of 2007, § 1520 (121 Stat. 444, Public Law 110-52, August 3, 2007); and Executive Order 9397, as amended.

Purpose: The Department of Homeland Security (DHS) will use the biographic information to conduct a security threat assessment. Your fingerprints and associated information will be provided to the Federal Bureau of Investigation (FBI) for the purpose of comparing your fingerprints to other fingerprints in the FBI's Next Generation Identification (NGI) system or its successor systems including civil, criminal, and latent fingerprint repositories. The FBI may retain your fingerprints and associated information in NGI after the completion of this application and, while retained your fingerprints may continue to be compared against other fingerprints submitted to or retained by NGI. DHS will also transmit your fingerprints for enrollment into the US-VISIT Automated Biometrics Identification System (IDENT). If you provide your Social Security Number (SSN), DHS may provide your name and SSN to the Social Security Administration (SSA) to compare that information against SSA's records to ensure the validity of the information.

Routine Uses: In addition to those disclosures generally permitted under 5 U.S.C 522a(b) of the Privacy Act, all or a portion of the records or information contained in this system may be disclosed outside DHS as a routine use pursuant to 5U.S.C 522a(b)(3) including with third parties during the course of a security threat assessment, employment investigation, or adjudication of a waiver or appeal request to the extent necessary to obtain information pertinent to the assessment, investigation, or adjudication of your application or in accordance with the routine uses identified in the TSA system of records notice (SORN) DHS/TSA 002, Transportation Security Threat Assessment System. For as long as your fingerprints and associated information are retained in NGI, your information may be disclosed pursuant to your consent or without your consent as permitted by the Privacy Act of 1974 and all applicable Routine Uses as may be published at any time in the Federal Register, Including the Routine Uses for the NGI system and the FBI's Blanket Routine Uses.

Disclosure: Furnishing this information (including your SSN) is voluntary; however, if you do not provide your SSN or any other information requested, DHS may be unable to complete your application for a security threat assessment.

I verify through my signature below that I have read and understand the above Privacy Act Notice.

Print Employee Full Name | Employee Signature | Date

PLEASE NOTE:

All KCI Airport badged employees entering the Sterile Areas, the Secured Areas, the SIDA, and/or the AOA are subject to inspection. Per TSA Regulations, All Badged employees working in the SIDA/Secured Area will undergo recurrent CHRC checks every two years.

As an **AUTHORIZED SIGNATORY** for my company, _____, I verify the above named employee has a legitimate need for a KCI Airport-issued ID badge / access media.

_____

Print Authorized Signatory's Name | Authorized Signature (Attachment 2 on File) | Date

_____

Authorized Signatory's E-Mail Address | Authorized Signatory's Work Telephone

AIRPORT ID OFFICE USE ONLY

If identification badge holder will be AOA Movement or Non-Movement privileged, applicant must present a valid, state-issued driver's license.

State of Issue:_____ Operator's License No:_____Expiration:_____/_____/_____

Issued Badge #:_____ Date of Issue:_____ Expiration:_____

Verified By:_____Date:_____
(Signature)

ID Badge Deactivation Date:_____Reason:_____
(Lost, Damaged, Stolen, Name Change)

Deactivation Date & Note Entered Into Badging System:_____
(Date of Entry) (Initials)

Badge was UNINTENTIONALLY damaged, a replacement badge was issued at no charge to the badge holder.

_____ _____

(Replacement Badge Number) (Date) (Initials)

Was $50.00 or $100.00 fee collected for badge not returned, expired, or lost?_____Was receipt given?_____

Deactivated By:_____
(Signature)

Badge Returned: Yes____ No_____ Was a receipt given? _____ Receipt #_____ Initials_____

If an individual KCI Airport badge holder experiences multiple unintentional damaged badges between badge renewals, the ID Office Trusted Agent will simply attach an additional Attachment 10 form page 4 of 4 to the individual's paperwork on file for each occurrence.

STEP-BY-STEP PROCEDURES FOR THE COMPLETION OF THE KCI AIRPORT ID BADGE / PROXIMITY CARD APPLICATION (ATTACHMENT 10)

NEW BADGES

All applications and signatures must be ORIGINALS. Copies will not be accepted.
Once the KCI Airport ID Badge Application is signed by the Authorized Signatory, the individual has 5 working days to respond to the ID Office to obtain a badge.

1. Print the employer's name in the upper right-hand corner of the Attachment 10 form. If the application is for a contractor, please write the employer name and the company the contractor actually works for. (Example: KCAD Engineering – Loch Sand Construction)

2. When an employee reports to the ID Office, Attachments 10, 7, and 1 are required upon arrival. The employee must present 2 forms of identification; one must be a government issued ID with a photo. The employee must also present the ORIGINAL documents used to provide identity and work authorization on page 2 of the Attachment 10 form.

3. "New" will need to be circled on the Attachment 10.

4. The employee's last, first, and middle name should be written legibly on the Attachment 10. List the employee's full initials. If no middle name, please indicate so. Provide any former or other names.

5. Fill in the COMPLETE street address, city, state, zip code and home telephone number. Circle either MALE or FEMALE.

6. The Address Country, Place of Birth Country, and Citizenship Country codes need to be listed. (Please refer to the NCIC 2-Character Abbreviations handout.)

7. List the COMPLETE Social Security Number. (9 digits; no dashes)

8. Fill in the COMPLETE date of birth. (MMDDYYY)

9. For individuals who are not U.S. citizens, provide the Alien Registration Number (9 digits; no dashes) or the I-94 Arrival / Departure Form Number (11 digits; no dashes).

10. For individuals who hold a non-immigrant visa, provide the visa control number, which appears in the top right-hand corner of the visa and is labeled "Control Number".

11. Individuals who are U.S. citizens board abroad or naturalized U.S. citizens, one of three documents can be used. Passport: copy the correct 9-digit number listed in the upper right-hand corner of the passport. Also enter the 2-character country code from where the passport was issued. Or a Certificate of Naturalization may be used. List the Certificate of Naturalization Number (9 digits; no dashes). This number appears on the right side of the document and may be called the ARN or INS number. Or a Certification of Birth Abroad may be used. List the Form DS-1350 or 10-digit document number, which appears in the top right-hand corner of the document. Precede the 10-digit number with DS. For example, DS 1234567890. Do not include dashes.

12. Circle the Type of Badge (Permanent, Contractor, and Temporary) that is requested for the employee.

13. Enter the COMPLETE Company Name. For example, American Airlines – Overhaul Base, or American Airlines – Terminal, or KCAD Field Maintenance.

14. Enter the Contractor Name, if applicable and the Project Number. For example, KCAD Engineering – Loch Sand Construction. Project Number 1234.

15. Company Selected Door Category Access is required for access to various doors and post gates your employees use in the course of their duties. (Refer to the Attachment 10 Door Category Access Codes handout.) For cargo employees, always indicate Post 1.

16. Access Level indicates where the employee needs to go and have access to in the course of their duties. CHECK ONLY ONE BOX.

17. Additional Authorities indicates other privileges and access the employee may need to perform his / her job. CHECK ALL THAT APPLY. When selecting AOA Non-movement or AOA movement, the OLN (Operator's License Number), State issued, and Expiration date need to be completed for all employees who are receiving this authority.

18. If the individual applying for a KCI Airport-issued ID Badge / Proximity Card has an operational need to access the US Customs facility, Terminal C, Gate 90, check the "CBP FIS Authorization" under additional authorities. BEFORE the individual reports to the ID Office they must stop by the US Customs office to have one of the Customs Officers sign and date the Attachment 10 form. Individuals must show proof of identity. The US Customs Office is located in Terminal C at Gate 90 and is open Monday through Friday from 8 am to 4 pm. Their telephone number is 816-243-3676.

Identity and Work Authorization

Original identity and work authorization documents must be presented at the ID Office for inspection, authentication, and copying. ***Attention***: **Authorized Signatories are not to complete this section**. **This section will be completed by the ID Office Personnel Only.**

19. The ID Office Trusted Agents verify the acceptable original documents for authenticity, list the type of document(s), document number(s), and list their OWN name as the individual verifying the documents. The ID Office Trusted Agents will make copies of the identity and employment eligibility documents and staple the copies to the Attachment 10 document.

20. Line 1 is used to establish BOTH Identity and Employment Eligibility. In most cases, a passport is used. Please refer to the Identity & Work Authorization Handout, LIST A for other acceptable documents.

21. Line 2 and line 3 are used to establish Identity. In most cases, a valid driver's license and Social Security Card are used. Please refer to the Identity & Work Authorization Handout, LIST B for other acceptable documents.

22. The employee needs to read the top paragraph on page 3, PRINT FULL NAME, SIGN, and DATE the application. The employee needs to provide his / her Social Security Number (9 digits; no dashes) and Date of Birth (MMDDYYY).

23. The employee needs to read the "Privacy Act Notice" on page 3, PRINT FULL NAME, SIGN, and DATE the application.

24. The line indicating, "As an authorized signatory for my employer…" should be completed with THE SIGNATORY'S COMPANY NAME.

25. The authorized signatory should PRINT FULL NAME, SIGN and DATE the application.

26. The authorized signatory should print his or her **own** e-mail address and list their work telephone number. The ID Office may need to contact the authorized signatory.

27. Page 4 is for Airport ID Office use only.

If you have any questions when completing a KCI Airport ID / Proximity Card Application (Attachment 10), please contact Robin McDaniel-Beck, ID Office Supervisor at 243-5105 or via e-mail at: Robin_McDaniel-Beck@kcmo.org.

Revised May 2010

STEP-BY-STEP PROCEDURES FOR THE COMPLETION OF THE KCI AIRPORT ID BADGE / PROXIMITY CARD APPLICATION (ATTACHMENT 10)

RENEWAL, LOST, DAMAGED, BADGES, NAME CHANGE and/or ADDITIONAL CATEGORY

All applications and signatures must be ORIGINALS. Copies will not be accepted.

1. Print the employer's name in the upper right-hand corner of the Attachment 10 form. If the application is for a contractor, please write the employer name and the company the contractor actually works for. (Example: KCAD Engineering – Loch Sand Construction)

2. When an employee reports to the ID Office to RENEW their badge, obtain another badge because theirs was LOST or DAMAGED, or due to a NAME CHANGE or ADDITIONAL CATEGORY needed, an original Attachment 10 is required upon arrival. The employee must present 2 forms of identification; one must be a government issued ID with a photo. The employee must also present the ORIGINAL documents used to provide identity and work authorization on page 2 of the Attachment 10 form.

3. Circle the appropriate reason for a badge request; i.e., RENEWAL, LOST, DAMAGED, NAME CHANGE, ADDITIONAL CATEGORY.

4. The employee's last, first, and middle name should be written legibly on the Attachment 10. List the employee's full initials. If no middle name, please indicate so. Provide any former or other names.

5. Fill in the COMPLETE street address, city, state, zip code and home telephone number. Circle either MALE or FEMALE.

6. The Address Country, Place of Birth Country, and Citizenship Country codes need to be listed. (Please refer to the NCIC 2-Character Abbreviations handout.)

7. List the COMPLETE Social Security Number. (9 digits; no dashes)

8. Fill in the COMPLETE date of birth. (MMDDYYY)

9. For individuals who are not U.S. citizens, provide the Alien Registration Number (9 digits; no dashes) or the I-94 Arrival / Departure Form Number (11 digits; no dashes).

10. For individuals who hold a non-immigrant visa, provide the visa control number, which appears in the top right-hand corner of the visa and is labeled "Control Number".

11. Individuals who are U.S. citizens board abroad or naturalized U.S. citizens, one of three documents can be used. Passport: copy the correct 9-digit number listed in the upper right-hand corner of the passport. Also enter the 2-character country code from where the passport was issued. Or a Certificate of Naturalization may be used. List the Certificate of Naturalization Number (9 digits; no dashes). This number appears on the right side of the document and may be called the ARN or INS number. Or a Certification of Birth Abroad may be used. List the Form DS-1350 or 10-digit document number, which appears in the top right-hand corner of the document. Precede the 10-digit number with DS. For example, DS 1234567890. Do not include dashes.

12. Circle the Type of Badge (Permanent, Contractor, and Temporary) that is requested for the employee.

13. Enter the COMPLETE Company Name. For example, American Airlines – Overhaul Base, or American Airlines – Terminal, or KCAD Field Maintenance.

14. Enter the Contractor Name, if applicable and the Project Number. For example, KCAD Engineering – Loch Sand Construction. Project Number 1234.

15. Company Selected Door Category Access is required for access to various doors and post gates your employees use in the course of their duties. (Refer to the Attachment 10 Door Category Access Codes handout.) For cargo employees, always indicate Post 1.

16. Access Level indicates where the employee needs to go and have access to in the course of their duties. CHECK ONLY ONE BOX.

17. Additional Authorities indicates other privileges and access the employee may need to perform his / her job. CHECK ALL THAT APPLY. When selecting AOA Non-movement or AOA movement, the OLN (Operator's License Number), State issued, and Expiration date need to be completed for all employees who are receiving this authority.

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19. The ID Office Trusted Agents verify the acceptable original documents for authenticity, list the type of document(s), document number(s), and list their OWN name as the individual verifying the documents. The ID Office Trusted Agents will make copies of the identity and employment eligibility documents and staple the copies to the Attachment 10 document.

20. Line 1 is used to establish BOTH Identity and Employment Eligibility. In most cases, a passport is used. Please refer to the Identity & Work Authorization Handout, LIST A for other acceptable documents.

21. Line 2 and line 3 are used to establish Identity. In most cases, a valid driver's license and Social Security Card are used. Please refer to the Identity & Work Authorization Handout, LIST B for other acceptable documents.

22. The employee needs to read the top paragraph on page 3, PRINT FULL NAME, SIGN, and DATE the application. The employee needs to provide his / her Social Security Number (9 digits; no dashes) and Date of Birth (MMDDYYY).

23. The employee needs to read the "Privacy Act Notice" on page 3, PRINT FULL NAME, SIGN, and DATE the application.

24. The line indicating, "As an authorized signatory for my employer…" should be completed with THE SIGNATORY'S COMPANY NAME.

25. The authorized signatory should PRINT FULL NAME, SIGN and DATE the application.

26. The authorized signatory should print his or her **own** e-mail address and list their work telephone number. The ID Office may need to contact the authorized signatory.

27. Page 4 is for Airport ID Office use only.

If you have any questions when completing a KCI Airport ID / Proximity Card Application (Attachment 10), please contact Robin McDaniel-Beck, ID Office Supervisor at 243-5105 or via e-mail at: Robin_McDaniel-Beck@kcmo.org.

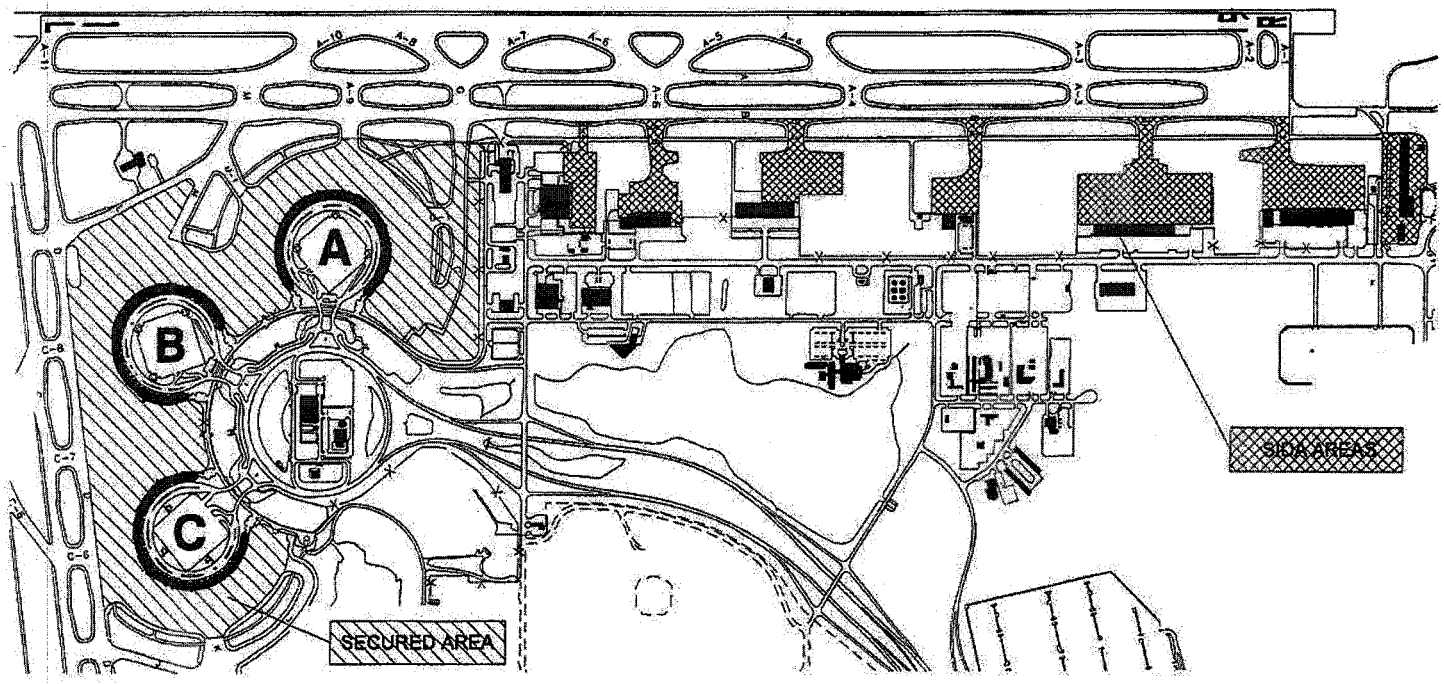
CERTIFICATE
FOR
REASSIGNED OR TEMPORARILY ASSIGNED
AIRCRAFT OPERATOR & TENANT EMPLOYEES

Kansas City International Airport (MCI)

I _____, successfully completed the Secured Area/SIDA training curriculum approved by the TSA, in accordance with TSR Part 1542.213 at _____ Airport. This can be verified by the attached document showing proof of training or by calling the following:

Training Received From: _____

Telephone Number: _____



Secured Area – The boundaries of the Secured Area at MCI include all the pavement areas between the terminals, aircraft operator ramps adjacent to the terminal buildings, and extend out to where the active taxiways begin. The Secured Area includes a small portion of taxiways and access roads adjacent to vehicle gates 1 and 2. The Secured Area also includes all areas beyond the access points on the passenger service level with access to the ramp and includes all baggage make-up areas.

SIDA – The SIDA at MCI has the same boundaries as the Secured Area. It also includes the ramp areas of the United States Postal Service, cargo facilities, FBO, and Aviation Field Maintenance located north of the terminal buildings.

FOR LAW ENFORCEMENT PERSONNEL (LEP) ASSISANCE IN SECURITY MATTERS CALL 243-4000.

Signature: _____

Date: _____

TSA APPROVED

DATE SEP 25 2014

Rev.8/18/14

TENANT & CONTRACTOR LETTER OF AGREEMENT

FOR

MCI AIRPORT IDENTIFICATION / ACCESS BADGES

This agreement is between the airport tenant and the primary contractor. The primary contractor understands that the identification / access badges must be returned to the Airport Identification Office (Airport ID Office) the next working day upon completion of the contract or prior to badge expiration. A deposit of $100.00 per badge is required. The deposit will be returned upon completion of contract and after all badges have been returned. There will be a $100.00 deduction from said deposit for each unreturned badge. At which time, any deposits made by a subcontractor will be reimbursed to the primary contractor. All badges must be renewed prior to the expiration date.

The construction contracts for the Engineering Division (Kansas City Aviation Department) will have final payments withheld in lieu of badge deposits. Upon completion of contract, a charge of $100.00 for each unreturned badge will be deducted from the final payment.

The primary contractor also understands that when anyone with an identification / access badge is terminated for any reason, they must immediately notify the Airport ID Office at 243-5211 or 5105 (during normal business hours) or the Airport Police at 243-4000. The badge for this individual will be returned to the Airport ID Office the next working day. The numbers above should also be called when a badge is lost or stolen.

Tenant / KCAD_____

Printed Name_____

Authorized Signature_____

Title_____

Telephone Number_____

Date_____

Contractor Name_____

Printed Name_____

Signature_____

Title_____

Telephone Number_____

Date_____

Project #_____

Expected Completion Date_____

Rev. 8/18/14

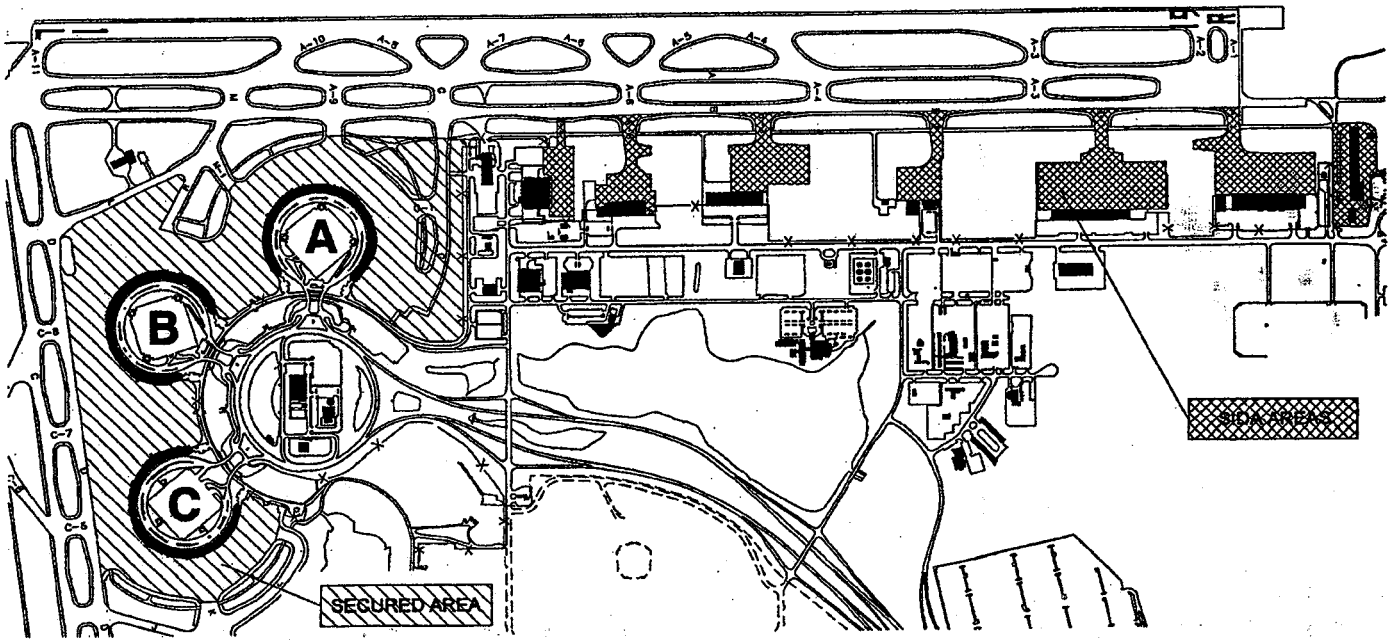
Attachment 13

TSA APPROVED

DATE SEP 25 2014

Secured Area/SIDA Boundaries

Kansas City International Airport (MCI)



Secured Area – The boundaries of the Secured Area at MCI include all the pavement areas between the terminals, aircraft operator ramps adjacent to the terminal buildings, and extend out to where the active taxiways begin. The Secured Area includes a small portion of taxiways and access roads adjacent to vehicle gates 1 and 2. The Secured Area also includes all areas beyond the access points on the passenger service level with access to the ramp and includes all baggage make-up areas.

SIDA – The SIDA at MCI has the same boundaries as the Secured Area. It also includes the ramp areas of the United States Postal Service, cargo facilities, FBO, and Aviation Field Maintenance located north of the terminal buildings.

Display – All persons within the Secured Area or SIDA of MCI shall display on their person, at all times while in the area, a valid identification badge issued or approved by MCI. Individuals in the Secured Area or SIDA must continuously display the identification badge issued to that individual on the outermost garment, above waist level, or be under escort by a properly badged individual.

Escort Procedures – Persons who do not have unescorted access and have a need to enter the Secured Area, must be under "positive" escort by a person who has a valid authorized identification/access badge for the Secured Area. "Positive" escort means the individual providing the escort must be in the proximity of the individual(s) being escorted to the extent capable of controlling the movement of the individual(s) and ensure the individual(s) under escort is engaged in only activities for which escorted access was granted. Should the individual(s) attempt to engage in unauthorized activity, the person providing the escort should conduct a verbal challenge. Should the person providing the escort become endangered, or the escorted individual(s) are unresponsive to the verbal challenge, the ACC should be notified immediately by radio or telephone. ACC will dispatch an Airport Police Officer to the reported location for appropriate action and follow-up.

No person may be escorted onto the Secured Area or SIDA who has been granted unescorted access authority and does not have their badge in their possession.

TSA APPROVED
Todd A. Hurri
DATE JUL 13 2006

Rev.7/13/2006

Section 011501 - KCAD VEHICLE INSPECTION AND SAFETY PROGRAM

Purpose

This program has been developed and is administrated by the Kansas City Aviation Department (KCAD) - Airport Operations Division. The program was developed to establish guidelines and procedures for issuing permanent and temporary Airport Operations Area (AOA) permit decals for all non-escorted motorized driven vehicles and all aircraft fuel carts governed by National Fire Protection Agency (NFPA) 407 operating on the AOA. The area covered by the program includes the following locations:

- All airline terminal aprons
- JP Cooper Road
- Ottawa Ave
- Gravel perimeter road
- AOA movement area
- Vehicles entering through Posts 1, 2, 3, 4, 5, 28

AOA locations exempt from this program include:

- Overhaul Base
- Federal Express apron
- Haith Cargo apron.
- Signature Flight Support apron
- Joint Cargo apron
- Aero Term apron
- North Field Maintenance

The purpose of the program is to provide rules to enhance AOA security, vehicle safety, and ensure minimum vehicle insurance requirements are met.

Motorcycles are prohibited, with the exception of law enforcement.

Types of Permits

This program is applicable to all authorized motorized driven vehicles, including aircraft fueling hydrant carts owned or leased by city, federal government, utility companies, tenants, city and tenant contractors and vendors which operate on the AOA at Kansas City International Airport. Proof of registered ownership, or lease agreement to one of the above entities, must be submitted prior to receiving a decal. Privately owned vehicles are prohibited unless otherwise specified in a contract or agreement with the city.

The following two types of vehicle permits are issued by Airport Operations:

- **Permanent**

Permanent permit decals are issued to vehicles operated by the city, city contractors and vendors, federal government, authorized utility companies, and tenants, operated by valid authorized AOA badged employees to conduct business on the AOA.

- **Temporary**

  Temporary permit decals are issued to vehicles operated by authorized AOA badged contractors hired by the city, federal government, and its tenants who perform work on a temporary basis, such as tenant modifications, airfield construction projects, or FAA facility installation. A temporary permit decal also shall be used for temporary leased vehicles that are being operated in lieu of a permanent vehicle that may be in the shop for repair or similar situation.

Vehicle Requirements

Regardless of whether the vehicle is being issued a permanent or temporary pass decal, all vehicle requirements will be the same.

- **Identification**
  Each vehicle authorized to operate within the program coverage area shall display on each side of the vehicle, either professionally painted, stenciled, or with a magnetic sign, the name of the company/authority with minimum font to be visible from a distance of 50 feet away.

- **Special Lighting**
  - All vehicles will have a amber/yellow rotating beacon or strobe light attached to the highest portion of the vehicle so that it will be visible 360-degrees, and operated at all times while the engine is running.
  - Lights must have peak intensity within the range of 40 to 400 candelas (effective) from 0^{o} (horizontal) up to 10^{o} above the horizontal and for 360^{o} horizontally. The upper limit of 400 candelas (effective) is necessary to avoid damage to night vision.
  - From 10^{o} to 15^{o} above the horizontal plane, the light output must be $1/10^{th}$ of peak intensity, or between 4 and 40 candelas (effective).
  - Lights must flash at 75 ± 15 flashes per minute.
  - The amber/yellow lens shall not be damaged or cracked to allow white light to pass through. All emergency vehicles are exempt from the color of the lens.

- **Required Vehicle Safety Equipment**
  - All vehicles shall have the following lighting and reflectors:
    - Operative headlights, taillights, side marker lamps – 2 rear red and 2 amber front.
    - Reflex reflectors - 2 red rear, 2 amber front side, 2 red rear side.
    - If the vehicle is designed to trailer equipment, that equipment must have reflex reflectors – 2 red rear, 2 amber front side, 2 red rear side. Three inch stripes of reflective tape may be used rather than reflectors.
    - Specialized equipment and fuel carts that were not originally manufactured with headlights and taillights shall have three inch stripe reflective tape and/or reflectors - 2 red rear, 2 amber front side, 2 red rear side.
  - Muffler systems must be free of holes. The exhaust end of the tailpipe and exhaust lines must be mounted so that they are positioned a minimum of 6 inches from the surface.
  - Emergency brakes must be capable of holding the vehicle when placed in drive with the motor running and only the emergency brake engaged.
  - The vehicle must not leak any fuel, oil, hydraulic, coolant, or transmission fluids.
  - Fueling vehicles and hydrant carts must comply with NFPA 407.

- **Insurance**

  The limits of insurance coverage is governed by Commercial Development. Prior to the issuance of the permit decal, proof of the following insurance is required:

  Signatory Airlines

  Commercial Automobile Liability Insurance: with a limit, unless otherwise specified in a contract or agreement, of five million dollars ($5,000,000) combined single limit, covering owned, hired and non-owned motor vehicles. Coverage provided shall be on an "any auto" basis and written on an "occurrence" basis. This insurance shall be written on a Commercial Business Auto form, or acceptable equivalent, and shall protect against claims arising out of the operation of motor vehicles on the airport, as to acts done in connection with the agreement, by airline. The above requirements apply to owned, non-owned and hired vehicles.

  Non-signatory airlines and all other tenants and contractors

  Commercial Automobile Liability Insurance: with a limit, unless otherwise specified in a contract or agreement, of five million dollars ($5,000,000) combined single limit, covering owned, hired and non-owned motor vehicles. Coverage provided shall be on an "any auto" basis and written on an "occurrence" basis. This insurance shall be written on a Commercial Business Auto form, or acceptable equivalent, and shall protect against claims arising out of the operation of motor vehicles on the airport. The above requirements apply to owned, non-owned and hired vehicles.

Acquiring a Permit

Each company, tenant, government agency, contractor, who has an operational need to operate a vehicle on the AOA, shall complete and have on file with Airport Operations, a list of those

individuals employed by each organization that have the authority to request an AOA vehicle permit.

Each company, tenant, government agency, contractor shall make a request from Airport Operations for a Permanent/Temporary AOA decal. Once the request has been received, and confirmed that the minimum insurance and registration and/or lease agreement requirements are met, Airport Operations shall make arrangements to inspect the vehicle to ensure it meets the minimum requirements. Once the vehicle has passed the inspection, a decal will be affixed to a prominent location on the driver side, such as the windshield, front bumper, or forward side. Once the decal has been affixed to the vehicle, the application form will reflect the permit number that was issued, and the database updated.

The company, tenant, Government agency or contractor shall maintain the vehicle to ensure it operates with the minimum lighting and safety equipment as indicated above.

Failure to Maintain Minimum Lighting and Safety Equipment

If the following discrepancies are found with a vehicle, the operator will be advised to park the vehicle until repairs are made:

- Inoperative headlights while operating the vehicle between sunset and sunrise.
- No muffler or damaged muffler.
- Missing or inoperative beacon while operating the vehicle.
- Fuel leaking, or significant fluid leaking at the discretion of Airport Operations.
- Condition of vehicle is determined to be a fire hazard.

Once the vehicle is parked, a “Do Not Operate Equipment” tag will be attached to the vehicle steering wheel and an electronic notification will be sent to the owner.

If a vehicle is found operating without the minimum lighting and safety equipment, but the condition does not deem it necessary to immediately park the vehicle, an electronic notification will be made to the owner. The notice will state the reason for the violation and grace period when repairs must be made to correct the infraction. Once the repairs are made, the owner of the

vehicle will request Airport Operations to inspect the vehicle. Once inspected and passed, a new decal will be issued and affixed to the vehicle.

If the vehicle is found operating past the grace period with the same infraction, the decal will be removed by Airport Operations and the operator of the vehicle will be warned not to operate the vehicle. In addition, a "Do Not Operate Equipment" tag will be attached to the vehicle steering wheel. An electronic notification will be made to the vehicle owner to whom the permit was issued. The notice will state the reason why the decal was removed, and indicate that the vehicle can not be operated on the AOA until repairs are made and inspected.

Once repairs are made, Airport Operations will be contacted by the owner so the vehicle can be inspected. Once inspected and passed, a new decal will be issued and affixed to the vehicle, the "Do Not Operate Equipment" tag will be removed, and database updated.

Audit Program

Each June 1st, Airport Operations will submit to the owner a list of their permitted vehicles. The owner will review the list and submit any changes.

Anytime a vehicle is taken out of inventory and/or no longer assigned or operating on the AOA, the owner will submit a "Change of Vehicle Status" form to Airport Operations.

Permanent vehicle decals are good for two years from the month it was issued. After two years, the vehicle will be inspected for minimum lighting and safety equipment. Once the vehicle has passed inspection, the existing inspection decal will be replaced with a new decal. The database will then reflect the new decal. It will be the responsibility to Airport Operations to monitor the program to ensure vehicles are inspected after the two years.

Any decal that cannot be accounted for will be reflected on an AOA Vehicle Decal Hot List. The Hot List will be maintained by Airport Operations. A copy of this report will be posted at Post 1 and 28 guard shacks.

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections include the following:
1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Form 00412 Unit Prices
3. Division 01 Section "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. CITY reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at CITY's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Form 00412 Unit Prices. Specification Sections referenced in the list contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. See Section 00412 Unit Prices.

END OF SECTION 012200

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. 00700 – General Conditions
2. 00800 – Supplementary Conditions
3. Division 01 Section "Unit Prices" for administrative requirements for using unit prices.
4. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.
5. Form 00930 Request For Interpretation
6. Form 00931 Supplemental Design Instructions
7. Form 00932 Request for Proposal
8. Form 00940 Change Order Form
9. Form 00945 Work Change Directive

1.3 REQUEST FOR INTERPRETATION (RFI)

A. Use Form 00930 to request design intent or clarification of item/s from Design Professional. Contractor shall not construe Design Professional's response to RFI as Contractor's right to additional cost. If Contractor deems that additional cost is involved due to Design Professionals' response, then Contractor must follow the requirements of Paragraph 1.5B below.

B. If the Contractor's RFI includes recommendation for alternate means and methods of achieving the desired end product, then that recommendation must indicate the order of magnitude costs, including debit and credits and impact on contract time to the City.

1.4 MINOR CHANGES IN THE WORK

A. Design Professional will issue through Construction Manager supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on Form 00931 Supplemental Design Instructions.

1.5 PROPOSAL REQUESTS

A. CITY-Initiated Proposal Requests: Design Professional and Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications. See Form 00932 Request for Proposal.

1. Proposal Requests issued by Design Professional or Construction Manager are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Design Professional and Construction Manager.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate delivery charges, equipment rental, and amounts of trade discounts.
4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
5. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use 00932 Request for Proposal or similar document agreeable to the CITY, Contractor and CITY’s Representative.

1.6 CHANGE ORDER PROCEDURES

A. On CITY's approval of a Proposal Request, Design Professional or Construction Manager will issue a Change Order for signatures of CITY and Contractor on Form 00940 Change Order.

1.7 WORK CHANGE DIRECTIVE

A. Work Change Directive: Design Professional or Construction Manager may issue a Work Change Directive on Form 00945. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time. See 00945 Work Change Directive.

2. If additional costs are required for the work included in the Work Change Directive, within time specified in Proposal Request after receipt of the Work Change Directive, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

3. If the work entailed in the Work Change Directive affects multiple discipline subcontractors, then cost (debits and credits to the CITY) for that Work Change Directive must be all inclusive (i.e. must include cost, contract sum and contract time) from any and all affected subcontractors. The Design Professional shall reject any and all Work Change Directive cost if it fails to include cost from affected subcontractors.

B. Documentation: If the work required by the Work Change Directive is to be completed on the basis of Cost of Work, maintain detailed records on a time and material basis in accordance with Article 11, Change of Contract Price.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Section 00700 “General Conditions”
2. Section 00800 “Supplementary Conditions”
3. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
4. Division 01 Section "Unit Prices" for administrative requirements governing use of unit prices.
5. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.
6. Form 012900.01 Application for Payment
7. Form 012900.02 Schedule of Values

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with Continuation Sheets.
b. Submittals Schedule.
c. Contractor’s Construction Schedule

2. Submit five (5) typed copies of the Schedule of Values, Form 012900.02, to Design Professional through Construction Manager at earliest possible date but no later than thirty (30) days after the effective date of the Agreement.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Include a separate line item for each of the following:

a. Bonds
b. Insurance
c. Mobilization

2. Dollar amounts shall include material, labor, overhead and profit applicable to each individual item indicated.

3. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

4. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

5. Schedule Updating: Update and resubmit the Schedule of Values before the next Application for Payment when Change Orders result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Design Professional and Construction Manager and paid for by CITY.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion and final Application for Payment involve additional requirements.

B. Payment Application Forms: Use Form 012900.01 Application for Payment supported by Form 012900.02 Schedule of Values.

C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Design Professional or Construction Manager will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Indicate each authorized Change Order as separate items on continuation sheet.

D. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Design Professional or Construction Manager by a method ensuring receipt within 24 hours.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
2. Submit an updated Construction Progress Schedule with each Application for Payment.
3. Indicate each authorized Change Order as separate items on continuation sheet.
   a. List by appropriate Change Order Number.
   b. Indicate dollar value breakdown of each Change Order by each applicable Project Manual Section.
   c. Indicate dollar value breakdown by each applicable Project Manual Section.

4. When CITY, Program Manager, or Design Professional requires substantiating information to support contractor's application for payment, submit data justifying dollar amounts which are in question.
    a. Provide 1 copy of data with cover letter for each copy of Application for Payment.
    b. Indicate application number and date.
    c. List each item in question by continuation sheet identification.

E. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.

F. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for CITY occupancy of designated portions of the Work.

G. Final Payment Application: Submit final Application for Payment in accordance with 00700 General and 00800 Supplementary Conditions.

1. Include 012900.14 Contractor Affidavit for Final Payment.

2. Include 012900.15 Subcontractor Affidavit for Final Payment for each subcontractor regardless of tier.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including 00700 General and 00800 Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Interpretation (RFIs)

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 01 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
2. Division 01 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service and repair of all components, including mechanical and electrical.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports and list of attendees at meetings.

1. Prepare similar memoranda for CITY and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of Form 012900.02 Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as CITY's property.

1.5 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.
b. Indicate required installation sequences.
c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Design Professional for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).

3. Number of Copies: Submit two opaque copies of each submittal. Design Professional or Construction Manager, will return one copy.

    a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Design Professional and Construction Manager will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.

4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify CITY and Design Professional of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including CITY and Design Professional, within 3 days of the meeting.

B. Preconstruction Conference: CITY will schedule and conduct a preconstruction conference before starting construction to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of CITY, Construction Manager, Design Professional and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Preparation of Record Documents.
    l. Use of the premises.
    m. Work restrictions.
    n. CITY’s occupancy requirements.
    o. Responsibility for temporary facilities and controls.
    p. Construction waste management and recycling.
    q. Parking availability.

r. Office, work, and storage areas.
s. Equipment deliveries and priorities.
t. First aid.
u. Security.
v. Progress cleaning.
w. Working hours.

3. Minutes: Contractor shall record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of CITY, Construction Manager and Design Professional, each contractor, subcontractor, supplier and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.

20) Documentation of information for payment requests.

3. Minutes: Contractor shall record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

    a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

D. Coordination Meetings: Conduct Project coordination meetings as needed throughout the project. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of CITY, Construction Manager, and Design Professional, each contractor, subcontractor, supplier and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Change Orders.

3. Reporting: Contractor shall record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Design Professional and/or Construction Manager.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs: Use 00930 Request for Interpretation Form.

1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Design Professional's and Construction Manager's Action: Design Professional and Construction Manager will review each RFI, determine action required, and return it. Allow seven working days for Design Professional's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Design Professional's actions on submittals.
f. Incomplete RFIs or RFIs with numerous errors.

2. Design Professional's action may include a request for additional information, in which case Design Professional's time for response will start again.
3. Design Professional's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Design Professional and Construction Manager in writing within 10 days of receipt of the RFI response.

F. On receipt of Design Professional's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Design Professional and Construction Manager within seven days if Contractor disagrees with response.

G. RFI Log: Contractor shall prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Design Professional and Construction Manager.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Design Professional's and Construction Manager's response was received.
8. Identification of related Minor Change in the Work, Work Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Form 013200.01 Daily Field Observation Report

C. Form 013200.02 Periodic Field Observation Report

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports. (Form 013200.01)
5. Periodic construction reports (Form 013200.02)
6. Weekly construction reports. (Form 013200.03)
7. Material location reports.
8. Field condition reports.
9. Special reports.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Design Professional.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either CITY or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

J. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

A. Qualification Data: For scheduling consultant.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Design Professional’s and Construction Manager's final release or approval.

C. Preliminary Construction Schedule: Submit two opaque copies.

1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.

D. Preliminary Network Diagram: Submit two opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

E. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

F. Daily Construction Reports: Submit two copies at weekly intervals.

G. Material Location Reports: Submit two copies at weekly intervals.

H. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

I. Special Reports: Submit two copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including work stages and interim milestones.
4. Review delivery dates for CITY-furnished products.
5. Review schedule for work of CITY's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule or network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

    a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Design Professional.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than 3 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Design Professional’s and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Work under More Than One Contract: Include a separate activity for each contract.
   2. Work by CITY: Include a separate activity for each portion of the Work performed by CITY, if applicable.
   3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   4. Work Restrictions: Show the effect of the following items on the schedule:

      a. Coordination with existing construction.
      b. Uninterruptible services.
      c. Use of premises restrictions.
      d. Seasonal variations.
      e. Environmental control.

   5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

      a. Subcontract awards.
      b. Submittals.
      c. Purchases.
      d. Deliveries.
      e. Installation.
      f. Tests and inspections.
      g. Adjusting.
      h. Curing.
      i. Startup and placement into final use and operation.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion and Final Completion.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

   1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.
   2. Each activity cost shall reflect an accurate value subject to approval by Design Professional.
   3. Total cost assigned to activities shall equal the total Contract Sum.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within five days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within five days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Work Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to CITY within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects and similar pertinent information. Advise CITY in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Design Professional, Construction Manager, CITY, separate contractors, testing and inspecting agencies and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including 00700 General and 00800 Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
4. Division 01 Section "Quality Requirements" for submitting test and inspection reports.
5. Division 01 Section "Closeout Procedures" for submitting warranties.
6. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
7. Technical Specification Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Design Professional's responsive action.

B. Informational Submittals: Written information that does not require Design Professional's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Design Professional for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Design Professional reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Buy American: Submittals for all manufactured products must include certification of compliance with Buy American requirements as established under Title 49 U.S.C. Section 50101. Submittal must include sufficient information to confirm compliance or submittal will be returned with no action.

D. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

E. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Design Professional's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Design Professional will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

F. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Design Professional.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name and address of Design Professional.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Submittal number or other unique identifier, including revision identifier.

        1) Submittals shall be numbered in the order that they are submitted, beginning with 1. Resubmittals shall have “R” with the revision number appended to the end of the original submittal number (e.g., 4R1).

    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

G. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

H. Additional Copies: Unless additional copies are required for final submittal, and unless Design Professional observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Design Professional.
2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Design Professional will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Use document 013300.01 or approved equal.

2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Design Professional on previous submittals and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "Accepted" with A or B action.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Use only final submittals with mark indicating "Accepted" with A or B action taken by Design Professional.

1.5 CONTRACTOR'S USE OF DESIGN PROFESSIONAL'S CAD FILES

A. General: At Contractor's written request, copies of Design Professional's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Submit electronic submittals directly to extranet specifically established for Project.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Standard color charts.
    e. Manufacturer's catalog cuts.
    f. Wiring diagrams showing factory-installed wiring.
    g. Printed performance curves.
    h. Operational range diagrams.
    i. Mill reports.
    j. Standard product operation and maintenance manuals.
    k. Compliance with specified referenced standards.
    l. Testing by recognized testing agency.
    m. Application of testing agency labels and seals.
    n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: Submit one copy of Product Data, unless otherwise indicated. Design Professional will return one copy. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal and control wiring.
    f. Shopwork manufacturing instructions.
    g. Templates and patterns.
    h. Schedules.
    i. Design calculations.
    j. Compliance with specified standards.
    k. Notation of coordination requirements.
    l. Notation of dimensions established by field measurement.
    m. Relationship to adjoining construction clearly indicated.
    n. Seal and signature of professional engineer if specified.
    o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit one copy of each submittal, unless copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Design Professional will retain one copy; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
4. Number of Copies: Submit copies of each submittal, as follows, unless otherwise indicated:

    a. Initial Submittal: Submit a preliminary single copy of each submittal where selection of options, color, pattern, texture, or similar characteristics is required. Design Professional will return submittal with options selected.
    b. Final Submittal: Submit one copy, unless multiple copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Design Professional will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Document.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as CITY's property, are the property of Contractor.

4. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Design Professional will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Design Professional will return two copies.

a. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.

G. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation."

H. Application for Payment: Comply with requirements in Division 01 Section "Payment Procedures."

I. Schedule of Values: Comply with requirements in Division 01 Section "Payment Procedures."

J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Design Professional will return two copies.

a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit one copy of each submittal, unless otherwise indicated. Design Professional will not return copies.

2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements in Division 01 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of Design Professionals and owners, and other information specified.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.

3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

U. Material Safety Data Sheets (MSDSs): Submit information directly to CITY; do not submit to Design Professional.

1. Design Professional will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Design Professional.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 DESIGN PROFESSIONAL'S ACTION

A. General: Design Professional will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Design Professional will review each submittal, make marks to indicate corrections or modifications required and return it. Design Professional will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. A – Submittal Accepted: Proceed with affected work. Send additional copies for final distribution.

2. B – Submittal Acceptable as Noted: Proceed with work in accordance with notations. Revise and resubmit.

3. C – Submittal Returned for Revision: Do not proceed with affected work. Revise or complete and resubmit.

4. D – Submittal Not Acceptable: Submit compliance submittals responsive to Contract Documents.

5. E – For Reference, No Acceptance Required: Send additional copies for final distribution.

6. F – Distribution Copy: Previous copies accepted.

C. Informational Submittals: Design Professional will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Design Professional will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive and will be returned without review.

E. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including 00700 General and 00800 Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Design Professional, CITY or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:
1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
3. Technical Specification Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Design Professional.

C. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction to establish product performance and compliance with industry standards.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Design Professional for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Design Professional for a decision before proceeding.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.

3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For CITY's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed

for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548, and with additional qualifications specified in individual Sections and where required by authorities having jurisdiction that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:.

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, mockups and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Design Professional, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in the Technical Specifications.

1.7 QUALITY CONTROL

A. CITY Responsibilities: Where quality-control services are indicated as CITY's responsibility, CITY will engage a qualified testing agency to perform these services.

1. CITY will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Tests and inspections not explicitly assigned to CITY are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ the same entity engaged by CITY, unless agreed to in writing by CITY.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Design Professional, Construction Manager and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Design Professional, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection and similar quality-control service through Contractor.
5. Do not release, revoke, alter or increase requirements of the Contract Documents or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections and similar quality-control services and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections and similar quality-control services required by the Contract Documents. Submit schedule within 7 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to CITY, Design Professional, Construction Manager, testing agencies and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Design Professional, Construction Manager and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Design Professional and Construction Manager with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Design Professional.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Design Professional's and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities and security and protection facilities.

B. Related Sections include the following:

1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 01 Section "Execution Requirements" for progress cleaning requirements.
4. Technical Specification Sections for requirements for products in those Sections.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Design Professional, testing agencies and authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.4 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before CITY's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pavement: Comply with Technical Specifications and Item P-401.

B. Paint: Comply with Technical Specifications and Item P-620.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Drinking water and private toilet.
3. Coffee machine and supplies.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, CITY and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system or as otherwise indicated as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation and maintenance of fixtures and facilities.

1. Toilets: Use of CITY's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to CITY. At Substantial Completion, restore these facilities to condition existing before initial use.

E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity and power characteristics required for construction operations.

1. Install electric power service underground, unless otherwise indicated.
2. Connect temporary service to CITY's existing power source, as directed by CITY.

F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Install lighting for Project identification sign.

G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install **one** telephone line(s) for each field office.

1. At each telephone, post a list of important telephone numbers.

a. KCAD Airport Operations
b. MCI Airport Police
c. Police and fire departments.
d. Ambulance service.
e. Contractor's home office.
f. Design Professional's office.
g. Engineers' offices.

h. CITY's office.
i. Principal subcontractors' field and home offices.

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

H. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.

1. Provide high speed internet in primary field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction staging area. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to CITY.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Provide temporary parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section “Execution” for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section “Summary”.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of birds, rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

F. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in all construction areas.
2. Do not permit welding on site.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. CITY reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section “Closeout Procedures”.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including 00700 General and 00800 Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions and comparable products.

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for submitting warranties for contract closeout.
2. Technical Specification Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system" and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.
b. Generic name used in the Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.
h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.

a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Design Professional's Action: Design Professional will respond in writing to Contractor within 15 days of receipt of completed product list. Design Professional's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Design Professional's response or lack of response does not constitute a waiver of requirement that products comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use Form 016300 Substitute Request.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by CITY and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as

performance, weight, size, durability, visual effect and specific features and requirements indicated.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of Design Professionals and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Design Professional's Action: If necessary, Design Professional will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Design Professional will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Design Professional cannot make a decision on use of a proposed substitution within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section “Submittal Procedure”s. Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged or sensitive to deterioration, theft and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to CITY.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for CITY.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
3. Refer to Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section “Closeout Procedures”.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. CITY reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Design Professional will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Design Professional's.
6. Descriptive, performance and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
2. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
3. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed or an unnamed product that complies with requirements. Comply with provisions in "Comparable Products" Article for consideration of an unnamed product.
4. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed or an unnamed manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article for consideration of an unnamed product.
5. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
6. Basis-of-Design Products: Where Specifications name a project and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Design Professional will consider requests for substitution if received within 30 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Design Professional.

B. Conditions: Design Professional will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Design Professional will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers CITY a substantial advantage in cost, time, energy conservation or other considerations, after deducting additional responsibilities CITY must assume. CITY's additional responsibilities may include compensation to Design Professional for redesign and evaluation services, increased cost of other construction by CITY and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Conditions: Design Professional will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Design Professional will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of Design Professionals and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of CITY-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of CITY-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

A. Qualification Data: For land surveyor and professional engineer to demonstrate their capabilities and experience, include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two copies signed by land surveyor or professional engineer.

E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Design Professional. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on Form 00930, Request for Interpretation.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Design Professional and Construction Manager promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Design Professional and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member and types of instruments and tapes used. Make the log available for reference by Design Professional and Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: CITY will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Design Professional or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Design Professional and Construction Manager before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: Upon completion of work, prepare a certified survey showing dimensions, locations, angles and elevations of construction and sitework.

E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

I. Hazardous Materials: Use products, cleaners and installation materials that are not considered hazardous.

3.6 CITY-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for CITY's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by CITY's construction forces.

1. Construction Schedule: Inform CITY of Contractor's preferred construction schedule for CITY's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify CITY if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include CITY's construction forces at preinstallation conferences covering portions of the Work that are to receive CITY's work. Attend preinstallation conferences conducted by CITY's construction forces if portions of the Work depend on CITY's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section “Quality Requirements”.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section “Cutting and Patching”.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Technical Specification Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Piping, conduit, and equipment.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

B. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by milling, sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.

1. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
2. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty and similar materials.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Sections include the following:
1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE GOALS

A. Salvage/Recycle Goals: CITY's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:

1. Demolition Waste:

a. Asphaltic concrete paving.
b. Concrete.
c. Concrete reinforcing steel.
d. Structural and miscellaneous steel.
e. Equipment.
f. Electrical conduit.
g. Copper wiring.
h. Lighting fixtures.
i. Electrical devices.

2. Construction Waste:

a. Site-clearing waste.
b. Metals.
c. Electrical conduit.
d. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.5 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 7 days of date established for the Notice of Award.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment submit three copies of report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.

7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

E. Forms: Prepare waste management plan on forms included at end of Part 3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by CITY. Provide handling, containers, storage, signage, transportation and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated and sold.
2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.

5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for CITY's Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to CITY.
4. Transport items to CITY's storage area designated by CITY.
5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: Contractor is responsible for finding available recycling receivers and processors and shall submit them to CITY for approval.

C. Recycling Incentives: Revenues, savings, rebates, tax credits and other incentives received for recycling waste materials shall be shared equally by CITY and Contractor.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off CITY's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Grind asphalt to maximum 1-1/2-inch size.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 4-inch size.

C. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers and other rough hardware.

D. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

E. Plumbing Fixtures: Separate by type and size.

F. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers and other components by type and size.

G. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off CITY's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including 00700 General and 00800 Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 01 Section "Execution Requirements" for progress cleaning of Project site.
3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Technical Specification Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list and reasons why the Work is not complete.
2. Advise CITY of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications and similar documents.
4. Obtain and submit releases permitting CITY unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys and similar final record information.
6. Deliver tools, spare parts, extra materials and similar items to location designated by CITY. Label with manufacturer's name and model number where applicable.
7. Complete startup testing of systems.
8. Submit test/adjust/balance records.

9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools and similar elements.
10. Advise CITY of changeover in heat and other utilities.
11. Submit changeover information related to CITY's occupancy, use, operation and maintenance.
12. Complete final cleaning requirements.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Design Professional and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Design Professional will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Design Professional, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Design Professional's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Design Professional. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct CITY's personnel in operation, adjustment and maintenance of products, equipment and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Design Professional and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Design Professional will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use Form 01290.13 Punch List.

1. Organize items applying by major element.
2. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Design Professional and Construction Manager.
    d. Name of Contractor.
    e. Page number.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Design Professional for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by CITY during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

1. Complete the following cleaning operations before requesting inspection for certification of Final Completion for entire Project or for a portion of Project:

    a. Clean Project site and areas disturbed by construction activities of dust, rubbish, waste material, litter and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains and other foreign deposits.
    c. Remove tools, construction equipment, machinery, traffic control devices and surplus material from Project site.
    d. Remove labels that are not permanent.
    e. Leave Project clean and ready for air traffic.

B. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of birds, rodents, insects and other pests. Prepare a report.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on CITY's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:
1. Division 01 Section "Closeout Procedures" for general closeout procedures and maintenance manual requirements.
2. Technical Specification Sections for specific requirements for Project Record Documents of products in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal: Submit one set of plots from corrected Record CAD Drawings and one set of marked-up Record Prints. Design Professional will initial and date each plot and mark whether general scope of changes, additional information recorded and quality of drafting are acceptable. Design Professional will return plots and prints for organizing into sets, printing, bindin, and final submittal.
b. Final Submittal: Submit one set of marked-up Record Prints, one set of Record CAD Drawing files, one set of Record CAD Drawing plots and three copies printed from record plots. Plot and print each Drawing, whether or not changes and additional information were recorded.

1) Electronic Media: CD-ROM.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit **one copy** of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Design Professional and Construction Manager. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:

1. Format: Same CAD program, version and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw and add details and notations where applicable.
3. Refer instances of uncertainty to Design Professional and Construction Manager for resolution.
4. Design Professional will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.

    a. Design Professional makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
    b. CAD Software Program: The Contract Drawings are available in AutoDesk AutoCAD.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Design Professional determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution or other modification.
2. Consult with Design Professional and Construction Manager for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding and submitting.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
2. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Design Professional and Construction Manager.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
3. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Drawings and Product Data where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Design Professional's and Construction Manager's reference during normal working hours.

END OF SECTION 017839

ITEM L-125 INSTALLATION OF AIRPORT LIGHTING SYSTEMS

DESCRIPTION

125-1.1 General.

This item shall consist of airport lighting systems removed and re-installed in accordance with this specification, any referenced specifications, and the applicable Federal Aviation Administration Advisory Circulars. The systems shall be installed at the location and in accordance with the dimensions, layout, design, and details shown in the plans. This item shall include removing and installing all lights, mounting assemblies, base plates, adapter rings and testing of the installation and all incidentals and appurtenances necessary to place the systems in operation as completed units to the satisfaction of the Engineer.

125-1.2 Referenced Materials.

Additional details pertaining to specific systems covered in this section are contained in the Federal Aviation Administration (FAA) Advisory Circulars (AC's), latest edition, listed below:

150/5200-18	Airport Safety Self-Inspection
150/5210-5	Painting, Marking and Lighting of Vehicles Used on an Airport
150/5340-26	Maintenance of Airport Visual Aid Facilities
150/5345-42	Specification for Airport Light Bases, Transformer Houses, Junction Boxes and Accessories Chg.
150/5345-46	Specification for Runway and Taxiway Light Fixtures
150/5345-47	Isolation Transformers for Airport Lighting Systems
150/5345-53	Airport Lighting Equipment Certification Program
150/5370-2	Operational Safety on Airports during Construction
150/5370-10	Standards for Specifying Construction of Airports

The Contractor is responsible for obtaining and using the latest edition of the referenced FAA Advisory Circulars. This is not all inclusive, but is offered as a convenience to the Contractor.

125-1.3 Submittals.

Shop drawings of each airfield lighting component, indicating FAA approval, shall be submitted to the Engineer for review and approval and be approved prior to ordering any materials for this item. This submittal shall include the proposed method of installation for all airfield lighting components. The submittal shall include data on all component parts of the item or system, and shall include the manufacturers list of recommended spare parts

for one years use. The data submitted shall be sufficient, in the opinion of the Engineer, to determine compliance with the contract documents. The Contractor's submittals shall be in accordance with Item 013300.

125-1.4 Qualifications.

The Engineer reserves the right to reject any and all equipment, materials or procedures which, in the Engineer's opinion, does not meet the system design and the standards and codes specified herein.

MATERIALS

125-2.1 General.

Airport lighting equipment and materials covered by FAA specifications shall have prior approval of the Federal Aviation Administration, Airports Service, Washington, D.C. 20591, and shall be listed in Advisory Circular 150/5345-1, latest edition, Approved Airport Equipment or shall be listed in AC 150/5345-53, latest edition, Airport Lighting Equipment Certification Program. All items that are FAA/Engineering Test Laboratories approved at the time of bidding, which otherwise meet the project specifications are acceptable.

All other equipment and materials covered by other referenced specifications shall be subject to acceptance through the manufacturer's certification of compliance with the applicable specifications. The Contractor shall submit the manufacturer's certificates of compliance with the applicable specifications to the Engineer for approval before the equipment and material are ordered.

Manufacturer's certifications shall not relieve the Contractor of his responsibility to provide materials in accordance with these specifications and acceptable to the Engineer. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the Engineer and replaced with materials which do comply with these specifications, at the sole cost of the Contractor.

Lists of the equipment and materials required for a particular system are contained in the applicable Advisory Circulars as shown and described in the Contract Documents.

All items required per this section are for use on a 6.6 amp primary series circuit unless specifically noted otherwise.

125-2.2 Guarantees.

Except as modified below, all equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of twenty four (24) months or the manufacturer's standard guarantee period which ever is greater, from final acceptance by the Owner. The defective materials and/or equipment shall be replaced with no additional cost to the Owner.

125-2.3 Basis of Design.

The airfield lighting systems are designed using the below listed descriptions.

125-2.4 Light Bases.

All light bases (base cans) shall meet the requirements of FAA AC 150/5345-42C, latest edition. The light bases shall be L-868 for the load bearing units. The sizes of the units shall be as shown on the contract drawing and in this specification. Two piece base cans may be used, where paving interferences require their use. All light bases, transformer houses and junction boxes shall be Class 1B, galvanized steel.

125-2.5 Isolation Transformer. Deleted.

125-2.6 Tape.

Plastic electrical tapes shall be Scotch Electrical Tape number 88 as manufactured by the Minnesota Mining and Manufacturing Company, or an approved equal. Electrical coating shall be Scotchkote as manufactured by Minnesota Mining and Manufacturing Company, or an approved equal.

125-2.7 Bolting Hardware.

All airfield bolting hardware shall be stainless steel and shall meet FAA requirements. All bolts 1/4 inch and larger shall be hex head type. All bolts smaller than 1/4 inch trade size shall be recessed allen type. All bolted connections shall utilize an anti-rotational locking type device. The base can cover and fixture mounting bolts shall extend thru the base can mounting flange into the base can a minimum of 0.5 inch. The bolts shall have enough thread length so they do not shoulder out before the fixture is securely tightened.

125-2.8 Anti-Seize Compound.

The anti-seize compound shall be Ideal "Noalox" or approved equal. Use Dow Corning Compound III valve lubricant non curing sealant to seal between sections of base cans, spacer rings, adapter rings or fixtures.

125-2.9 Pavement Surface Sensor.

The Contractor shall furnish new pavement surface sensor and all necessary cabling. Pavement surface sensor provided shall be by the same manufacturer as existing, or approved equivalent. Manufacturer and model shall be submitted prior to purchasing for approval. Pavement surface sensor shall include new sensor and new and cable necessary for splicing into existing junction box.

125-2.10 Delivery, Storage, and Handling.

Ship materials and equipment disassembled only to the extent necessary for reasons of shipping limitations, handling facilities, and to avoid damage during shipment. Maintain materials and equipment in new condition. This shall include the use of heat lamps, suitable coverings, indoor storage, etc. to properly protect the equipment and materials. Any

equipment or materials, in the opinion of the Owner or Engineer, damaged during construction or storage periods shall be replaced by and at the expense of the Contractor.

CONSTRUCTION METHODS

125-3.1 Installation.

125-3.1.1 Fixtures and Base Cans.

All fixtures, base cans, etc., shall be installed as shown on the plans or approved shop drawings and in accordance with the applicable FAA Advisory Circulars and manufacturers' recommendations. Survey instruments shall be used to position all items to insure precise orientation. Tolerances given in the FAA Advisory Circulars, these specifications, and the plans shall not be exceeded. Where no tolerance is given, no deviation is permitted. Items not installed in accordance with the FAA Advisory Circulars, these specifications and plans shall be replaced by and at the expense of the Contractor.

The finished pavement surface shall be protected from foreign substances which could cause staining, i.e., oil, P-606, etc. The Contractor shall immediately clean all spills and correct/clean any stained surfaces at the Contractor's expense.

Assemble units and connect to the system in accordance with the manufacturer's recommendations and instructions.

Painted and galvanized surfaces that are damaged shall be repaired according to the manufacturer's recommendations, to the satisfaction of the Owner and Engineer. Use LPS-1G cold galvanizing compound or approved equal to repair galvanized surfaces. Obtain paint and primer, of same batch number, from the equipment manufacturer to repair painted surfaces.

All threaded portions of frangible couplings, bolts etc., shall be coated with Ideal "Noalox" compound or approved equal before being assembled.

If a light can or fixture is damaged as a result of construction activities the light base can and or the light shall be removed and replaced at the Contractor's expense.

Dewatering necessary to construct L-125 Items and related erosion and turbidity control in accordance with Federal, State, and Local requirements is incidental to its respective pay item as a part of L-125. The cost of all excavation regardless of type of material encountered shall be included in the unit price bid for the L-125 Item.

125-3.1.2 Pavement Surface Sensor.

Pavement surface sensor shall be installed as shown on the plans, approved shop drawings, in accordance in accordance with the applicable FAA Advisory Circulars, and manufacturer’s recommendations.

Contractor shall be responsible for installing pavement surface sensor in the location it existed prior to construction activities.

Items not installed in accordance with the FAA Advisory Circulars, drawings, manufacturer's recommendations, or these specifications shall be replaced by and at the expense of the Contractor.

125-3.2 Testing.

This section describes the testing and demonstrations furnished by this Contractor. All items furnished and/or installed by this Contractor shall be tested and demonstrated in accordance with these specifications. All equipment and labor required for testing and demonstrations shall be furnished by this Contractor.

Fully test the installation by continuous operation for a period of not less than twelve (12) hours as a completed unit, prior to acceptance by the Owner.

Up to two (2) walk-throughs may be initiated by the Owner or the Engineer during which the airfield lighting units would be required to be in operation. Additional walk-through may be necessary depending upon the number of discrepancies found on the previous walk-through.

The Contractor is responsible for lamp replacements and necessary maintenance of airfield items during the testing, construction and walk-through periods.

The Contractor shall perform the necessary inspection and tests for some items concurrently with the installation because of subsequent inaccessibility of some components. The ENGINEER shall be notified by the Contractor forty-eight (48) hours in advance of any testing.

There are no approved "repair" procedures for items that have failed testing other than complete replacement. Any other corrective measures shall be approved in writing by the Engineer.

METHOD OF MEASUREMENT

125-4.1 General.

The quantity of airfield lighting units to be paid for under this item shall be the number of each in-pavement light fixture removed, installation of blank lid, and re-installation of fixture, and accepted by the Engineer.

The quantity of pavement surface sensor units to be paid for under this item shall be the number of each pavement surfaces sensor installed, complete and in place, ready for operation, and accepted by the Engineer.

125-4.2 Remove In-Pavement Fixture, Install Blank Cover And Re-Install Fixture.

This item includes all materials, labor, transportation, and services required to remove existing runway or taxiway lights, properly box and store fixture and furnish and install a blank

cover to prepare for pavement milling, PCC collar removal 4 inches in depth, asphalt paving, and establishment of new collar around the fixture. After completion of paving operation, reinstall fixture, adjust elevation and align and level as required. This item also includes spacer rings and dam ring as required, properly sized, functioning L-830 transformer, L-823 connectors i.e. superkits, replacement of damaged and missing o-rings, new fixture mounting bolts, sealer and all incidentals to provide a complete and operational light to the satisfaction of the Engineer.

125-4.3 New L-868B Base Can.

New L-868B Base Cans are only required should an existing base can become damaged from the Contractor's activities. In the event an existing base can becomes damaged, it shall be replaced by the Contractor at no cost to the Owner.

125-4.4 Pavement Surface Sensor.

This item includes all material, labor, transportation, and services required to remove the existing pavement surface sensor prior to pavement milling. After completion of paving operation, furnish a new pavement surface sensor, and install newly furnished pavement surface sensor and splice new wire into existing junction box. This item also includes all incidentals to provide a complete and operational pavement surface sensor to the satisfaction of the Engineer.

BASIS OF PAYMENT

125-5.1 General.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the Engineer. This price shall include all necessary items for the complete installation of the Item to the satisfaction of the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly and installation of these materials, and for all labor, equipment, tools, incidentals, and appurtenances necessary to complete these items.

Payment will be made under:

Item L-125-5.1-1 Remove In-Pavement Fixture, Install Blank Cover, and Re-Install Fixture -- per Each

Item L-125-5.1-2 Install New Pavement Surface Sensor -- per Each

END OF ITEM L-125

ITEM P-101 SURFACE PREPARATION

DESCRIPTION

101-1.1

This item shall consist of preparation of existing pavement surfaces for overlay, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable drawings.

EQUIPMENT

101-2.1

All equipment shall be specified here and in the following paragraphs or approved by the Engineer. The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

a. Concrete pavement. Deleted.

b. Asphalt concrete pavement. Asphaltic concrete pavement shall be removed by cold planing (milling) or other method acceptable to the KCAD. No material shall be allowed to be wasted on the airport property. The Contractor's removal operation shall not cause damage to surrounding pavement to remain, airfield lighting and signage, cables, utility ducts, pipelines, or drainage structures under the pavement. Any damage shall be repaired by the Contractor at no expense to the KCAD.

101-3.2 Preparation of joints and cracks.

See Item P-410 Bituminous Pavement Repair for Crack Sealing and Patching of Flexible (Bituminous) Pavements.

101-3.3 Removal of paint and rubber.

See preparation of surface in Item P-620 Runway and Taxiway Marking.

101-3.4 Concrete spall or failed asphaltic concrete pavement repair.

a. Repair of concrete spalls in areas to be overlaid with asphalt. Deleted.

b. Asphaltic concrete pavement repair. Deleted.

101-3.5 Cold milling.

The machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the pavement to remain. The machine shall have a positive method of controlling the depth of cut. The Engineer shall approve the area to be milled before removal begins. The area shall be laid out with straightedges in increments of 1-foot widths. The area to

be milled shall cover only the designated and approved area. Any excessive area that is milled because the Contractor doesn't have the appropriate machine, or areas that are damaged because of his negligence, shall not be included in the measurement for payment and shall be repaired at no expense to the KCAD.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The Engineer shall layout the area to be milled with a straightedge in increments of 1 foot widths. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall not be included in the measurement for payment.

b. Profiling, grade correction, or surface correction. All smoothness testing shall be performed per Item P-401. Surface corrections shall be completed by the Contractor per Item P-401 at no cost to the KCAD. The machine used for correction shall have a minimum width of 10 feet. It shall be equipped with electronic grade control devices on both sides that will cut the surface to the grade and tolerances specified. A positive method of dust control shall be provided. The machine shall be capable of discharging the millings in a truck or leaving them in a defined windrow.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual aggregate and fines are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface off to remove any remaining aggregate or fines.

101-3.6. Preparation of asphalt pavement surfaces.

a. Repair joints and cracks in accordance with paragraph 101-3.2.

b. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.

101-3.7 Maintenance.

The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the Engineer. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 Preparation of Joints in Rigid Pavement. Deleted.

101-3.9 Preparation of Cracks in Flexible Pavement.

101-3.9.1 Preparation of Crack.

See Item P-410 Bituminous Pavement Repair for Crack Sealing and Patching of Flexible (Bituminous) Pavements.

101-3.9.2 Removal of Existing Sealant.

See Item P-410 Bituminous Pavement Repair for Crack Sealing and Patching of Flexible (Bituminous) Pavements.

METHOD OF MEASUREMENT

101-4.1 Pavement removal. See 101-4.5 Cold milling.

101-4.2 Joint and crack repair. Deleted.

101-4.3 Paint and rubber removal. Deleted.

101-4.4 Spalled and failed asphaltic concrete pavement repair. Deleted.

101-4.5 Cold milling.

The unit of measurement for milling and removal of AC pavement shall be the number of square yards removed by the Contractor. Any pavement removed outside the approved limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment.

BASIS OF PAYMENT

101-5.1 Payment.

Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item P 101-5.1-1 Asphalt Surface Course Milling (4”) -- per Square Yard

MATERIAL REQUIREMENTS

ASTM D6690 Standard Specification For Joint And Crack Sealants, Hot Applied, For Concrete and Asphalt Pavements

END OF ITEM P-101

ITEM P-102 TEMPORARY MARKING, LIGHTING, AND BARRICADES

DESCRIPTION

102-1.1

This item shall consist of the installation, relocation, maintenance and removal of all temporary marking, lighting and barricades at the locations shown on the plans, or as directed by the Engineer, and required in accordance with FAA AC 150/5370-2F, Operational Safety On Airports During Construction.

Work under this Item will have been previously completed under a separate and simultaneous contract (Rehabilitate Runway 1R-19L – Package 2). Therefore, no payment shall be made for Temporary Marking, Lighting and Barricades. The separate contract is expected to be executed simultaneously which closes Runway 9-27 and the requirements of this Item are to be installed and paid for under said separate contract. Any additional requirements of Temporary Marking, Lighting, and Barricades under this contract will be determined by the KCAD and the Engineer.

BASIS OF PAYMENT

102-1.2

Payment shall be based on the contract lump sum price for Temporary Marking, Lighting, and Barricades and partial payments will be allowed on the next Application for Payment based on the percentage of the original contract amount earned. This price shall be full compensation for furnishing all materials, including low profile barricades, barricade lights, temporary runway closure equipment, lighted runway closure equipment, traffic cones and airfield lighting and signage covers and for all labor, equipment, tools and incidentals necessary to complete the item.

The KCAD owns multiple portable lighted runway closure markers that the Contractor shall use for the duration of any runway closure. Contractor shall contact Melissa Cooper with KCAD Field Maintenance to coordinate use of the lighted runway closure markers. The Contractor shall be responsible for maintenance and repair of all lighted runway closure marker components, including fuel and replacement bulbs. At the conclusion of the project, the Contractor shall return the lighted runway closure markers to KCAD Field Maintenance in proper working condition. Any damage to the lighted runway closure markers shall be repaired by the Contractor at no cost to the KCAD.

No payment shall be made on a contract lump sum price for Temporary Marking, Lighting and Barricades.

END OF ITEM P-102

ITEM P-105 MOBILIZATION

105-1 Description.

This item shall consist of work and operations, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-1.1 Posted notices.

Prior to commencement of construction activities the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. The KCAD may include other posted notices as required by local and State law. These notices must remain posted until final acceptance of the work by the Owner.

105-2 Basis of measurement and payment.

Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

a. With first pay request, 25%.
b. When 25% or more of the original contract is earned, an additional 25%.
c. When 50% or more of the original contract is earned, an additional 40%.
d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by the Specifications, the final 10%.

Payment will be made under:

Item P-105-2-1 Mobilization -- per Lump Sum

END OF SECTION 105

ITEM P-401 HOT MIX ASPHALT (HMA) PAVEMENTS

DESCRIPTION

401-1.1

This item shall consist of pavement courses composed of mineral aggregate and asphalt cement binder (asphalt binder) mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

401-2.1 Aggregate.

Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The aggregates should be free of ferrous sulfides, such as pyrite, that would cause "rust" staining that can bleed through pavement markings. The portion retained on the No. 4 (4.75 mm) sieve is coarse aggregate. The portion passing the No. 4 (4.75 mm) sieve and retained on the No. 200 (0.075 mm) sieve is fine aggregate, and the portion passing the No. 200 (0.075 mm) sieve is mineral filler.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the bituminous material and free from organic matter and other deleterious substances. The percentage of wear shall not be greater than 40% when tested in accordance with ASTM C131. The sodium sulfate soundness loss shall not exceed 12%, or the magnesium sulfate soundness loss shall not exceed 18%, after five cycles, when tested in accordance with ASTM C88. Clay lumps and friable particles shall not exceed 1.0% when tested in accordance with ASTM C142.

Aggregate shall contain at least 70 percent by weight of individual pieces having two or more fractured faces and 85 percent by weight having at least one fractured face. The area of each face shall be equal to at least 75% of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be achieved by crushing.

The aggregate shall not contain more than a total of 8%, by weight, of flat particles, elongated particles, and flat and elongated particles, when tested in accordance with ASTM D4791 with a value of 5:1.

b. Fine aggregate. Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter.

The fine aggregate, including any blended material for the fine aggregate, shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The soundness loss shall not exceed 10% when sodium sulfate is used or 15% when magnesium sulfate is used, after five cycles, when tested per ASTM C88.

Clay lumps and friable particles shall not exceed 1.0%, by weight, when tested in accordance with ASTM C142.

Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. The amount of sand to be added will be adjusted to produce mixtures conforming to requirements of this specification. The fine aggregate shall not contain more than 15% natural sand by weight of total aggregates. If used, the natural sand shall meet the requirements of ASTM D1073 and shall have a plasticity index of not more than six (6) and a liquid limit of not more than 25 when tested in accordance with ASTM D4318.

The aggregate shall have sand equivalent values of 45 or greater when tested in accordance with ASTM D2419.

c. Sampling. ASTM D75 shall be used in sampling coarse and fine aggregate, and ASTM C183 shall be used in sampling mineral filler.

401-2.2 Mineral filler.

If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of ASTM D242.

401-2.3 Asphalt cement binder.

Asphalt cement binder shall conform to ASTM D6373 Performance Grade (PG) 70-28. A certificate of compliance from the manufacturer shall be included with the mix design submittal.

The supplier's certified test report with test data indicating grade certification for the asphalt binder shall be provided to the Engineer for each load at the time of delivery to the mix plant. A certified test report with test data indicating grade certification for the asphalt binder shall also be provided to the Engineer for any modification of the asphalt binder after delivery to the mix plant and before use in the HMA. In addition, the asphalt cement binder shall exhibit a minimum elastic recovery of 60% when testing in accordance with ASTM D6084-06.

401-2.4 Preliminary material acceptance.

Prior to delivery of materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials:

a. Coarse aggregate:

(1) Percent of wear
(2) Soundness
(3) Clay lumps and friable particles
(4) Percent fractured faces
(5) Flat and elongated particles

b. Fine aggregate:

(1) Liquid limit and Plasticity index
(2) Soundness
(3) Clay lumps and friable particles
(4) Percent natural sand
(5) Sand equivalent

c. Mineral filler.

d. Asphalt binder. Test results for asphalt binder shall include temperature/viscosity charts for mixing and compaction temperatures.

The certifications shall show the appropriate ASTM tests for each material, the test results, and a statement that the material meets the specification requirement.

The Engineer may request samples for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

401-2.5 Anti-stripping agent.

Any anti-stripping agent or additive if required shall be heat stable, shall not change the asphalt cement viscosity beyond specifications, shall contain no harmful ingredients, shall be added in recommended proportion by approved method, and shall be a material approved by the Department of Transportation of the State in which the project is located.

COMPOSITION

401-3.1 Composition of mixture.

The HMA mix shall be composed of a mixture of well-graded aggregate, filler and anti-strip agent if required, and asphalt binder. The several aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

401-3.2 Job mix formula (JMF).

No hot-mixed asphalt (HMA) for payment shall be produced until a JMF has been approved in writing by the Engineer. The asphalt mix-design and JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.4. The HMA shall be designed using procedures contained in the Asphalt Institute's MS-2 Mix Design Manual, 7th Edition.

Tensile strength ratio (TSR) of the composite mixture, as determined by ASTM D4867, shall not be less than 80 when tested at a saturation of 70-80% or an anti-stripping agent shall be added to the HMA, as necessary, to produce a TSR of not less than 80 when tested at a saturation of 70-80%. If an anti-strip agent is required, it shall be provided by the Contractor at no additional cost to the Owner.

The JMF shall be submitted in writing by the Contractor at least **15** days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates currently being produced. Mix designs that are not dated or which are from a prior construction season will not be accepted.

The submitted JMF shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

a. Percent passing each sieve size for total combined gradation, individual gradation of all aggregate stockpiles and percent by weight of each stockpile used in the job mix formula.

b. Percent of asphalt cement.

c. Asphalt performance grade and type of modifier if used.

d. Number of blows of hammer per side of molded specimen.

e. Laboratory mixing temperature.

f. Laboratory compaction temperature.

g. Temperature-viscosity relationship of the PG asphalt cement binder showing acceptable range of mixing and compaction temperatures; and for modified binders include supplier recommended mixing and compaction temperatures.

h. Plot of the combined gradation on a 0.45 power gradation curve.

i. Graphical plots of stability, flow, air voids, voids in mineral aggregate, and unit weight versus asphalt content.

j. Specific Gravity and absorption of each aggregate.

k. Percent natural sand.

l. Percent fractured faces.

m. Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).

n. Tensile Strength Ratio (TSR).

o. Anti-strip agent (if required).

p. Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

The Contractor shall submit to the Engineer the results of verification testing of three (3) asphalt samples prepared at the optimum asphalt content. The average of the results of this testing shall indicate conformance with the JMF requirements specified in Tables 1 and 3.

When the project requires asphalt mixtures of differing aggregate gradations, a separate JMF and the results of JMF verification testing shall be submitted for each mix.

The JMF for each mixture shall be in effect until a modification is approved in writing by the Engineer. Should a change in sources of materials be made, a new JMF must be submitted within 15 days and approved by the Engineer in writing before the new material is used. After the initial production JMF has been approved by the Engineer and a new or modified JMF is required for whatever reason, the subsequent cost of the

Engineer's approval of the new or modified JMF, including a new test strip when required by the engineer, will be borne by the Contractor. There will be no time extension given or considerations for extra costs associated with the stoppage of production paving or restart of production paving due to the time needed for the Engineer to approve the initial, new or modified JMF.

The design criteria in Table 1 are target values necessary to meet the acceptance requirements contained in paragraph 401-5.2b. The criteria is based on a production process which has a material variability with the following standard deviations:

Stability (lbs.) = 270
Flow (0.01 inch) = 1.5
Air Voids (%) = 0.65

If material variability exceeds the standard deviations indicated, the job mix formula and subsequent production targets shall be based on a stability greater than shown in Table 1, and the flow and air voids shall be targeted close to the mid-range of the criteria in order to meet the acceptance requirements.

Table 1. Marshall Design Criteria

Test Property	Pavements Designed for Aircraft Gross Weights of 60,000 lbs. or More or Tire Pressures of 100 psi or More
Number of blows	75
Stability, pounds minimum	2150
Flow, 0.01 in. (0.25 mm)	10-16
Air voids (%)	2.8-4.2
Percent voids in mineral aggregate, minimum	See Table 2

Table 2. Minimum Percent Voids In Mineral Aggregate (VMA)

Aggregate (See Table 3)	Minimum VMA
¾ inch (19 mm)	15%

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 3 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 3 represent the limits that shall determine the suitability of aggregate for use from the sources of supply; be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

Deviations from the final approved mix design for asphalt cement binder content and gradation of aggregates shall be within the action limits for individual measurements as specified in

paragraph 401-6.5a. The limits still will apply if they fall outside the master grading band in Table 3.

The maximum size aggregate used shall not be more than on-half of the thickness of the course being constructed except where otherwise shown on the plans or ordered by the Engineer.

Table 3. Aggregate - HMA Pavements

Sieve Size	Percentage by Weight Passing Sieve
1 inch (25 mm)	--
3/4 inch (19 mm)	100
1/2 inch (12 mm)	79-99
3/8 inch (9 mm)	68-88
No. 4 (4.75 mm)	48-64
No. 8 (2.36 mm)	33-53
No. 16 (1.18 mm)	20-40
No. 30 (0.60 mm)	14-30
No. 50 (0.30 mm)	9-21
No. 100 (0.15 mm)	6-16
No. 200 (0.075 mm)	0-4
Asphalt Percent:	
Stone or gravel	5.0-7.0

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

401-3.3 Reclaimed asphalt pavement (RAP).

RAP shall not be used.

401-3.4 Job mix formula (JMF) laboratory.

The Contractor's laboratory used to develop the JMF shall be accredited in accordance with ASTM D3666, including the requirement to be accredited by a national authority such as the National Voluntary Laboratory Accreditation Program (NVLAP), the American Association for Laboratory Accreditation (AALA), or AASHTO Accreditation Program (AAP).. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the JMF must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

Laboratory personnel shall meet the requirements of Section 100 of the General Provisions. A certification signed by the manager of the laboratory stating that it meets these

requirements shall be submitted to the Engineer prior to the start of construction. The certification shall contain as a minimum:

a. Qualifications of personnel, laboratory manager, supervising technician, and testing technicians.

b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

401-3.5 Test section.

Prior to full production, the Contractor shall prepare and place a quantity of HMA according to the JMF. The amount of HMA shall be sufficient to construct a test section 300 feet long and 37.5 or 50 feet wide, placed in two lanes, with a longitudinal cold joint, and shall be of the same depth specified for the construction of the course which it represents. A cold joint for this test section is an exposed construction joint at least four (4) hours old or whose mat has cooled to less than 160°F. The cold joint must be cut back using the same procedure that will be used during production in accordance with 401-4.13. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section.

The test section shall be evaluated for acceptance as a single lot in accordance with the acceptance criteria in paragraph 401-5.1 and 401-5.2. The test section shall be divided into equal sublots. As a minimum the test section shall consist of three (3) sublots.

The test section shall be considered acceptable if (1) stability, flow, mat density, air voids, and joint density are 90% or more within limits, (2) gradation and asphalt content are within the action limits specified in paragraphs 401-6.5a and 5b, and (3) the voids in the mineral aggregate are within the limits of Table 2.

If the initial test section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. If the second test section also does not meet specification requirements, both sections shall be removed at the Contractor's expense. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Any additional sections that are not acceptable shall be removed at the Contractor's expense. Full production shall not begin until an acceptable test section has been constructed and accepted in writing by the Engineer. Once an acceptable test section has been placed, payment for the initial test section and the section that meets specification requirements shall be made in accordance with paragraph 401-8.1.

Job mix control testing shall be performed by the Contractor at the start of plant production and in conjunction with the calibration of the plant for the JMF. If aggregates produced by the plant do not satisfy the gradation requirements or produce a mix that meets the JMF, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates.

Specimens shall be prepared and the optimum asphalt content determined in the same manner as for the original JMF tests.

Contractor will not be allowed to place the test section until the Contractor Quality Control Program, showing conformance with the requirements of Paragraph 401-6.1, has been approved, in writing, by the Engineer.

CONSTRUCTION METHODS

401-4.1 Weather limitations.

The HMA shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the Engineer, if requested; however, all other requirements including compaction shall be met.

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness	Base Temperature (Minimum)
	°F
3 inches or greater	40
Greater than 2 inches but less than 3 inches	45

401-4.2 HMA plant.

Plants used for the preparation of HMA shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 with the following changes:

Requirements for all plants include:

a. Truck scales. The HMA shall be weighed on approved scales furnished by the Contractor, or on certified public scales at the Contractor's expense. Scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy. Scales shall conform to the requirements of the General Provisions, subsection 90-01.

In lieu of scales, and as approved by the Engineer, HMA weight may be determined by the use of an electronic weighing system equipped with an automatic printer that weighs the total HMA production and as often thereafter as requested by the Engineer.

b. Testing facilities**.** The Contractor shall ensure laboratory facilities are provided at the plant for the use of the Engineer. The lab shall have sufficient space and equipment so that both testing representatives (Engineer's and Contractor's) can operate efficiently. The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, calibrations, current reference standards to comply with the specifications and a masonry saw with diamond blade for trimming pavement cores and samples.

The plant testing laboratory shall have a floor space area of not less than 200 square feet, with a ceiling height of not less than 7-1/2 feet. The laboratory shall be weather tight, sufficiently heated in cold weather, air-conditioned in hot weather to maintain temperatures for testing purposes of 70°F ±5°F. The plant testing laboratory shall be located on the plant site to provide an unobstructed view, from one of its windows, of the trucks being loaded with the plant mix materials. In addition, the facility shall include the minimum:

(1) Adequate artificial lighting.
(2) Electrical outlets sufficient in number and capacity for operating the required testing equipment and drying samples.
(3) A minimum of two (2) Underwriter's Laboratories approved fire extinguishers of the appropriate types and class.
(4) Work benches for testing.
(5) Desk with chairs and file cabinet.
(6) Sanitary facilities convenient to testing laboratory.
(7) Exhaust fan to outside air.
(8) Sink with running water.

Failure to provide the specified facilities shall be sufficient cause for disapproving HMA plant operations.

Laboratory facilities shall be kept clean, and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness quality control activities. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

c. Inspection of plant. The Engineer, or Engineer's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

d. Storage bins and surge bins. The HMA stored in storage and surge bins shall meet the same requirements as HMA loaded directly into trucks and may be permitted under the following conditions:

(1) Stored in non-insulated bins for a period of time not to exceed three (3) hours.
(2) Stored in insulated bins for a period of time not to exceed eight (8) hours.

If the Engineer determines that there is an excessive amount of heat loss, segregation, or oxidation of the HMA due to temporary storage, no temporary storage will be allowed.

401-4.3 Hauling equipment.

Trucks used for hauling HMA shall have tight, clean, and smooth metal beds. To prevent the HMA from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the Engineer. Fuel oil or petroleum products shall not be used for coating truck beds. Each

truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

401-4.3.1 Material transfer vehicle (MTV).

Material transfer vehicles used to transfer the material from the hauling equipment to the paver, shall use a self-propelled, material transfer vehicle with a swing conveyor that can deliver material to the paver without making contact with the paver. The MTV shall be able to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. The Material Transfer Vehicle will have remixing and storage capability to prevent physical and thermal segregation.

401-4.4 HMA pavers.

HMA pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of HMA that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the HMA uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. The auger screw shall extend to within 10” of the end of the screed.

If, during construction, it is found that the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued and satisfactory equipment shall be provided by the Contractor.

401-4.4.1 Automatic grade controls.

The HMA paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices that will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within ±0.1%.

The controls shall be capable of working in conjunction with any of the following attachments:

a. Ski-type device of not less than 30 feet in length.

b. Taut string-line (wire) set to grade.

c. Short ski or shoe.

d. Laser control.

401-4.5 Rollers.

Rollers of the vibratory, steel wheel, and pneumatic-tired type shall be used. They shall be in good condition, capable of operating at slow speeds to avoid displacement of the HMA. The number, type, and weight of rollers shall be sufficient to compact the HMA to the required density while it is still in a workable condition.

All rollers shall be specifically designed and suitable for compacting HMA concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used. Depressions in pavement surfaces caused by rollers shall be repaired by the Contractor at their own expense.

The use of equipment that causes crushing of the aggregate will not be permitted.

401-4.6. Density device.

The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall also supply a qualified technician during all paving operations to calibrate the gauge and obtain accurate density readings for all new HMA. These densities shall be supplied to the Engineer upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

401-4.7 Preparation of asphalt binder.

The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. The temperature of unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F when added to the aggregate.

401-4.8 Preparation of mineral aggregate.

The aggregate for the HMA shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

401-4.9 Preparation of HMA.

The aggregates and the asphalt binder shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for

determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all HMA upon discharge shall not exceed 0.5%.

401-4.10 Preparation of the underlying surface.

Immediately before placing the HMA, the underlying course shall be cleaned of all dust and debris. A tack coat shall be applied in accordance with Item P-603, if shown on the plans.

401-4.11 Laydown plan, transporting, placing, and finishing.

Prior to the placement of the HMA, the Contractor shall prepare a laydown plan for approval by the Engineer. This is to minimize the number of cold joints in the pavement. The laydown plan shall include the sequence of paving laydown by stations, width of lanes, temporary ramp locations, and laydown temperature. The laydown plan shall also include estimated time of completion for each portion of the work (that is, milling, paving, rolling, cooling, etc.). Modifications to the laydown plan shall be approved by the Engineer.

The HMA shall be transported from the mixing plant to the site in vehicles conforming to the requirements of paragraph 401-4.3. Deliveries shall be scheduled so that placing and compacting of HMA is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified and allowed to cool to atmospheric temperature.

The Contractor shall use a material transfer vehicle to deliver HMA to the paver.

The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose for the first lift of all runway and taxiway pavements. Successive lifts of HMA surface course may be placed using a ski, or laser control per paragraph 401-4.4.1, provided grades of the first lift of HMA surface course meet the tolerances of paragraphs 401-5.2b(6) as verified by a survey. Contractor shall survey each lift of HMA surface course and certify to Engineer that every lot of each lift meets the grade tolerances of paragraph 401-5.2b(6) before the next lift can be placed.

The initial placement and compaction of the HMA shall occur at a temperature suitable for obtaining density, surface smoothness, and other specified requirements but not less than 250°F.

Edges of existing HMA pavement abutting the new work shall be saw cut and carefully removed as shown on the drawings and coated with asphalt tack coat before new material is placed against it.

Upon arrival, the HMA shall be placed to the full width by a HMA paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the HMA mat. Unless otherwise permitted, placement of the HMA shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The HMA shall be placed in consecutive

adjacent strips having a minimum width of **15** feet except where edge lanes require less width to complete the area. Additional screed sections shall not be attached to widen paver to meet the minimum lane width requirements specified above unless additional auger sections are added to match. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot; however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet from transverse joints in the previous course.

Transverse joints in adjacent lanes shall be offset a minimum of 10 feet.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the HMA may be spread and luted by hand tools.

Areas of segregation in the surface course, as determined by the Engineer, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of 2 inches deep. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet long.

401-4.12 Compaction of HMA.

After placing, the HMA shall be thoroughly and uniformly compacted by power rollers. The surface shall be compacted as soon as possible when the HMA has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section and the required field density is obtained. To prevent adhesion of the HMA to the roller, the wheels shall be equipped with a scraper and kept properly moistened but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power driven tampers. Tampers shall weigh not less than 275 pounds, have a tamping plate width not less than 15 inches, be rated at not less than 4,200 vibrations per minute, and be suitably equipped with a standard tamping plate wetting device.

Any HMA that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

401-4.13 Joints.

The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid HMA except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh HMA against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F; or are irregular, damaged, uncompacted or otherwise defective shall be cut back 3 inches to 6 inches to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material shall be removed from the project. Asphalt tack coat or other product approved by the Engineer shall be applied to the clean, dry joint, prior to placing any additional fresh HMA against the joint. Any laitance produced from cutting joints shall be removed by vacuuming and washing. The cost of this work shall be considered incidental to the cost of the HMA.

401-4.14 Saw-cut grooving.

Saw cut grooves shall be provided as specified in Item P-621.

401-4.15 Diamond grinding.

When required, diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive. The saw blades shall be assembled in a cutting head mounted on a machine designed specifically for diamond grinding that will produce the required texture and smoothness level without damage to the pavement. The saw blades shall be 1/8-inch wide and there shall be a minimum of 55 to 60 blades per 12 inches of cutting head width; the actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Each machine shall be capable of cutting a path at least 3 feet wide. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted. The depth of grinding shall not exceed 1/2 inch and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. Areas that have been ground will be sealed with a surface treatment as directed by the Engineer. It may be necessary to seal a larger area to avoid surface treatment creating any conflict with runway or taxiway markings.

401-4.16 Nighttime paving requirements.

Paving during nighttime construction shall require the following:

a. All paving machines, rollers, distribution trucks and other vehicles required by the Contractor for his operations shall be equipped with artificial illumination sufficient to safely complete the work.

b. Minimum illumination level shall be twenty (20) horizontal foot-candles and maintained in the following areas:

(1) An area of 30 feet wide by 30 feet long immediately behind the paving machines during the operations of the machines.

(2) An area 15 feet wide by 30 feet long immediately in front and back of all rolling equipment, during operation of the equipment.

(3) An area 15 feet wide by 15 feet long at any point where an area is being tack coated prior to the placement of pavement.

c. As partial fulfillment of the above requirements, the Contractor shall furnish and use, complete artificial lighting units with a minimum capacity of 3,000 watt electric beam lights, affixed to all equipment in such a way to direct illumination on the area under construction.

d. A lighting plan must be submitted by the Contractor and approved by the Engineer prior to the start of any nighttime work.

MATERIAL ACCEPTANCE

401-5.1 Acceptance sampling and testing.

Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer at no cost to the Contractor except that coring and profilograph testing as required in this section shall be completed and paid for by the Contractor.

Testing organizations performing these tests except profilograph shall be accredited in accordance with ASTM D3666. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction. All equipment in Contractor furnished laboratories shall be calibrated by an independent testing organization prior to the start of operations at the Contractor's expense.

a. Hot mixed asphalt. Plant-produced HMA shall be tested for air voids, stability, and flow on a lot basis. Sampling shall be from material deposited into trucks at the plant or from trucks at the job site. Samples shall be taken in accordance with ASTM D979.

A standard lot shall be equal to one day's production or 2000 tons whichever is smaller. If the day's production is expected to exceed 2000 tons, but less than 4000 tons, the lot size shall be 1/2 day's production. If the day's production exceeds 4000 tons, the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2000 tons.

Where more than one plant is simultaneously producing HMA for the job, the lot sizes shall apply separately for each plant.

(1) Sampling. Each lot will consist of four equal sublots. Sufficient HMA for preparation of test specimens for all testing will be sampled by the Engineer on a random basis, in accordance with the procedures contained in ASTM D3665. Samples will be taken in accordance with ASTM D979.

The sample of HMA may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to stabilize to compaction temperature. The compaction temperature of the specimens shall be as specified in the JMF.

(2) Testing. Sample specimens shall be tested for stability and flow in accordance with ASTM D6927. Air voids will be determined by the Engineer in accordance with ASTM D3203. One set of laboratory compacted specimens will be prepared for each sublot in accordance with ASTM D6926 at the number of blows required by paragraph 401-3.2, Table 1. Each set of laboratory compacted specimens will consist of three test specimens prepared from the same sample. The manual hammer is ASTM D6926 shall be used.

Prior to testing, the bulk specific gravity of each test specimen shall be measured by the Engineer in accordance with ASTM D2726 using the procedure for laboratory-prepared thoroughly dry specimens for use in computing air voids and pavement density.

For air voids determination, the theoretical maximum specific gravity of the mixture shall be measured one time for each sublot in accordance with ASTM D2041. The value used in the air voids computation for each sublot shall be based on theoretical maximum specific gravity measurement for the sublot.

The stability and flow for each sublot shall be computed by averaging the results of all test specimens representing that sublot.

(3) Acceptance. Acceptance of plant produced HMA for stability, flow, and air voids shall be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b.

b. In-place HMA. HMA placed in the field shall be tested for mat and joint density on a lot basis. A standard lot shall be equal to one day's production or 2000 tons whichever is smaller. If the day's production is expected to exceed 2000 tons, but less than 4000 tons, the lot size shall be 1/2 day's production. If the day's production exceeds 4000 tons, the lot size shall be an equal sized fraction of the day's production, but shall not exceed 2000 tons.

(1) Mat density. The lot size shall be the same as that indicated in paragraph 401-5.1a and shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each sublot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. Cores for mat density shall not be taken closer than one foot from a transverse or longitudinal joint.

(2) Joint density. The lot size shall be the total length of longitudinal joints constructed by a lot of HMA as defined in paragraph 401-5.1a. The lot shall be divided into four equal sublots. One core of finished, compacted HMA shall be taken by the Contractor from each sublot. Core locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D3665. All cores for joint density shall be taken centered on the joint. The minimum core diameter for joint density determination shall be 5 inches.

(3) Sampling. Samples shall be neatly cut with a diamond core drill bit. Samples will be taken in accordance with ASTM D979. The minimum diameter of the sample shall be 5 inches. Samples that are clearly defective, as a result of sampling, shall be discarded and another sample taken. The Contractor shall furnish all tools, labor, and materials for

cutting samples, cleaning, and filling the cored pavement. Cored pavement shall be cleaned and core holes shall be filled in a manner acceptable to the Engineer and within one day after sampling. Laitance produced by the coring operation shall be removed immediately.

The top most lift of HMA shall be completely bonded to the underlying layer. If any of the cores reveal that the surface is not bonded to the layer immediately below the surface then additional cores shall be taken as directed by the Engineer in accordance with paragraph 401-5.1b to determine the extent of any delamination. All delaminated areas shall be completely removed by milling to the limits and depth and replaced as directed by the Engineer at no additional cost.

(4) Testing. The bulk specific gravity of each cored sample will be measured by the Engineer in accordance with ASTM D2726. Samples will be taken in accordance with ASTM D979. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each sublot sample by the average bulk specific gravity of all laboratory prepared specimens for the lot, as determined in paragraph 401-5.1a(2). The bulk specific gravity used to determine the joint density at joints formed between different lots shall be the lowest of the bulk specific gravity values from the two different lots.

(5) Acceptance. Acceptance of field placed HMA for mat density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b(1). Acceptance for joint density will be determined by the Engineer in accordance with the requirements of paragraph 401-5.2b(3).

c. Partial lots. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot, or when the Contractor and Engineer agree in writing to allow overages or other minor tonnage placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

The last batch produced where production is halted will be sampled, and its properties shall be considered as representative of the particular sublot from which it was taken. In addition, an agreed to minor placement will be sampled, and its properties shall be considered as representative of the particular sublot from which it was taken. Where three sublots are produced, they shall constitute a lot. Where one or two sublots are produced, they shall be incorporated into the next lot, and the total number of sublots shall be used in the acceptance plan calculation, that is, n = 5 or n = 6, for example. Partial lots at the end of asphalt production on the project shall be included with the previous lot. The lot size for field placed material shall correspond to that of the plant material, except that, in no cases, shall less than three (3) cored samples be obtained, that is, n = 3.

401-5.2 Acceptance criteria.

a. General. Acceptance will be based on the following characteristics of the HMA and completed pavement as well as the implementation of the Contractor Quality Control Program and test results:

(1) Air voids

(2) Mat density

(3) Joint density

(4) Thickness

(5) Smoothness

(6) Grade

(7) Stability

(8) Flow

(9) Bond

(10) VMA

Mat density and air voids will be evaluated for acceptance in accordance with paragraph 401-5.2b(1). Stability and flow will be evaluated for acceptance in accordance with paragraph 401-5.2b(2). Joint density will be evaluated for acceptance in accordance with paragraph 401-5.2b(3).

Thickness will be evaluated by the Engineer for compliance in accordance with paragraph 401-5.2b(4). Acceptance for smoothness will be based on the criteria contained in paragraph 401-5.2b(5). Acceptance for grade will be based on the criteria contained in paragraph 401-5.2b(7).

The Engineer may at any time, reject and require the Contractor to dispose of any batch of HMA which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or improper mix temperature. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

b. Acceptance criteria.

(1) Mat density and air voids. Acceptance of each lot of plant produced material for mat density and air voids shall be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. Acceptance and payment shall be determined in accordance with paragraph 401-8.1.

(2) Stability and flow. Acceptance of each lot of plant produced HMA for stability and flow shall be based on the PWL. If the PWL of the lot equals or exceeds 90%, the lot shall be acceptable. If the PWL is less than 90%, the Contractor shall determine the reason and take corrective action. If the PWL is below 80%, the Contractor must stop production until the reason for poor stability and/or flow has been determined and adjustments to the HMA are made.

(3) Joint density. Acceptance of each lot of plant produced HMA for joint density shall be based on the PWL. If the PWL of the lot is equal to or exceeds 90%, the lot shall be

considered acceptable. If the PWL is less than 90%, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80%, the Contractor shall cease operations and until the reason for poor compaction has been determined. If the PWL is less than 71%, the pay factor for the lot used to complete the joint shall be reduced by five (5) percentage points. This lot pay factor reduction shall be incorporated and evaluated in accordance with paragraph 401-8.1.

(4) Thickness. Thickness of each lift of surface course shall be evaluated by the Engineer for compliance to the requirements shown on the plans. Measurements of thickness shall be made by the Engineer using the cores extracted for each sublot for density measurement. The maximum allowable deficiency at any point shall not be more than 1/4 inch less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, shall not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or sublot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the Engineer to circumscribe the deficient area.

(5) Smoothness. The final surface shall be free from roller marks. After the final rolling, but not later than 24 hours after placement, the surface of each lot shall be tested in both longitudinal and transverse directions for smoothness to reveal all surface irregularities exceeding the tolerances specified. The Contractor shall furnish paving equipment and employ methods that produce a surface for each pavement lot having an average profile index meeting the requirements of paragraph 401-8.1d when evaluated with a profilograph; and the finished surface course of the pavement shall not vary more than 1/4 inch when evaluated with a Contractor – provided 12-foot straightedge. When the surface course smoothness exceeds specification tolerances which cannot be corrected by diamond grinding of the surface course, full depth removal and replacement of surface course corrections shall be to the limit of the longitudinal placement. Corrections involving diamond grinding will be subject to the final pavement thickness tolerances specified. The Contractor shall apply a surface treatment to all areas that have been subject to grinding as directed by the Engineer.

(a) Transverse measurements. Transverse measurements will be taken for each lot placed. Transverse measurements will be taken by the Engineer perpendicular to the pavement centerline each 50 feet or more often as determined by the Engineer.

(i) Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. High spots on final surface course > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth

transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding. Areas in excess of 10% grinding are subject to being allowed to remain in place at zero percent pay at the discretion of the Owner.

(ii) The joint between lots shall be tested separately to facilitate smoothness between lots. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface, with half the straightedge on one side of the joint and the other half of the straightedge on the other side of the joint. Measure the maximum gap between the straightedge and the pavement surface in the area between these two high points. One measurement shall be taken at the joint every 50 feet or more often if directed by the Engineer. Deviations on final surface course > 1/4 inch in transverse direction shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Each measurement shall be recorded and a copy of the data shall be furnished to the Engineer at the end of each days testing.

(b) Longitudinal measurements. Longitudinal measurements will be taken for each lot placed. Longitudinal tests will be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet; and at the third points of paving lanes when widths of paving lanes are 20 ft or greater.

(i) Longitudinal Short Sections. Longitudinal Short Sections are when the longitudinal lot length is less than 200 feet and areas not requiring a profilograph. When approved by the Engineer, the first and last 15 feet of the lot can also be considered as short sections for smoothness. The finished surface shall not vary more than 1/4 inch when evaluated with a 12-foot straightedge. Smoothness readings will not be made across grade changes or cross slope transitions; at these transition areas, the straightedge position shall be adjusted to measure surface smoothness and not design grade or cross slope transitions. Testing shall be continuous across all joints, starting with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Deviations on final surface course > 1/4 inch in longitudinal direction will be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

(ii) Profilograph Testing. Profilograph testing shall be performed by the contractor using approved equipment and procedures as described as

ASTM E1274. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2 inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. A copy of the reduced tapes shall be furnished to the Engineer at the end of each days testing.

The pavement must have an average profile index meeting the requirements of paragraph 401-8.1d. High spots, or "must grind" spots, on final surface course in longitudinal direction shall be corrected with diamond grinding per paragraph 401-4.15 or by removing and replacing full depth of surface course. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The area corrected by grinding should not exceed 10% of the total area and these areas shall be retested after grinding.

Where corrections are necessary, second profilograph runs shall be performed to verify that the corrections produced an average profile index of 15 inches per mile or less. If the initial average profile index was less than 15 inches, only those areas representing greater than 0.4 inch deviation will be re-profiled for correction verification.

(iii) Final profilograph of runway. Deleted.

Smoothness testing indicated in the above paragraphs except paragraph (iii) shall be performed within 24 hours of placement of material. Smoothness testing indicated in paragraph (iii) shall be performed within 48 hours of paving completion. The primary purpose of smoothness testing is to identify areas that may be prone to ponding of water which could lead to hydroplaning of aircraft. If the contractor's machines and/or methods are producing significant areas that need corrective actions then production should be stopped until corrective measures can be implemented. If corrective measures are not implemented and when directed by the Engineer, production shall be stopped until corrective measures can be implemented.

(6) Grade. Grade shall be evaluated on the first day of placement and then as a minimum, every day to allow adjustments to paving operations if measurements do not meet specification requirements. The Contractor must submit the survey data to the Engineer by the following day after measurements have been taken. The finished surface of the pavement shall not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch. The finished grade of each lot will be determined by running levels at intervals of 50 feet or less longitudinally and all breaks in grade transversely (not to exceed 50 feet) to determine the elevation of the completed pavement. The Contractor shall pay the cost of surveying of the level runs that shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer. The lot size shall be 2,000 square yards. When more than 15% of all the measurements within a lot are outside the specified tolerance, or if any one shot within the lot deviates 3/4 inch or more from planned grade, the Contractor shall remove the deficient area to the depth of the final course plus 1/2 inch of pavement and replace with new material. Skin patching shall not be permitted.

Isolated high points may be ground off provided the course thickness complies with the thickness specified on the plans. The surface of the ground pavement shall have a texture consisting of grooves between 0.090 and 0.130 inches wide. The peaks and ridges shall be approximately 1/32 inch higher than the bottom of the grooves. The pavement shall be left in a clean condition. The removal of all of the slurry resulting from the grinding operation shall be continuous The grinding operation should be controlled so the residue from the operation does not flow across other lanes of pavement. High point grinding will be limited to 15 square yards. Areas in excess of 15 square yards will require removal and replacement of the pavement in accordance with the limitations noted above. The Contractor shall apply a surface treatment to all areas that have been subject to grinding as directed by the Engineer.

c. Percentage of material within specification limits (PWL). The PWL shall be determined in accordance with procedures specified by the Federal Aviation Administration (FAA) in Advisory Circular 150/5370-10G, Section 110 of the General Provisions. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

Table 5. Marshall Acceptance Limits for Stability, Flow, Air Voids, and Density

TEST PROPERTY	Pavements Designed for Aircraft Gross Weights of 60,000 lbs or More or Tire Pressures of 100 psi or More	
Number of Blows	75 blows	
	Specification Tolerance	
	L	U
Stability, minimum (pounds)(N)	1800	--
Flow, 0.01 inch (25 mm)	8	18
Air Voids Total Mix (%)	2	5
Mat Density (%)	96.3	--
Joint Density (%)	93.3	--

d. Outliers. All individual tests for mat density and air voids shall be checked for outliers (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers shall be discarded, and the PWL shall be determined using the remaining test values. The criteria in Table 5 is based on production processes which have a variability with the following standard deviations: Surface Course Mat Density (%), 1.30; Base Course Mat Density (%), 1.55; Joint Density (%), 2.1.

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 98% with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 97.5% with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 96% with 2.1% or less variability.

401-5.3 Resampling pavement for mat density.

a. General. Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the Engineer. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-5.1b and 401-5.2b(1). Only one resampling per lot will be permitted.

(1) A redefined PWL shall be calculated for the resampled lot. The number of tests used to calculate the redefined PWL shall include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for resampled lots. The redefined PWL for a resampled lot shall be used to calculate the payment for that lot in accordance with Table 6.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%.

401-5.4 Leveling course.

Any course used for trueing and leveling shall meet the aggregate gradation in Table 3, paragraph 401-3.2. The trueing and leveling course shall meet the requirements of paragraph 401-3.2, 401-5.2b(1) for air voids and 401-5.2b(2) for stability and flow, but shall not be subject to the density requirements of paragraph 401-5.2b(1) for mat density and 401-5.2b(3) for joint density. The leveling course shall be compacted with the same effort used to achieve density of the test section. The trueing and leveling course shall not exceed the maximum lift thickness associated with each gradation in Table 3, paragraph 401-3.2. The leveling course is the first variable thickness lift of an overlay placed prior to subsequent courses.

CONTRACTOR QUALITY CONTROL

401-6.1 General.

The Contractor shall develop a Quality Control Program in accordance with Section 100 of the General Provisions. The program shall address all elements that affect the quality of the pavement including, but not limited to:

a. Mix design

b. Aggregate grading

c. Quality of materials

d. Stockpile management

e. Proportioning

f. Mixing and transportation
g. Placing and finishing

h. Joints

i. Compaction

j. Surface smoothness

k. Personnel

l. Laydown plan

The Contractor shall perform quality control sampling, testing, and inspection during all phases of the work and shall perform them at a rate sufficient to ensure that the work conforms to the contract requirements, and at minimum test frequencies required by paragraph 401-6.3 and Section 100 of the General Provisions. As a part of the process for approving the Contractor's plan, the Engineer may require the Contractor's technician to perform testing of samples to demonstrate an acceptable level of performance.

No partial payment will be made for materials that are subject to specific quality control requirements without an approved plan.

401-6.2 Contractor testing laboratory.

The lab shall meet the requirements of ASTM D3666 including all necessary equipment, materials, and current reference standards to comply with the specifications.

401-6.3 Quality control testing.

The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved Quality Control Program. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

a. Asphalt content. A minimum of two asphalt content tests shall be performed per lot in accordance with ASTM D6307 or ASTM D2172 if the correction factor in ASTM D6307 is greater than 1.0. The asphalt content for the lot will be determined by averaging the test results.

b. Gradation. Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of extracted aggregate in accordance with ASTM D5444, ASTM C136, and ASTM C117.

c. Moisture content of aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C566.

d. Moisture content of HMA. The moisture content shall be determined once per lot in accordance with ASTM D1461.

e. Temperatures. Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the HMA at the plant, and the HMA at the job site.

f. In-place density monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

g. Additional testing. Any additional testing that the Contractor deems necessary to control the process may be performed at the Contractor's option.

h. Monitoring. The Engineer reserves the right to monitor any or all of the above testing.

401-6.4 Sampling.

When directed by the Engineer, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

401-6.5 Control charts.

The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each sublot will be calculated and monitored by the Quality Control laboratory.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the Engineer may suspend production or acceptance of the material.

a. Individual measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits For Individual Measurements		
Sieve	Action Limit	Suspension Limit
3/4 inch (19 mm)	±6%	±9%
1/2 inch (12 mm)	±6%	±9%
3/8 inch (9 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (0.30 mm)	±3%	±4.5%
No. 200 (0.075 mm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
VMA	-1.00%	-1.50%

b. Range. Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of n = 2. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for n = 3 and by 1.27 for n = 4.

Control Chart Limits Based On Range (Based On n = 2)	
Sieve	Suspension Limit
1/2 inch (12 mm)	11%
3/8 inch (9 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (0.30 mm)	6%
No. 200 (0.075 mm)	3.5%
Asphalt Content	0.8%

c. Corrective Action. The Contractor Quality Control Program shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

(1) One point falls outside the Suspension Limit line for individual measurements or range; or

(2) Two points in a row fall outside the Action Limit line for individual measurements.

401-6.6 Quality control reports.

The Contractor shall maintain records and shall submit reports of quality control activities daily, in accordance with the Contractor Quality Control Program described in General Provisions, Section 100.

METHOD OF MEASUREMENT

401-7.1 Measurement.

HMA shall be measured by the number of tons of HMA used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

BASIS OF PAYMENT

401-8.1 Payment.

Payment for a lot of HMA meeting all acceptance criteria as specified in paragraph 401-5.2 shall be made based on results of tests for smoothness, mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1a for mat density and air voids and 401-8.1c for smoothness, subject to the limitation that:

a. The total project payment for plant mix bituminous concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons of HMA used in the accepted work (See Note 1 under Table 6).

b. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

c. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71 percent then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1. Payment in excess of 100% for accepted lots of HMA shall be used to offset payment for accepted lots of bituminous concrete pavement that achieve a lot pay factor less than 100% for density and air voids ONLY. Pay factors in excess of 100 will not be allowed to offset unacceptable smoothness results.

Table 6. Price Adjustment Schedule[1]

Percentage of material within specification limits (PWL)	Lot pay factor (percent of contract unit price)
96 – 100	100
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject [2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1.

[2] The lot shall be removed and replaced. However, the Engineer may decide to allow the rejected lot to remain. In that case, if the Engineer and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

d. Profilograph smoothness. When the final average profile index (subsequent to any required corrective action) does not exceed 7 inches per mile, payment will be made at the contract unit price for the completed pavement. If the final average profile index (subsequent to any required corrective action) exceeds 7 inches per mile, but does not exceed 15 inches per mile, the Contractor may elect to accept a contract unit price adjustment in lieu of reducing the profile index.

e. Basis of adjusted payment for smoothness. Price adjustment for pavement smoothness will be made in accordance with Table 7. The adjustment will apply to the total tonnage of HMA within a lot of pavement and shall be applied with the following equation:

(Tons of asphalt concrete in lot) × (lot pay factor) × (unit price per ton) × (smoothness pay factor) = payment for lot

Table 7. Profilograph Average Profile Index Smoothness Pay Factor

Inches/miles per 1/10 mile	Short Sections	Pay Factor
0.0 - 7	00.0 - 15.0	100%
7.1 - 9	15.1 - 16	98%
9.1 - 11	16.1 - 17	96%
11.1 - 13	17.1 - 18	94%
13.1 - 14	18.1 - 20	92%
14.1 - 15	20.1 - 22	90%
15.1 and up	22.1 and up	Corrective work required[1]

[1] The Contractor shall correct pavement areas not meeting these tolerances by removing and replacing the defective work. If the Contractor elects to construct an overlay to correct deficiencies, the minimum thickness of the overlay should be at least three times the maximum aggregate size (approximately four (4) times the nominal maximum aggregate size). The corrective overlay shall not violate grade Criteria and butt joints shall be constructed by sawing and removing the original pavement in compliance with the thickness/ maximum aggregate size ratio. Skin patching shall not be permitted.

HMA placed above the specified grade shall not be included in the quantities for payment.

401-8.1.1. Payment.

Payment will be made under:

Item P-401-8.1.1-1 Asphalt Surface Course (4") -- per Ton

TESTING REQUIREMENTS

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C183	Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D979	Standard Practice for Sampling Bituminous Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Bituminous Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures

ASTM D2726 Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures

ASTM D2950 Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

ASTM D3203 Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures

ASTM D3665 Standard Practice for Random Sampling of Construction Materials

ASTM D3666 Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D4791 Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

ASTM D4867 Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures

ASTM D5444 Standard Test Method for Mechanical Size Analysis of Extracted Aggregate

ASTM D6084 Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer

ASTM D6307 Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method

ASTM D6752 Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method

ASTM D6926 Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus

ASTM D6927 Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures

ASTM E11 Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

ASTM E178 Standard Practice for Dealing with Outlying Observations

ASTM E1274 Standard Test Method for Measuring Pavement Roughness Using a Profilograph

AASHTO T030 Standard Method of Test for Mechanical Analysis of Extracted Aggregate

AASHTO T110 Standard Method of Test for Moisture or Volatile Distillates in Hot Mix Asphalt (HMA)

AASHTO T275 Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Paraffin-Coated Specimens

AASHTO M156 Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

AASHTO T329 Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method

Asphalt Institute Handbook MS-26, Asphalt Binder

Asphalt Institute MS-2 Mix Design Manual, 7th Edition

MATERIAL REQUIREMENTS

ASTM D242 Standard Specification for Mineral Filler for Bituminous Paving Mixtures

ASTM D946 Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction

ASTM D3381 Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction

ASTM D4552 Standard Practice for Classifying Hot-Mix Recycling Agents

ASTM D6373 Standard Specification for Performance Graded Asphalt Binder

END OF ITEM P-401

ITEM P-410 BITUMINOUS PAVEMENT REPAIR FOR CRACK SEALING AND PATCHING OF FLEXIBLE (BITUMINOUS) PAVEMENTS

DESCRIPTION

410-1.1

This item shall consist of the rehabilitation items for patch repair of the flexible (bituminous) pavements. The P-401 Plant Mix Bituminous Pavement specification shall serve as the bituminous patching materials. The item shall include the removal and replacement of existing flexible pavement that has medium to severe cracking to a minimum depth of 2 inches and a maximum depth of 4 inches. Grinding of flexible pavements may be required for high spots. This item also consists of providing and installing a resilient and adhesive crack sealant, hot-applied, capable of effectively sealing cracks in flexible (bituminous) pavements. This item includes the removal of existing, loose, or damaged sealant material where applicable, preparation of the cracks, preparation of the sealant material, and the complete installation of the sealant repair system. The selection of sealant material products will be based on climate conditions, past performance of products, and at the discretion of the Engineer.

MATERIALS

410-2.1 Sealant Material.

The sealant for crack repair will be a hot-applied sealant conforming to requirements of ASTM D 6690, as listed in Table 1, for the classification type specified below. The Engineer will evaluate performance based on local conditions.

a. *Type II* – A joint and crack sealant capable of maintaining an effective seal in climates experiencing very cold temperatures. The material is tested for low temperature performance at -29°C (-84.2°F) using 50% extension.

Table 1. Sealant Requirements per Classification Type

	Type II
Cone Penetration at 25°C (77°F), per ASTM D 5329	90 max.
Softening Point °C (°F) per ASTM D 36, minimum	80 (176) minimum
Bond, non-immersed per ASTM D 5329	Three 12.7 mm specimens pass[A] 3 cycles at 50% ext at -29°C (-84.2°F)
Bond, water immersed per ASTM D 5329	--
Resilience, % per ASTM D 5329	60 min
Oven Aged Resilience, % per ASTM D 5329	--
Asphalt Compatibility per ASTM D 5329	Pass[B]

[A] The development of at any time during the test procedure of a crack, separation, or other opening over 6 mm (0.24 in) deep, in the sealant or between the sealant and the concrete block will constitute failure of the test specimen. The depth of crack, separation, or other opening will be measured perpendicular to the side of the sealant showing defect.

[B] There will be no failure in adhesion, formation of an oily exudates at the interface between the sealant and asphaltic concrete of other deleterious effects on the asphaltic concrete or sealant when tested at 60°C (140°F).

410-2.2 Heating of Materials.

The hot-applied sealant will be heated in conformance with ASTM D 5167, Standard Practice for Melting of Hot-Applied Joint and Crack Sealant and Filler Evaluation.

410-2.3 Bituminous Concrete Pavement.

The hot mix bituminous concrete pavement shall conform to the requirements set forth in Item P-401.

CONSTRUCTION METHODS

410-3.1 General.

The amount of bituminous pavement required to complete the work area patches should be ordered for arrival to the site based on the methods to be used for placement. The temperature of the mix should be within the limits specified in P-401. The size of the repairs should determine which placement method will be utilized. There are two methods of spreading and finishing the mixture. Hand spreading and finishing is commonly used for small patches and trench style repairs. Conventional small scale pavers and rollers should be used whenever the repair areas are large and of such size and number that this equipment is effective.

Asphalt crack repairs shall be made for cracks found to be less than 2 inch and shall consist of routing, cleaning and sealing. Cracks that are found along a milled surface during patching shall also require sealing.

410-3.2 Repair of Bituminous Pavements.

Remove the surface to a minimum depth of 2 inches and / or a maximum depth of 4 inches as required by the severity of the distressed area as shown on the drawings or as directed by the Engineer. Sawcut the existing bituminous pavement making vertical square or rectangular cuts through the pavement as necessary to obtain a clean straight edge. Clean all debris and dust along the milled surface prior to applying the tack coat materials (as specified in P-603). Apply the tack coat material in a uniform rate to all vertical edge faces of the existing pavement as well as the milled surface. Tack coat should not be applied to a wet surface and should further be tacky to the touch prior to placement of any bituminous concrete material. Place the P-401 bituminous concrete pavement materials into the area and compact. The placement of the bituminous concrete materials in the cutout areas should not exceed 2 ½ inches nor be less than 1 ½ inches when compacted. Continue with subsequent lifts until the bituminous patch meets the existing grade of the surrounding pavement. If the Contractor can demonstrate that minimum density and smoothness can be attained by placing the full depth of bituminous concrete material in one lift, the KCAD may choose to permit lifts up to 4 inches. Continue to compact the bituminous mixture with rollers suitable for the size of the repair area, until the surface is the same elevation as the surrounding pavement. Test the repaired areas in accordance with the requirements for air voids, density, and smoothness listed in the P-401 specification requirements. Upon completion and cure, all bituminous patches on Runway 9-27 and connecting taxiways shall be grooved to match existing grooving per specification P-621 and the detail(s) in the drawings.

410-3.3 Preparation of Cracks in Flexible Pavements.

a. Routing. All cracks ¾” wide or less shall be cleaned of any debris or laitance by use of a hot lance and compressed air free of oil and water. For cracks greater than ¾” wide but less than 2” wide, routing shall be required. If routing the cracks is required, immediately after routing, the resulting debris shall be completely removed from the crack and adjacent area by a hot lance and compressed air free of oil and water, and by use of other tools as necessary. The crack shall be allowed sufficient time to dry prior to sealing. When routing cracks, the reservoir ratio should be 1:1 with a 3/4-inch minimum width recommended. All cracks greater than 2” wide shall be repaired with either a 4” or 2” depth asphalt patch, as determined by the Engineer.

b. Sealing. Immediately before sealing, the cracks shall be thoroughly cleaned of all remaining laitance and other foreign material. Cleaning shall be accomplished by use of a hot lance. Upon completion of cleaning, the cracks shall be blown out with compressed air free of oil and water. Only air compressors with operable oil and water traps shall be used to prepare the cracks for sealing. The crack faces shall be surface dry when the seal is applied. The surface of the installed sealant material shall be 1/8-inch below the existing pavement elevation for surface cracks. The surface of the installed sealant material for cracks in milled areas shall be ¼-inch below the milled surface elevation.

410-3.4 Time of Application.

Cracks will be sealed as soon after completion of the pavement preparation as feasible and before the pavement is open to traffic, including construction equipment. The pavement temperature must be above 50°F at the time of installation of the hot-applied crack sealing material.

410-3.5 Installation of Sealants.

Cracks will be inspected for proper width, depth, and preparation, and will be approved by the Engineer before sealing is allowed. Sealants will be installed in accordance with the following requirements:

a. Hot Poured Sealants. The crack sealant will be applied uniformly solid from bottom to top and will be filled without formation of entrapped air or voids. The sealant surface when complete will be 1/8-inch below the existing pavement surface and ¼-inch below the milled surface. A backing material will be placed to obtain the desired width to depth ratio and will be non-reactive and non-adhesive to the pavement or the sealant material. The heating kettle will be an indirect heating type, constructed of a double boiler. A positive temperature control and mechanical agitator will be provided. The sealant will not be heated to more than 20°F below the safe heating temperature. The safe heating temperature can be obtained from the manufacturer's shipping container. A direct connecting pressure type extruding device with nozzles shaped for insertion into the crack will be provided. Any sealant spilled on the surface of the pavement, structures and /or lighting will be removed immediately.

b. Backer Rod Material. The use of backer rod material or bond breaker in the bottom of the crack to be filled is recommended to control the depth of the sealant, to achieve the desired shape factor, and to support the sealant against indentation and sag. Backer rod materials and bond breakers should be compatible with the sealant, should not adhere to the sealant, should be compressible without extruding the sealant, and should recover to maintain contact with the crack faces when the crack is open. The backer rod will be 25 percent larger in diameter than the width of the reservoir.

METHOD OF MEASUREMENT

410-4.1 MEASUREMENT.

The plant mix bituminous concrete pavement used for the patching repairs will be measured in accordance with the requirements listed in P-401. The removal, cleaning and preparation costs associated with the patching shall further be incidental to the P-101 and P-401 items.

The quantity Flexible Pavement Crack Sealing to be paid for shall be the number of linear feet of sealing performed in accordance with the specifications and accepted by the Engineer.

BASIS OF PAYMENT

410-5.1 PAYMENT.

There shall be no separate payment made for the removal, cleaning and preparation and placement of the bituminous concrete pavement under this specification.

Payment for sealing material will be made at the contract unit price bid per linear foot. This price will be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-410-5.1-1	Flexible Pavement Crack Sealing -- per Linear Foot

TESTING REQUIREMENTS

ASTM D 36 Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

ASTM D 5167 Standard Practice for Melting Hot-Applied Joint and Crack Sealant and Filler Evaluation

MATERIAL REQUIREMENTS

ASTM D 5249 Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland Cement Concrete and Asphalt Joints

ASTM D 6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END OF ITEM P-410

ITEM P-603 BITUMINOUS TACK COAT

DESCRIPTION

603-1.1

This item shall consist of preparing and treating a bituminous or concrete surface with bituminous material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

603-2.1 Bituminous materials.

The bituminous material shall be an emulsified asphalt indicated in ASTM D3628 as a bituminous application for tack coat appropriate to local conditions or as designated by the Engineer.

CONSTRUCTION METHODS

603-3.1 Weather limitations.

The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F or above; the temperature has not been below 35°F for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the Engineer.

603-3.2 Equipment.

The Contractor shall provide equipment for heating and applying the bituminous material.

The distributor shall be designed, equipped, maintained, and operated so that bituminous material at even heat may be applied uniformly on variable widths of surface at the specified rate. The allowable variation from the specified rate shall not exceed 10 percent. Distributor equipment shall include a tachometer, pressure gages, volume-measuring devices or a calibrated tank and a thermometer for measuring temperatures of tank contents. The distributor shall be self-powered and shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically. If the distributor is not equipped with an operable quick shutoff valve, the tack operations shall be started and stopped on building paper. The Contractor shall remove blotting sand prior to asphalt concrete lay down operations at no additional expense to the Owner.

A power broom and/or power blower suitable for cleaning the surfaces to which the bituminous tack coat is to be applied shall be provided.

603-3.3 Application of bituminous material.

All surfaces to be overlaid with bituminous pavement shall receive tack coat. If any bituminous pavements are to be placed in multiple lifts, tack coat shall be applied between placement of each lift. Immediately before applying the tack coat, the full width of surface to be

treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material.

Emulsified asphalt shall be diluted by the addition of water when directed by the Engineer and shall be applied a sufficient time in advance of the paver to ensure that all water has evaporated before the overlying mixture is placed on the tacked surface.

The bituminous material including vehicle shall be uniformly applied with a bituminous distributor at the rate of 0.05 to 0.10 gallons per square yard depending on the condition of the existing surface. The type of bituminous material and application rate shall be approved by the Engineer prior to application.

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the Engineer. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed. Suitable precautions shall be taken by the Contractor to protect the surface against damage during this interval.

603-3.4 Bituminous material Contractor's responsibility.

The Contractor shall provide a statement of source and character of the proposed bituminous material which must be submitted and approved by the Engineer before any shipment of bituminous materials to the project. Only satisfactory materials so demonstrated by service tests, shall be acceptable.

The Contractor shall furnish the vendor's certified test reports for each carload, or equivalent, of bituminous material shipped to the project. The tests reports shall be provided to and approved by the Engineer before the bituminous material is applied. If the Contractor applies the material prior to receipt of the tests reports, payment for the material shall be withheld until they are received. If the bituminous material does not meet the specifications, it shall be replaced at the Contractor's expense. Furnishing the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verification by testing samples of material received for use on the project.

603-3.5 Freight and weigh bills

The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the Engineer certified waybills and certified delivery tickets for all bituminous materials actually used in the construction of the pavement covered by the contract. Do not remove bituminous material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

METHOD OF MEASUREMENT

603-4.1

The bituminous material for tack coat shall be measured by the gallon. Volume shall be corrected to the volume at 60°F in accordance with ASTM D1250 for cutback asphalt, ASTM D 633 for tar, and Table IV-3 of The Asphalt Institute's Manual MS-6 for emulsified

asphalt. The bituminous material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of bituminous material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the bituminous material is necessary. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

603-5.1

Payment shall be made at the contract unit price per gallon of bituminous material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-603-5.1-1 Bituminous Tack Coat -- per Gallon

MATERIAL REQUIREMENTS

ASTM D633 Standard Volume Correction Table for Road Tar

ASTM D977 Standard Specification for Emulsified Asphalt

ASTM D1250 Standard Guide for Use of the Petroleum Measurement Tables

ASTM D2028 Standard Specification for Cutback Asphalt (Rapid-Curing Type)

ASTM D2397 Standard Specification for Cationic Emulsified Asphalt

ASTM D3628 Standard Practice for Selection and Use of Emulsified Asphalts

END ITEM P-603

ITEM P-605 SEALANTS FOR IN-PAVEMENT LIGHT FIXTURES

DESCRIPTION

605-1.1

This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints between in-pavement fixtures and adjacent asphalt pavement.

MATERIALS

605-2.1 Joint sealants.

Joint sealant materials shall meet the requirements of ASTM D5893 Standard Specifications for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements, Type NL or SL.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 Backer rod.

Backer rod shall not be installed prior to sealing of in-pavement fixtures.

605-2.3 Backup materials.

For installation of light cans, backup materials shall not be used between Items P-605 and P-606. Can installation shall be per Advisory Circular (AC) 150/5340-30.

605-2.4 Bond breaking tapes. Deleted.

CONSTRUCTION METHODS

605-3.1 Time of application.

Application areas to be sealed shall be sealed as soon after completion of the curing period of the P-606 and adjacent asphalt pavement as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F and rising at the time of application of the poured sealing material. Do not apply sealant if moisture is observed in the joint.

605-3.2 Equipment.

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 7 days prior to use on the project.

a. Tractor-mounted routing tool. Deleted.

b. Concrete saw. Deleted.

c. Sandblasting equipment. Sandblasting is not allowed.

d. Waterblasting equipment. Include with the waterblasting equipment a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. Provide water tank and auxiliary resupply equipment of sufficient capacity to permit continuous operations. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately one inch above the pavement surface. Adjust the height, angle of inclination and the size of the nozzle as necessary to obtain satisfactory results. A pressure gauge mounted at the pump shall show at all times the pressure in psi at which the equipment is operating. Waterblasting operation shall not damage the new asphalt pavement or the adjacent existing Portland Cement Concrete pavement. Should either of these pavements become damaged, they shall be repaired by the Contractor at no cost to the Owner.

e. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a fixture.

f. Hot-poured sealing equipment. Deleted.

g. Two-component, cold-applied, machine mix sealing equipment. Deleted.

h. Two-component, cold-applied, hand-mix sealing equipment. Deleted.

i. Cold-applied, single-component sealing equipment. The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the application area to allow sealing from the bottom of the application area to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

605-3.3 Preparation of application areas.

a. Sawing. Deleted.

b. Sealing. Immediately before sealing, the application areas shall be thoroughly cleaned of all remaining laitance, filler, and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by waterblasting or hand tools as specified in paragraph 605-3.2. After final cleaning and immediately prior to sealing, blow out the application area with compressed air and leave it completely free of debris and water. The adjacent surfaces shall be dry when the seal is applied.

c. Back-up material. For installation of light cans, backup materials shall not be used between Items P-605 and P-606. Can installation shall be per Advisory Circular (AC) 150/5340-30.

d. Bond-breaking tape. Deleted.

605-3.4 Installation of sealants.

Application areas shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding sealing operations, perform a final cleaning with compressed air. Fill the application areas from the bottom up to 1/8 inch below the pavement surface and adjacent top of fixture. Remove and discard excess or spilled sealant from the pavement and fixture by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed areas until sealant has sufficiently cured. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the application areas frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 Inspection.

The Contractor shall inspect the sealant for proper rate of cure and set, bonding to the adjacent walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the application area, wasted, and replaced as specified at no additional cost to the airport.

605-3.6 Clean-up.

Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1

Sealing material will not be measured separately. Sealing material will be considered incidental to Item L-125-5.1-1 Remove In-Pavement Fixture, Install Blank Cover, and Re-Install Fixture.

BASIS OF PAYMENT

605-5.1

Joint sealing material shall be considered incidental to Item L-125-5.1-1 Remove In-Pavement Fixture, Install Blank Cover, and Re-Install Fixture. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials,

and for all labor, equipment, tools, and incidentals necessary to complete the item shall be included in Item L-125-5.1-1 Remove In-Pavement Fixture, Install Blank Cover, and Re-Install Fixture.

MATERIAL REQUIREMENTS

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements

END ITEM P-605

ITEM P-606 ADHESIVE COMPOUNDS, TWO-COMPONENT, FOR SEALING WIRE AND LIGHTS IN PAVEMENT

DESCRIPTION

606-1.1.

This specification covers a liquid suitable for sealing light fixtures or bases in pavement. This material is a two-component filled formula with the characteristics specified in paragraph 606-2.4. Materials supplied for use with bituminous concrete pavements must be formulated so they are compatible with the bituminous concrete.

EQUIPMENT AND MATERIALS

606-2.1 Curing.

When pre-warmed to 77°F, mixed, and placed in accordance with manufacturer's directions, the materials shall cure at temperatures of 45°F or above without the application of external heat.

606-2.2 Storage.

The adhesive components shall not be stored at temperatures over 86°F.

606-2.3 Caution.

Installation and use shall be in accordance with the manufacturer's recommended procedures. Avoid prolonged or repeated contact with skin. In case of contact, wash with soap and flush with water. If taken internally, call doctor. Keep away from heat or flame. Avoid vapor. Use in well-ventilated areas. Keep in cool place. Keep away from children.

606-2.4 Characteristics.

When mixed and cured in accordance with the manufacturer's directions, the materials shall have the following properties shown in Table 1.

SAMPLING, INSPECTION, AND TEST PROCEDURES

606-3.1 Tensile properties.

Tests for tensile strength and elongation shall be conducted in accordance with ASTM D638.

606-3.2 Expansion.

Tests for coefficients of linear and cubical expansion shall be conducted in accordance with ASTM D1168, Method B, except that mercury shall be used instead of glycerine. The test specimen shall be mixed in the proportions specified by the manufacturer, and cured in a glass tub approximately 2 inch long by 3/8 inch in diameter. The interior of the tube shall be precoated with a silicone mold release agent. The hardened sample shall be removed

from the tube and aged at room temperature for one (1) week before conducting the test. The test temperature range shall be from 35°F to 140°F.

606-3.3 Test for dielectric strength.

Test for dielectric strength shall be conducted in accordance with ASTM D149 for sealing compounds to be furnished for sealing electrical wires in pavement.

Table 1. Property Requirements

Physical or Electrical Property	Minimum	Maximum	ASTM Method
Tensile			
Portland cement concrete	1,000 psi		D638
Bituminous concrete	500 psi		
Elongation			
Portland cement concrete		See note [1]	D638
Bituminous concrete	50%		D638
Coef. of cub. exp. cu. cm/cu. cm/°C	0.00090	0.00120	D1168
Coef. of lin. exp. cm/cm/°C	0.000030	0.000040	D1168
Dielectric strength, short time test	350 volts/mil.		D149
Arc resistance	125 sec		
Pull-off			
Adhesion to steel	1,000 psi		
Adhesion to Portland cement concrete	200 psi		
Adhesion to asphalt concrete	No test available.		
Adhesion to aluminum	250 psi		

[1] 20% or more (without filler) for formulations to be supplied for areas subject to freezing.

606-3.4 Test for arc resistance.

Test for arc resistance shall be conducted for sealing compounds to be furnished for sealing electrical wires in pavement.

606-3.5 Test for adhesion to steel.

The ends of two smooth, clean, steel specimens of convenient size (1 inch by 1 inch by 6 inch) would be satisfactory when bonded together with adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure on a Riehle (or similar) tensile tester. The thickness of adhesive to be tested shall be 1/4 inch.

606-3.6 Adhesion to Portland cement concrete.

a. Concrete Test Block Preparation.

The aggregate grading shall be as shown in Table 2.

The coarse aggregate shall consist of crushed rock having a minimum of 75% of the particles with at least one fractured face and having a water absorption of not more than 1.5%. The fine aggregate shall consist of crushed sand manufactured from the same parent rock as the coarse aggregate. The concrete shall have a water-cement ratio of 5.5 gallons of water per bag of cement, a cement factor of 6, ±0.5, bags of cement per cubic yard of concrete, and a slump of 2-1/2 inch, ±1/2 inch. The ratio of fine aggregate to total aggregate shall be approximately 40% by solid volume. The air content shall be 5.0%, ±0.5%, and it shall be obtained by the addition to the batch of an air-entraining admixture such as Vinsol® resin. The mold shall be of metal and shall be provided with a metal base plate.

Means shall be provided for securing the base plate to the mold. The assembled mold and base plate shall be watertight and shall be oiled with mineral oil before use. The inside measurement of the mold shall be such that several 1 inch by 2 inch by 3 inch test blocks can be cut from the specimen with a concrete saw having a diamond blade. The concrete shall be prepared and cured in accordance with ASTM C192.

Table 2. Aggregate For Bond Test Blocks

Type	Sieve Size	Percent Passing
Coarse Aggregate	3/4 inch (19 mm)	97 to 100
	1/2 inch (12 mm)	63 to 69
	3/8 inch (9 mm)	30 to 36
	No. 4 (4.75 mm)	0 to 3
Fine Aggregate	No. 4 (4.75 mm)	100
	No. 8 (2.36 mm)	82 to 88
	No. 16 (1.18 mm)	60 to 70
	No. 30 (600 μm)	40 to 50
	No. 50 (300 μm)	16 to 26
	No. 100 (150 μm)	5 to 9

b. Bond Test.

Prior to use, oven-dry the test blocks to constant weight at a temperature of 220°F to 230°F, cool to room temperature, 73.4°F ±3°F, in a desiccator, and clean the surface of the blocks of film or powder by vigorous brushing with a stiff-bristled fiber brush. Two test blocks shall be bonded together on the one inch by 3 inch sawed face with the adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure in a Riehle (or similar) tensile tester. The thickness of the adhesive to be tested shall be 1/4 inch.

606-3.7 Compatibility with asphalt concrete.

Test for compatibility with asphalt in accordance with ASTM D5329.

606-3.8 Adhesive compounds - Contractor's responsibility.

The Contractor shall furnish the vendor's certified test reports for each batch of material delivered to the project. The report shall certify that the material meets specification requirements and is suitable for use with bituminous concrete pavements. The report shall be delivered to the Engineer before permission is granted for use of the material. In addition the Contractor shall obtain a statement from the supplier or manufacturer that guarantees the material for one year. The supplier or manufacturer shall furnish evidence that the material has performed satisfactorily on other projects.

606-3.9 Application.

Adhesive shall be applied on a dry, clean surface, free of grease, dust, and other loose particles. The method of mixing and application shall be in strict accordance with the manufacturer's recommendations. When used with Item P-605, such as light can installation, Item P-605 shall not be applied until the Item P-606 has fully cured.

METHOD OF MEASUREMENT

606-4.1

No measurement will be made for direct payment of adhesive compound. The cost of furnishing and installing shall be considered a subsidiary obligation to Item L-125-5.1-1.

BASIS OF PAYMENT

606-5.1

Adhesive compound material and installation shall be considered incidental to Item L-125-5.1-1 Remove In-Pavement Fixture, Install Blank Cover, and Re-Install Fixture. The price for full compensation for furnishing all materials, and for all preparation, delivering, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item shall be included in Item L-125-5.1-1 Remove In-Pavement Fixture, Install Blank Cover, and Re-Install Fixture.

TESTING REQUIREMENTS

ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM D149	Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D1168	Standard Test Method for Hydrocarbon Waxes Used for Electrical Insulation

ASTM D5329	Standard Test Methods for Sealants and Fillers, Hot-applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements

END OF ITEM P-606

ITEM P-620 RUNWAY AND TAXIWAY MARKING

DESCRIPTION

620-1.1

This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer. The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification.

MATERIALS

620-2.1 Materials acceptance.

The Contractor shall furnish manufacturer’s certified test reports for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers 55 gallons or smaller for inspection by the Engineer. Material shall not be loaded into the equipment until inspected by the Engineer.

620-2.2 Marking materials.

Paint shall be waterborne in accordance with the requirements of paragraph 620-2.2a. Paint shall be furnished in in accordance with Federal Standard No. 595. Paint shall be furnished in white – 37925, yellow – 33538 or 33655, red – 31136 and black – 37038 in accordance with Federal Standard No. 595.

a. Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952E, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis. The acrylic resin used for Type III shall be 100% cross linking acrylic as evidenced by infrared peaks at wavelengths 1568, 1624, and 1672 cm-l with intensities equal to those produced by an acrylic resin known to be 100% cross linking.

b. Epoxy. Deleted.
c. Methacrylate. Deleted.
d. Solvent-Base. Deleted.

e. Preformed Thermoplastic Airport Pavement Markings. Deleted.

620-2.3 Reflective media.

Glass beads shall meet the requirements for Federal Specification TT-B-1325D, Type III. Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

CONSTRUCTION METHODS

620-3.1 Weather limitations.

The painting shall be performed only when the surface is dry and when the surface temperature is at least 45°F and rising and the pavement surface temperature is at least 5°F above the dew point or meets the manufacturer's recommendations. Painting operations shall be discontinued when the surface temperature exceeds the paint manufacturer's recommendations. Markings shall not be applied when the pavement temperature is greater than 130°F. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns.

620-3.2 Equipment.

Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless-type marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray.

620-3.3 Preparation of surface.

Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material that would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by sweeping and blowing or by other methods as required to remove all contaminants minimizing damage to the pavement surface. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the Engineer. After the cleaning operations, sweeping, blowing or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

Prior to the application of any markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the type of marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufacturer's surface preparation and application requirements must be submitted and approved by the Engineer prior to the initial application of markings.

620-3.4 Layout of markings.

The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans. The locations of markings to receive silica sand shall be shown on the plans. The marking layout shall be approved by the Engineer prior to application of new markings.

620-3.5 Application.

Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the Engineer. The edges of the markings shall not vary from a straight line more than

1/2 inch in 50 feet, and marking dimensions and spacings shall be within the following tolerances:

Dimension and Spacing	Tolerance
36 inch or less	±1/2 inch
greater than 36 inch to 6 feet	±1 inch
greater than 6 feet to 60 feet	±2 inch
greater than 60 feet	±3 inch

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted. A period of 30 days shall elapse between placement of a bituminous surface course or seal coat and application of the paint final coat at 100% of the specified application rates. A temporary light coat application will be required on all new bituminous pavement surfaces in order to open construction areas to aircraft traffic prior to the completion of the 30 day bituminous pavement curing period. The paint and glass beads shall be applied at 30% of the specified application rates for the temporary light coat.

Prior to the initial application of markings, the Contractor shall certify in writing that the surface has been prepared in accordance with the paint manufacturer's requirements, that the application equipment is appropriate for the marking paint and that environmental conditions are appropriate for the material being applied. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the Engineer prior to the initial application of markings.

620-3.6 Test strip.

Prior to the full application of airfield markings, the Contractor shall produce a test strip in the presence of the Engineer. The test strip shall include the application of a minimum of 5 gallons of paint and application of 35 lbs of Type I/50 lbs of Type III glass beads. The test strip shall be used to establish thickness/darkness standard for all markings. The test strip shall cover no more than the maximum area prescribed in Table 1 (e.g., for 5 gallons of waterborne paint shall cover no more than 575 square feet).

Table 1. Application Rates For Paint And Glass Beads
(See Note regarding Red and Pink Paint)

Paint Type	Paint Square feet per gallon, ft^2/gal.	Glass Beads, Type III Pounds per gallon of paint—lb./gal.
Waterborne	115 ft^2/gal. maximum	*10 lb./gal. minimum

Note: The glass bead application rate for Red and Pink paint shall be reduced by 2 lb/gal for Type I and Type IV beads. Type III beads shall not be applied to Red or Pink paint.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment should be performed.

All emptied containers shall be returned to the paint storage area for checking by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer.

620-3.7 Application--preformed thermoplastic airport pavement markings. Deleted.

620-3.8 Protection and cleanup.

After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose or unadhered reflective media and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local and Federal environmental statutes and regulations.

METHOD OF MEASUREMENT

620-4.1

The quantity of Reflectorized Pavement Marking (white) to be paid for shall be the number of square feet of painting performed in accordance with the specifications and accepted by the Engineer.

620-4.2

The quantity of Reflectorized Pavement Marking (yellow) to be paid for shall be the number of square feet of painting performed in accordance with the specifications and accepted by the Engineer.

620-4.3

The quantity of Non-Reflectorized Pavement Marking (black) to be paid for shall be the number of square feet of painting performed in accordance with the specifications and accepted by the Engineer.

BASIS OF PAYMENT

620-5.1

Payment shall be made at the respective contract unit price per square foot for runway and taxiway painting**.** This price shall be full compensation for furnishing all materials and

for all labor, equipment, tools, and incidentals necessary to complete the item. The preparation of all surfaces to receive paint shall be per paragraph 620-3.3 and P-101 and shall be considered incidental to the items paid under this specification.

Payment will be made under:

Item P-620-5.1-1	Reflectorized Pavement Marking (White) -- per Square Foot
Item P-620-5.1-2	Reflectorized Pavement Marking (Yellow) -- per Square Foot
Item P-620-5.1-3	Non-reflectorized Pavement Marking (Black) -- per Square Foot

TESTING REQUIREMENTS

ASTM C371	Standard Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D711	Standard Test Method for No-Pick-Up Time of Traffic Paint
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

MATERIAL REQUIREMENTS

ASTM D476 Standard Classification for Dry Pigmentary Titanium Dioxide Products

40 CFR Part 60, Appendix A-7, Method 24
Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings

29 CFR Part 1910.1200 Hazard Communication

FED SPEC TT-B-1325D Beads (Glass Spheres) Retro-Reflective

American Association of State Highway and Transportation Officials (AASHTO) M247 Standard Specification for Glass Beads Used in Pavement Markings

FED SPEC TT-P-1952E Paint, Traffic and Airfield Marking, Waterborne

Commercial Item Description A-A-2886B Paint, Traffic, Solvent Based

FED STD 595 Colors used in Government Procurement

AC 150/5340-1 Standards for Airport Markings

END OF ITEM P-620

ITEM P-621 SAW-CUT GROOVES

DESCRIPTION

621-1.1

This item consists of providing a skid resistant surface that prevents hydroplaning during wet weather in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer.

CONSTRUCTION METHODS

621-2.1 Procedures.

The Contractor shall submit to the Engineer the grooving sequence and method of placing guide lines to control grooving operation. Transverse grooves saw-cut in the pavement must form a 1/4 inch wide by 1/4 inch deep by 1-1/2 inch center-to-center configuration. The grooves must be continuous for the entire runway length. They must be saw-cut transversely (perpendicular to centerline) in the runway and high-speed taxiway pavement to not less than10 feet from the runway pavement edge to allow adequate space for equipment operation. The Contractor must provide a grooving machine of a type equipped with diamond-saw cutting blade groove cutting head capable of making at least 18 inches in width of multiple parallel grooves in one pass of the machine. Thickness of the cutting blades shall be capable of making the required width and depth of grooves in one pass of the machine. The cutting head shall not contain a mixture of new and worn blades or blades of unequal wear or diameter. The wheels on the grooving machine shall be of a design that will not scar or spall the pavement. The machine must be equipped with devices to control depth of groove and alignment within the specified tolerances.

The saw-cut grooves must meet the following tolerances. The tolerances apply to each day's production and to each piece of grooving equipment used for production. The Contractor is responsible for all controls and process adjustments necessary to meet these tolerances. The Contractor shall routinely spot check for compliance each time the equipment aligns for a grooving pass.

a. Alignment tolerance. The grooves shall not vary more than ±1-1/2 inch in alignment for 75 feet along the runway length, allowing for realignment every 500 feet along the runway length.

b. Groove tolerance. Depth. The standard depth is 1/4 inch. At least 90% of the grooves must be at least 3/16 inch, at least 60% of the grooves must be at least 1/4 inch, and not more than 10% of the grooves may exceed 5/16 inch.

c. Width. The standard width is 1/4 inch. At least 90% of the grooves must be at least 3/16 inch, at least 60% of the grooves must be at least 1/4 inch, and not more than 10% of the grooves may exceed 5/16 inch.

d. Center-to-center spacing. The standard spacing is 1-1/2 inch. Minimum spacing 1-3/8 inch. Maximum spacing 1-1/2 inch.

Saw-cut grooves must not be closer than 3 inches or more than 9 inches from transverse joints in concrete pavements. Grooves must not be closer than 6 inches and no more than 18 inches from in-pavement light fixtures. Grooves may be continued through longitudinal construction joints. Where neoprene compression seals have been installed and the compression seals are recessed sufficiently to prevent damage from the grooving operation, grooves may be continued through the longitudinal joints. Where neoprene compression seals have been installed and the compression seals are not recessed sufficiently to prevent damage from the grooving operation, grooves must not be closer than 3 inches or more than 5 inches from the longitudinal joints. Where lighting cables are installed, grooving through longitudinal or diagonal saw kerfs shall not be allowed.

Saw-cut grooving of new pavements that abut existing pavements shall be aligned in a manner to match the grooving of the existing pavements. The Contractor shall be responsible for recording the limits of grooving of existing pavements prior to the start of demolition. The Contractor shall be responsible for the layout of saw-cut grooving of all new pavements. Saw-cut grooving shall be approved by the Engineer before full grooving operations begin.

621-2.2 Environmental requirements.

Grooving operations will not be permitted when freezing conditions prevent the immediate removal of debris and/or drainage of water from the grooved area. Discharge and disposal of waste slurry shall be the Contractor's responsibility.

621-2.3 Test section.

A test section of saw-cut grooves shall be completed by the Contractor for approval by the Engineer and KCAD. At a minimum, three passes of the grooving machine shall be made across the full width of the area to be grooved. The test section shall be done on the most recently completed pavement area. The Contractor may submit a request to KCAD to complete the test section prior to the end of the 30 day asphalt pavement cure period. Upon approval of the test section by the Engineer and KCAD, the Contractor may proceed with full saw-cut grooving operations.

621-2.4 Existing pavements.

Bumps, depressed areas, bad or faulted joints, and badly cracked and/or spalled areas in the pavement shall not be grooved until such areas are adequately repaired or replaced.

621-2.5 New pavements.

New asphalt concrete pavements shall be allowed to cure for a minimum of 30 days before grooving, to allow the material to become stable enough to prevent closing of the grooves under normal use. Spalling along or tearing or raveling of the groove edges shall not be allowed.

621-2.6 Grooving machine.

Provide a grooving machine that is power driven, self-propelled, specifically designed and manufactured for pavement grooving, and has a self-contained and integrated continuous slurry vacuum system as the primary method for removing waste slurry. The grooving

machine shall be equipped with diamond-saw cutting blades, and capable of making at least 18 inches in width of multiple parallel grooves in one pass of the machine. Thickness of the cutting blades shall be capable of making the required width and depth of grooves in one pass of the machine. The cutting head shall not contain a mixture of new and worn blades or blades of unequal wear or diameter. Match the blade type and configuration with the hardness of the existing airfield pavement. The wheels on the grooving machine shall be of a design that will not scar or spall the pavement. Provide the machine with devices to control depth of groove and alignment.

621-2.7 Water supply.

Water for the grooving operation shall be provided by the Contractor.

621-2.8 Clean-up.

During and after installation of saw-cut grooves, the Contractor must remove from the pavement all debris, waste, and by-products generated by the operations to the satisfaction of the Engineer. Cleanup of waste material must be continuous during the grooving operation. Flush debris produced by the machine to the edge of the grooved area or pick it up as it forms. The dust coating remaining shall be picked up or flushed to the edge of the area if the resultant accumulation is not detrimental to the vegetation or storm drainage system. Accomplish all flushing operations in a manner to prevent erosion on the shoulders or damage to vegetation. Waste material must be disposed of as approved by the Engineer and KCAD. Waste material must not be allowed to enter the airport storm sewer system or sanitary sewer system. The Contractor must dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations

621-2.9 Repair of damaged pavement.

Grooving must be stopped and damaged pavement repaired at the Contractor’s expense when, in the opinion of the Engineer, the result of the grooving operation will be detrimental to aircraft tires.

ACCEPTANCE

621-3.1 Acceptance testing.

Grooves will be accepted based on results of zone testing. All acceptance testing necessary to determine conformance with the groove tolerances specified will be performed by the Engineer.

Instruments for measuring groove width and depth must have a range of at least 0.5 inch and a resolution of at least 0.005 inch. Gage blocks or gages machined to standard grooves width, depth, and spacing may be used.

Instruments for measuring center-to-center spacing must have a range of at least 3 inches and a resolution of at least 0.02 inch.

The Engineer will measure grooves in five zones across the pavement width. Measurements will be made at least three times during each day’s production. Measurements in all zones will

be made for each cutting head on each piece of grooving equipment used for each day's production.

The five zones are as follows:

Zone 1 Centerline to 5 feet left or right of the centerline.

Zone 2 5 feet to 25 feet left of the centerline.

Zone 3 5 feet 25 feet right of the centerline.

Zone 4 25 feet to edge of grooving left of the centerline.

Zone 5 25 feet to edge of grooving right of the centerline.

At a random location within each zone, five consecutive grooves sawed by each cutting head on each piece of grooving equipment will be measured for width, depth, and spacing. The five consecutive measurements must be located about the middle blade of each cutting head ±4 inches. Measurements will be made along a line perpendicular to the grooves.

Width or depth measurements less than 0.170 inch shall be considered less than 3/16 inch.

Width or depth measurements more than 0.330 inch shall be considered more than 5/16 inch.

Width or depth measurements more than 0.235 inch shall be considered more than 1/4 inch.

Production must be adjusted when more than one groove on a cutting head fails to meet the standard depth, width, or spacing in more than one zone.

METHOD OF MEASUREMENT

621-4.1

The quantity of saw-cut grooving to be paid for shall be the number of square yards of grooving performed in accordance with the specifications and accepted by the Engineer per paragraph 621-3.1.

BASIS OF PAYMENT

621-5.1 Payment for saw-cut grooving.

Payment for saw-cut grooving will be made at the contract unit price per square yard for saw-cut grooving. This price shall be full compensation for furnishing all materials, and for all preparation, delivering, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-621-5.1-1 Saw-Cut Grooving -- per Square Yard

END OF ITEM P-621

U.S. Department of Transportation

Federal Aviation Administration

Advisory Circular

Subject: Operational Safety on Airports During Construction	**Date:** 9/29/11 **Initiated by:** AAS-100	**AC No:** 150/5370-2F

1. Purpose. This AC sets forth guidelines for operational safety on airports during construction.

2. What this AC Cancels. This AC cancels AC 150/5370-2E, Operational Safety on Airports During Construction, dated January 17, 2003.

3. Whom This AC Affects. This AC assists airport operators in complying with Title 14 Code of Federal Regulations (CFR) Part 139, Certification of Airports (Part 139). For those certificated airports, this AC provides one way, but not the only way, of meeting those requirements. The use of this AC is mandatory for those airport construction projects receiving funds under the Airport Improvement Program (AIP) or the Passenger Facility Charge (PFC) Program. See Grant Assurance No. 34, "Policies, Standards, and Specifications," and PFC Assurance No. 9, "Standard and Specifications." While we do not require non-certificated airports without grant agreements to adhere to these guidelines, we recommend that they do so to help these airports maintain operational safety during construction.

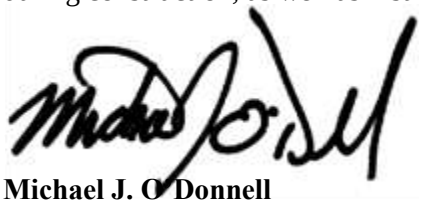
4. Principal Changes.

a. Construction activities are prohibited in safety areas while the associated runway or taxiway is open to aircraft.

b. Guidance is provided in incorporating Safety Risk Management.

c. Recommended checklists are provided for writing Construction Safety and Phasing Plans and for daily inspections.

5. Reading Material Related to this AC. Numerous ACs are referenced in the text of this AC. These references do not include a revision letter, as they are to be read as referring to the latest version. Appendix 1 contains a list of reading material on airport construction, design, and potential safety hazards during construction, as well as instructions for obtaining these documents.



Michael J. O'Donnell
Director of Airport Safety and Standards

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Chapter 1. Planning an Airfield Construction Project

101. Overview. Airports are complex environments, and procedures and conditions associated with construction activities often affect aircraft operations and can jeopardize operational safety. Safety considerations are paramount and may make operational impacts unavoidable. However, careful planning, scheduling, and coordination of construction activities can minimize disruption of normal aircraft operations and avoid situations that compromise the airport's operational safety. The airport operator must understand how construction activities and aircraft operations affect one another to be able to develop an effective plan to complete the project. While the guidance in this AC is primarily used for construction operations, some of the concepts, methods and procedures described may also enhance the day-to-day airport maintenance operations, such as lighting maintenance and snow removal operations.

102. Plan for Safety. Safety, maintaining aircraft operations, and construction costs are all interrelated. Since safety must not be compromised, the airport operator must strike a balance between maintaining aircraft operations and construction costs. This balance will vary widely depending on the operational needs and resources of the airport and will require early coordination with airport users and the FAA. As the project design progresses, the necessary construction locations, activities, and associated costs will be identified. As they are identified, their impact to airport operations must be assessed. Adjustments are made to the proposed construction activities, often by phasing the project, and/or to airport operations in order to maintain operational safety. This planning effort will ultimately result in a project Construction Safety and Phasing Plan (CSPP). The development of the CSPP takes place through the following five steps:

a. Identify Affected Areas. The airport operator must determine the geographic areas on the airport affected by the construction project. Some, such as a runway extension, will be defined by the project. Others may be variable, such as the location of haul routes and material stockpiles.

b. Describe Current Operations. Identify the normal airport operations in each affected area for each phase of the project. This becomes the baseline from which the impact on operations by construction activities can be measured. This should include a narrative of the typical users and aircraft operating within the affected areas. It should also include information related to airport operations: the Aircraft Reference Code (ACRC) for each runway; Airplane Design Group (ADG) and Taxiway Design Group (TDG)[1] for each affected taxiway; designated approach visibility minimums; available approach and departure procedures; most demanding aircraft; declared distances; available air traffic control services; airport Surface Movement Guidance and Control System plan; and others. The applicable seasons, days and times for certain operations should also be identified as applicable.

c. Allow for Temporary Changes to Operations. To the extent practical, current airport operations should be maintained during the construction. In consultation with airport users, Aircraft Rescue and Fire Fighting (ARFF) personnel, and FAA Air Traffic Organization (ATO) personnel, the airport operator should identify and prioritize the airport's most important operations. The construction activities should be planned, through project phasing if necessary, to safely accommodate these operations. When the construction activities cannot be adjusted to safely maintain current operations, regardless of their importance, then the operations must be revised accordingly. Allowable changes include temporary revisions to approach procedures, restricting certain aircraft to specific runways and taxiways, suspension of certain operations, decreased weights for some aircraft due to shortened runways,

[1] Taxiway Design Group will be introduced in AC 150/5300-13A.

and other changes. An example of a table showing temporary operations versus current operations is shown in Table 3-1 Sample Operations Effects.

d. Take Required Measures to Revised Operations. Once the level and type of aircraft operations to be maintained are identified, the airport operator must determine the measures required to safely conduct the planned operations during the construction. These measures will result in associated costs, which can be broadly interpreted to include not only direct construction costs, but also loss of revenue from impacted operations. Analysis of costs may indicate a need to reevaluate allowable changes to operations. As aircraft operations and allowable changes will vary so widely among airports, this AC presents general guidance on those subjects.

e. Manage Safety Risk. Certain airport projects may require the airport operator to provide a Project Proposal Summary to help the FAA to determine the appropriate level of Safety Risk Management (SRM) documentation. The airport operator must coordinate with the appropriate FAA Airports Regional or District Office early in the development of the CSPP to determine the need for SRM documentation. See FAA Order 5200.11, FAA Airports (ARP) Safety Management System (SMS), for more information. If the FAA requires SRM documentation, the airport operator must at a minimum:

(1) Notify the appropriate FAA Airports Regional or District Office during the project "scope development" phase of any project requiring a CSPP.

(2) Provide documents identified by the FAA as necessary to conduct SRM.

(3) Participate in the SRM process for airport projects.

(4) Provide a representative to participate on the SRM panel.

(5) Ensure that all applicable SRM identified risks elements are recorded and mitigated within the CSPP.

103. Develop a Construction Safety and Phasing Plan (CSPP). Development of an effective CSPP will require familiarity with many other documents referenced throughout this AC. See Appendix 1, Related Reading Material for a list of related reading material.

a. List Requirements. A CSPP must be developed for each on-airfield construction project funded by the Airport Improvement Program (AIP) or the Passenger Facility Charge (PFC) program or located on an airport certificated under Part 139. As per Order 5200.11, such projects do not include construction, rehabilitation, or change of any facility that is entirely outside the air operations area, does not involve any expansion of the facility envelope and does not involve construction equipment, haul routes or placement of material in locations that require access to the air operations area, increase the facility envelope, or impact line-of-sight. Such facilities may include passenger terminals and parking or other structures. However, extraordinary circumstances may trigger the need for a Safety Assessment and a CSPP. The CSPP is subject to subsequent review and approval under the FAA's Safety Risk Management procedures (see paragraph 102.e above). Additional information may be found in Order 5200.11.

b. Prepare a Safety Plan Compliance Document. The Safety Plan Compliance Document (SPCD) details how the contractor will comply with the CSPP. Also, it will not be possible to determine all safety plan details (for example specific hazard equipment and lighting, contractor's points of contact, construction equipment heights) during the development of the CSPP. The successful contractor must define such details by preparing an SPCD that the airport operator reviews for approval prior to issuance of a notice-to-proceed. The SPCD is a subset of the CSPP, similar to how a shop drawing review is a subset to the technical specifications.

c. Assume Responsibility for the CSPP. The airport operator is responsible for establishing and enforcing the CSPP. The airport operator may use the services of an engineering consultant to help develop the CSPP. However, writing the CSPP cannot be delegated to the construction contractor. Only those details the airport operator determines cannot be addressed before contract award are developed by the contractor and submitted for approval as the SPCD. The SPCD does not restate nor propose differences to provisions already addressed in the CSPP.

104. Who Is Responsible for Safety During Construction?

a. Establish a Safety Culture. Everyone has a role in operational safety on airports during construction: the airport operator, the airport's consultants, the construction contractor and subcontractors, airport users, airport tenants, ARFF personnel, Air Traffic personnel, including Technical Operations personnel, FAA Airports Division personnel, and others. Close communication and coordination between all affected parties is the key to maintaining safe operations. Such communication and coordination should start at the project scoping meeting and continue through the completion of the project. The airport operator and contractor should conduct onsite safety inspections throughout the project and immediately remedy any deficiencies, whether caused by negligence, oversight, or project scope change.

b. Assess Airport Operator's Responsibilities. An airport operator has overall responsibility for all activities on an airport, including construction. This includes the predesign, design, preconstruction, construction, and inspection phases. Additional information on the responsibilities listed below can be found throughout this AC. The airport operator must:

(1) Develop a CSPP that complies with the safety guidelines of Chapter 2, Construction Safety and Phasing Plans, and Chapter 3, Guidelines for Writing a CSPP. The airport operator may develop the CSPP internally or have a consultant develop the CSPP for approval by the airport operator. For tenant sponsored projects, approve a CSPP developed by the tenant or its consultant.

(2) Require, review and approve the SPCD by the contractor that indicates how it will comply with the CSPP and provides details that cannot be determined before contract award.

(3) Convene a preconstruction meeting with the construction contractor, consultant, airport employees and, if appropriate, tenant sponsor and other tenants to review and discuss project safety before beginning construction activity. The appropriate FAA representatives should be invited to attend the meeting. See AC 150/5300-9, *Predesign, Prebid, and Preconstruction Conferences for Airport Grant Projects.* (Note "FAA" refers to the Airports Regional or District Office, the Air Traffic Organization, Flight Standards Service, and other offices that support airport operations, flight regulations, and construction/environmental policies.)

(4) Ensure contact information is accurate for each representative/point of contact identified in the CSPP and SPCD.

(5) Hold weekly or, if necessary, daily safety meetings with all affected parties to coordinate activities.

(6) Notify users, ARFF personnel, and FAA ATO personnel of construction and conditions that may adversely affect the operational safety of the airport via Notices to Airmen (NOTAM) and other methods, as appropriate. Convene a meeting for review and discussion if necessary.

(7) Ensure construction personnel know of any applicable airport procedures and of changes to those procedures that may affect their work.

(8) Ensure construction contractors and subcontractors undergo training required by the CSPP and SPCD.

(9) Ensure vehicle and pedestrian operations addressed in the CSPP and SPCD are coordinated with airport tenants, the airport traffic control tower (ATCT), and construction contractors.

(10) At certificated airports, ensure each CSPP and SPCD is consistent with Part 139.

(11) Conduct inspections sufficiently frequently to ensure construction contractors and tenants comply with the CSPP and SPCD and that there are no altered construction activities that could create potential safety hazards.

(12) Resolve safety deficiencies immediately. At airports subject to 49 CFR Part 1542, Airport Security, ensure construction access complies with the security requirements of that regulation.

(13) Notify appropriate parties when conditions exist that invoke provisions of the CSPP and SPCD (for example, implementation of low-visibility operations).

(14) Ensure prompt submittal of a Notice of Proposed Construction or Alteration (Form 7460-1) for conducting an aeronautical study of potential obstructions such as tall equipment (cranes, concrete pumps, other.), stock piles, and haul routes. A separate form may be filed for each potential obstruction, or one form may be filed describing the entire construction area and maximum equipment height. In the latter case, a separate form must be filed for any object beyond or higher than the originally evaluated area/height. The FAA encourages online submittal of forms for expediency. The appropriate FAA Airports Regional or District Office can provide assistance in determining which objects require an aeronautical study.

(15) Promptly notify the FAA Airports Regional or District Office of any proposed changes to the CSPP prior to implementation of the change. Changes to the CSPP require review and approval by the airport operator and the FAA. Coordinate with appropriate local and other federal government agencies, such as EPA, OSHA, TSA, and the state environmental agency.

c. Define Construction Contractor's Responsibilities. The contractor is responsible for complying with the CSPP and SPCD. The contractor must:

(1) Submit a Safety Plan Compliance Document (SPCD) to the airport operator describing how it will comply with the requirements of the CSPP and supplying any details that could not be determined before contract award. The SPCD must include a certification statement by the contractor that indicates it understands the operational safety requirements of the CSPP and it asserts it will not deviate from the approved CSPP and SPCD unless written approval is granted by the airport operator. Any construction practice proposed by the contractor that does not conform to the CSPP and SPCD may impact the airport's operational safety and will require a revision to the CSPP and SPCD and re-coordination with the airport operator and the FAA in advance.

(2) Have available at all times copies of the CSPP and SPCD for reference by the airport operator and its representatives, and by subcontractors and contractor employees.

(3) Ensure that construction personnel are familiar with safety procedures and regulations on the airport. Provide a point of contact who will coordinate an immediate response to correct any construction-related activity that may adversely affect the operational safety of the airport. Many projects will require 24-hour coverage.

(4) Identify in the SPCD the contractor's on-site employees responsible for monitoring compliance with the CSPP and SPCD during construction. At least one of these employees must be on-site whenever active construction is taking place.

(5) Conduct inspections sufficiently frequently to ensure construction personnel comply with the CSPP and SPCD and that there are no altered construction activities that could create potential safety hazards.

(6) Restrict movement of construction vehicles and personnel to permitted construction areas by flagging, barricading, erecting temporary fencing, or providing escorts, as appropriate and as specified in the CSPP and SPCD.

(7) Ensure that no contractor employees, employees of subcontractors or suppliers, or other persons enter any part of the air operations area (AOA) from the construction site unless authorized.

(8) Ensure prompt submittal through the airport operator of Form 7460-1 for the purpose of conducting an aeronautical study of contractor equipment such as tall equipment (cranes, concrete pumps, other equipment), stock piles, and haul routes when different from cases previously filed by the airport operator. The FAA encourages online submittal of forms for expediency.

d. Define Tenant's Responsibilities if planning construction activities on leased property. Airport tenants, such as airline operators, fixed base operators, and FAA ATO/Technical Operations sponsoring construction must:

(1) Develop, or have a consultant develop, a project specific CSPP and submit it to the airport operator for certification and subsequent approval by the FAA. The approved CSPP must be made part of any contract awarded by the tenant for construction work.

(2) In coordination with its contractor, develop an SPCD and submit it to the airport operator for approval to be issued prior to issuance of a Notice to Proceed.

(3) Ensure that construction personnel are familiar with safety procedures and regulations on the airport.

(4) Provide a point of contact of who will coordinate an immediate response to correct any construction-related activity that may adversely affect the operational safety of the airport.

(5) Identify in the SPCD the contractor's on-site employees responsible for monitoring compliance with the CSPP and SPCD during construction. At least one of these employees must be on-site whenever active construction is taking place.

(6) Ensure that no tenant or contractor employees, employees of subcontractors or suppliers, or any other persons enter any part of the AOA from the construction site unless authorized.

(7) Restrict movement of construction vehicles to construction areas by flagging and barricading, erecting temporary fencing, or providing escorts, as appropriate, and as specified in the CSPP and SPCD.

(8) Ensure prompt submittal through the airport operator of Form 7460-1 for the purpose of conducting an aeronautical study of contractor equipment such as tall equipment (cranes, concrete pumps, other.), stock piles, and haul routes. The FAA encourages online submittal of forms for expediency.

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Chapter 2. Construction Safety and Phasing Plans

Section 1. Basic Considerations

201. Overview. Aviation safety is the primary consideration at airports, especially during construction. The airport operator's Construction Safety and Phasing Plan (CSPP) and the contractor's Safety Plan Compliance Document (SPCD) are the primary tools to ensure safety compliance when coordinating construction activities with airport operations. These documents identify all aspects of the construction project that pose a potential safety hazard to airport operations and outline respective mitigation procedures for each hazard. They must provide all information necessary for the Airport Operations department to conduct airfield inspections and expeditiously identify and correct unsafe conditions during construction. All aviation safety provisions included within the project drawings, contract specifications, and other related documents must also be reflected in the CSPP and SPCD.

202. Assume Responsibility. Operational safety on the airport remains the airport operator's responsibility at all times. The airport operator must develop, certify, and submit for FAA approval each CSPP. It is the airport operator's responsibility to apply the requirements of the FAA approved CSPP. The airport operator must revise the CSPP when conditions warrant changes and must submit the revised CSPP to the FAA for approval. The airport operator must also require and approve a SPCD from the project contractor.

203. Submit the CSPP. Construction Safety and Phasing Plans should be developed concurrently with the project design. Milestone versions of the CSPP should be submitted for review and approval as follows. While these milestones are not mandatory, early submission will help to avoid delays. Submittals are preferred in 8.5 x 11 in or 11 x 17 in format for compatibility with the FAA's Obstruction Evaluation / Airport Airspace Analysis (OE / AAA) process.

a. Submit an Outline/Draft. By the time approximately 25% to 30% of the project design is completed, the principal elements of the CSPP should be established. Airport operators are encouraged to submit an outline or draft, detailing all CSPP provisions developed to date, to the FAA for review at this stage of the project design.

b. Submit a Construction Safety and Phasing Plan (CSPP). The CSPP should be formally submitted for FAA approval when the project design is 80% to 90% complete. Since provisions in the CSPP will influence contract costs, it is important to obtain FAA approval in time to include all such provisions in the procurement contract.

c. Submit a Safety Plan Compliance Document (SPCD). The contractor should submit the SPCD to the airport operator for approval to be issued prior to the Notice to Proceed.

d. Submit CSPP Revisions. All revisions to the CSPP or SPCD should be submitted to the FAA for approval as soon as required changes are identified.

204. Meet CSPP Requirements.

a. To the extent possible, the CSPP should address the following as outlined in Section 2, Plan Requirements and Chapter 3, Guidelines for Writing a CSPP, as appropriate. Details that cannot be determined at this stage are to be included in the SPCD.

(1) Coordination.

(a) Contractor progress meetings.

(b) Scope or schedule changes.

(c) FAA ATO coordination.

(2) Phasing.

(a) Phase elements.

(b) Construction safety drawings

(3) Areas and operations affected by the construction activity.

(a) Identification of affected areas.

(b) Mitigation of effects.

(4) Protection of navigation aids (NAVAIDs).

(5) Contractor access.

(a) Location of stockpiled construction materials.

(b) Vehicle and pedestrian operations.

(6) Wildlife management.

(a) Trash.

(b) Standing water.

(c) Tall grass and seeds.

(d) Poorly maintained fencing and gates.

(e) Disruption of existing wildlife habitat.

(7) Foreign Object Debris (FOD) management.

(8) Hazardous materials (HAZMAT) management

(9) Notification of construction activities.

(a) Maintenance of a list of responsible representatives/ points of contact.

(b) Notices to Airmen (NOTAM).

(c) Emergency notification procedures.

(d) Coordination with ARFF Personnel.

(e) Notification to the FAA.

(10) Inspection requirements.

(a) Daily (or more frequent) inspections.

(b) Final inspections.

(11) Underground utilities.

(12) Penalties.

(13) Special conditions.

(14) Runway and taxiway visual aids. Marking, lighting, signs, and visual NAVAIDs.

(a) General.

(b) Markings.

(c) Lighting and visual NAVAIDs.

(d) Signs.

(15) Marking and signs for access routes.

(16) Hazard marking and lighting.

(a) Purpose.

(b) Equipment.

(17) Protection. Of runway and taxiway safety areas, object free areas, obstacle free zones, and approach/departure surfaces

(a) Runway Safety Area (RSA).

(b) Runway Object Free Area (ROFA).

(c) Taxiway Safety Area (TSA).

(d) Taxiway Object Free Area (TOFA).

(e) Obstacle Free Zone (OFZ).

(f) Runway approach/departure surfaces.

(18) Other limitations on construction.

(a) Prohibitions.

(b) Restrictions.

b. The Safety Plan Compliance Document (SPCD) should include a general statement by the construction contractor that he/she has read and will abide by the CSPP. In addition, the SPCD must include all supplemental information that could not be included in the CSPP prior to the contract award. The contractor statement should include the name of the contractor, the title of the project CSPP, the approval date of the CSPP, and a reference to any supplemental information (that is, "I , Name of Contractor , have read the Title of Project CSPP, approved on Date , and will abide by it as written and with the following additions as noted:"). The supplemental information in the SPCD should be written to match the format of the CSPP indicating each subject by corresponding CSPP subject number and title. If no supplemental information is necessary for any specific subject, the statement, "No supplemental information," should be written after the corresponding subject title. The SPCD should not duplicate information in the CSPP:

(1) Coordination. Discuss details of proposed safety meetings with the airport operator and with contractor employees and subcontractors.

(2) Phasing. Discuss proposed construction schedule elements, including:

(a) Duration of each phase.

(b) Daily start and finish of construction, including "night only" construction.

(c) Duration of construction activities during:

(i) Normal runway operations.

(ii) Closed runway operations.

(iii) Modified runway "Aircraft Reference Code" usage.

(3) Areas and operations affected by the construction activity. These areas and operations should be identified in the CSPP and should not require an entry in the SPCD.

(4) Protection of NAVAIDs. Discuss specific methods proposed to protect operating NAVAIDs.

(5) Contractor access. Provide the following:

(a) Details on how the contractor will maintain the integrity of the airport security fence (gate guards, daily log of construction personnel, and other).

(b) Listing of individuals requiring driver training (for certificated airports and as requested).

(c) Radio communications.

(i) Types of radios and backup capabilities.

(ii) Who will be monitoring radios.

(iii) Whom to contact if the ATCT cannot reach the contractor's designated person by radio.

(d) Details on how the contractor will escort material delivery vehicles.

(6) Wildlife management. Discuss the following:

(a) Methods and procedures to prevent wildlife attraction.

(b) Wildlife reporting procedures.

(7) Foreign Object Debris (FOD) management. Discuss equipment and methods for control of FOD, including construction debris and dust.

(8) Hazardous material (HAZMAT) management. Discuss equipment and methods for responding to hazardous spills.

(9) Notification of construction activities. Provide the following:

(a) Contractor points of contact.

(b) Contractor emergency contact.

(c) Listing of tall or other requested equipment proposed for use on the airport and the timeframe for submitting 7460-1 forms not previously submitted by the airport operator.

(d) Batch plant details, including 7460-1 submittal.

(10) Inspection requirements. Discuss daily (or more frequent) inspections and special inspection procedures.

(11) Underground utilities. Discuss proposed methods of identifying and protecting underground utilities.

(12) Penalties. Penalties should be identified in the CSPP and should not require an entry in the SPCD.

(13) Special conditions. Discuss proposed actions for each special condition identified in the CSPP.

(14) Runway and taxiway visual aids. Including marking, lighting, signs, and visual NAVAIDs. Discuss proposed visual aids including the following:

(a) Equipment and methods for covering signage and airfield lights.

(b) Equipment and methods for temporary closure markings (paint, fabric, other).

(c) Types of temporary Visual Guidance Slope Indicators (VGSI).

(15) Marking and signs for access routes. Discuss proposed methods of demarcating access routes for vehicle drivers.

(16) Hazard marking and lighting. Discuss proposed equipment and methods for identifying excavation areas.

(17) Protection of runway and taxiway safety areas. including object free areas, obstacle free zones, and approach/departure surfaces. Discuss proposed methods of identifying, demarcating, and protecting airport surfaces including:

(a) Equipment and methods for maintaining Taxiway Safety Area standards.

(b) Equipment and methods for separation of construction operations from aircraft operations, including details of barricades.

(18) Other limitations on construction should be identified in the CSPP and should not require an entry in the SPCD.

Section 2. Plan Requirements

205. Coordination. Airport operators, or tenants conducting construction on their leased properties, should use predesign, prebid, and preconstruction conferences to introduce the subject of airport operational safety during construction (see AC 150/5300-9). In addition, the following should be coordinated as required:

a. Contractor Progress Meetings. Operational safety should be a standing agenda item for discussion during progress meetings throughout the project.

b. Scope or Schedule Changes. Changes in the scope or duration of the project may necessitate revisions to the CSPP and review and approval by the airport operator and the FAA.

c. FAA ATO Coordination. Early coordination with FAA ATO is required to schedule airway facility shutdowns and restarts. Relocation or adjustments to NAVAIDs, or changes to final grades in critical areas, may require an FAA flight inspection prior to restarting the facility. Flight inspections must be coordinated and scheduled well in advance of the intended facility restart. Flight inspections may require a reimbursable agreement between the airport operator and FAA ATO. Reimbursable agreements should be coordinated a minimum of 12 months prior to the start of construction. (See 213.e(3)(b) for required FAA notification regarding FAA owned NAVAIDs.)

206. Phasing. Once it has been determined what types and levels of airport operations will be maintained, the most efficient sequence of construction may not be feasible. In such a case, the sequence of construction may be phased to gain maximum efficiency while allowing for the required operations. The development of the resulting construction phases should be coordinated with local Air Traffic personnel and airport users. The sequenced construction phases established in the CSPP must be incorporated into the project design and must be reflected in the contract drawings and specifications.

a. Phase Elements. For each phase the CSPP should detail:

- Areas closed to aircraft operations

- Duration of closures
- Taxi routes
- ARFF access routes
- Construction staging areas
- Construction access and haul routes
- Impacts to NAVAIDs
- Lighting and marking changes
- Available runway length
- Declared distances (if applicable)
- Required hazard marking and lighting
- Lead times for required notifications

b. Construction Safety Drawings. Drawings specifically indicating operational safety procedures and methods in affected areas (that is, construction safety drawings) should be developed for each construction phase. Such drawings should be included in the CSPP as referenced attachments and should likewise be included in the contract drawing package.

207. Areas and Operations Affected by Construction Activity. Runways and taxiways should remain in use by aircraft to the maximum extent possible without compromising safety. Pre-meetings with the FAA Air Traffic Organization (ATO) will support operational simulations. See Chapter 3 for an example of a table showing temporary operations versus current operations.

a. Identification of Affected Areas. Identifying areas and operations affected by the construction will help to determine possible safety problems. The affected areas should be indentified in the construction safety drawings for each construction phase. (See 206.b above.) Of particular concern are:

(1) Closing, or partial closing, of runways, taxiways and aprons. When a runway is partially closed, a portion of the pavement is unavailable for any aircraft operation, meaning taxiing, landing, or taking off in either direction on that pavement is prohibited. A displaced threshold, by contrast, is established to ensure obstacle clearance and adequate safety area for landing aircraft. The pavement prior to the displaced threshold is available for take-off in the direction of the displacement and for landing and taking off in the opposite direction. Misunderstanding this difference, and issuance of a subsequently inaccurate NOTAM, can lead to a hazardous condition.

(2) Closing of Aircraft Rescue and Fire Fighting access routes.

(3) Closing of access routes used by airport and airline support vehicles.

(4) Interruption of utilities, including water supplies for fire fighting.

(5) Approach/departure surfaces affected by heights of objects.

(6) Construction areas, storage areas, and access routes near runways, taxiways, aprons, or helipads.

b. Mitigation of Effects. Establishment of specific procedures is necessary to maintain the safety and efficiency of airport operations. The CSPP must address:

(1) Temporary changes to runway and/or taxi operations.

(2) Detours for ARFF and other airport vehicles.

(3) Maintenance of essential utilities.

(4) Temporary changes to air traffic control procedures. Such changes must be coordinated with the ATO.

208. Navigation Aid (NAVAID) Protection. Before commencing construction activity, parking vehicles, or storing construction equipment and materials near a NAVAID, coordinate with the appropriate FAA ATO/Technical Operations office to evaluate the effect of construction activity and the required distance and direction from the NAVAID. (See paragraph 213.e(3) below.) Construction activities, materials/equipment storage, and vehicle parking near electronic NAVAIDs require special consideration since they may interfere with signals essential to air navigation. If any NAVAID may be affected, the CSPP and SPCD must show an understanding of the "critical area" associated with each NAVAID and describe how it will be protected. Where applicable, the operational critical areas of NAVAIDs should be graphically delineated on the project drawings. Pay particular attention to stockpiling material, as well as to movement and parking of equipment that may interfere with line of sight from the ATCT or with electronic emissions. Interference from construction equipment and activities may require NAVAID shutdown or adjustment of instrument approach minimums for low visibility operations. This condition requires that a NOTAM be filed (see paragraph 213.b below). Construction activities and materials/equipment storage near a NAVAID must not obstruct access to the equipment and instruments for maintenance. Submittal of a 7460-1 form is required for construction vehicles operating near FAA NAVAIDs. (See paragraph 213.e(1) below.)

209. Contractor Access. The CSPP must detail the areas to which the contractor must have access, and explain how contractor personnel will access those areas. Specifically address:

a. Location of Stockpiled Construction Materials. Stockpiled materials and equipment storage are not permitted within the RSA and OFZ, and if possible should not be permitted within the Object Free Area (OFA) of an operational runway. Stockpiling material in the OFA requires submittal of a 7460-1 form and justification provided to the appropriate FAA Airports Regional or District Office for approval. The airport operator must ensure that stockpiled materials and equipment adjacent to these areas are prominently marked and lighted during hours of restricted visibility or darkness. (See paragraph 218.b below.) This includes determining and verifying that materials are stabilized and stored at an approved location so as not to be a hazard to aircraft operations and to prevent attraction of wildlife and foreign object damage. See paragraphs 210 and 211 below.

b. Vehicle and Pedestrian Operations. The CSPP should include specific vehicle and pedestrian requirements. Vehicle and pedestrian access routes for airport construction projects must be controlled to prevent inadvertent or unauthorized entry of persons, vehicles, or animals onto the AOA. The airport operator should coordinate requirements for vehicle operations with airport tenants, contractors, and the FAA air traffic manager. In regard to vehicle and pedestrian operations, the CSPP should include the following, and detail associated training requirements:

(1) Construction site parking. Designate in advance vehicle parking areas for contractor employees to prevent any unauthorized entry of persons or vehicles onto the AOA. These areas should provide reasonable contractor employee access to the job site.

(2) Construction equipment parking. Contractor employees must park and service all construction vehicles in an area designated by the airport operator outside the OFZ and never in the safety area of an active runway or taxiway. Unless a complex setup procedure makes movement of specialized equipment infeasible, inactive equipment must not be parked on a closed taxiway or runway. If it is necessary to leave specialized equipment on a closed taxiway or runway at night, the equipment must be well lighted. Employees should also park construction vehicles outside the OFA when not in use by

construction personnel (for example, overnight, on weekends, or during other periods when construction is not active). Parking areas must not obstruct the clear line of sight by the ATCT to any taxiways or runways under air traffic control nor obstruct any runway visual aids, signs, or navigation aids. The FAA must also study those areas to determine effects on airport design criteria, surfaces established by 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace (Part 77), and on NAVAIDs and Instrument Approach Procedures (IAP). See paragraph 213.e(1) below for further information.

(3) Access and haul roads. Determine the construction contractor's access to the construction sites and haul roads. Do not permit the construction contractor to use any access or haul roads other than those approved. Access routes used by contractor vehicles must be clearly marked to prevent inadvertent entry to areas open to airport operations. Pay special attention to ensure that if construction traffic is to share or cross any ARFF routes that ARFF right of way is not impeded at any time, and that construction traffic on haul roads does not interfere with NAVAIDs or approach surfaces of operational runways.

(4) Marking and lighting of vehicles in accordance with AC 150/5210-5, Painting, Marking, and Lighting of Vehicles Used on an Airport.

(5) Description of proper vehicle operations on various areas under normal, lost communications, and emergency conditions.

(6) Required escorts.

(7) Training requirements for vehicle drivers to ensure compliance with the airport operator's vehicle rules and regulations. Specific training should be provided to those vehicle operators providing escorts. See AC 150/5210-20, Ground Vehicle Operations on Airports, for information on training and records maintenance requirements.

(8) Situational awareness. Vehicle drivers must confirm by personal observation that no aircraft is approaching their position (either in the air or on the ground) when given clearance to cross a runway, taxiway, or any other area open to airport operations. In addition, it is the responsibility of the escort vehicle driver to verify the movement/position of all escorted vehicles at any given time.

(9) Two-way radio communication procedures.

(a) General. The airport operator must ensure that tenant and construction contractor personnel engaged in activities involving unescorted operation on aircraft movement areas observe the proper procedures for communications, including using appropriate radio frequencies at airports with and without ATCT. When operating vehicles on or near open runways or taxiways, construction personnel must understand the critical importance of maintaining radio contact, as directed by the airport operator, with:

(i) Airport operations

(ii) ATCT

(iii) Common Traffic Advisory Frequency (CTAF), which may include UNICOM, MULTICOM.

(iv) Automatic Terminal Information Service (ATIS). This frequency is useful for monitoring conditions on the airport. Local air traffic will broadcast information regarding construction related runway closures and "shortened" runways on the ATIS frequency.

(b) Areas requiring two-way radio communication with the ATCT. Vehicular traffic crossing active movement areas must be controlled either by two-way radio with the ATCT, escort, flagman, signal light, or other means appropriate for the particular airport.

(c) Frequencies to be used. The airport operator will specify the frequencies to be used by the contractor, which may include the CTAF for monitoring of aircraft operations. Frequencies may also be assigned by the airport operator for other communications, including any radio frequency in compliance with Federal Communications Commission requirements. At airports with an ATCT, the airport operator will specify the frequency assigned by the ATCT to be used between contractor vehicles and the ATCT.

(d) Proper radio usage, including read back requirements.

(e) Proper phraseology, including the International Phonetic Alphabet.

(f) Light gun signals. Even though radio communication is maintained, escort vehicle drivers must also familiarize themselves with ATCT light gun signals in the event of radio failure. See the FAA safety placard "Ground Vehicle Guide to Airport Signs and Markings." This safety placard may be downloaded through the Runway Safety Program Web site at http://www.faa.gov/airports/runway_safety/publications/ (See "Signs & Markings Vehicle Dashboard Sticker".) or obtained from the FAA Airports Regional Office.

(10) Maintenance of the secured area of the airport, including:

(a) Fencing and gates. Airport operators and contractors must take care to maintain security during construction when access points are created in the security fencing to permit the passage of construction vehicles or personnel. Temporary gates should be equipped so they can be securely closed and locked to prevent access by animals and unauthorized people. Procedures should be in place to ensure that only authorized persons and vehicles have access to the AOA and to prohibit "piggybacking" behind another person or vehicle. The Department of Transportation (DOT) document DOT/FAA/AR-00/52, Recommended Security Guidelines for Airport Planning and Construction, provides more specific information on fencing. A copy of this document can be obtained from the Airport Consultants Council, Airports Council International, or American Association of Airport Executives.

(b) Badging requirements.

(c) Airports subject to 49 CFR Part 1542, Airport Security, must meet standards for access control, movement of ground vehicles, and identification of construction contractor and tenant personnel.

210. Wildlife Management. The CSPP and SPCD must be in accordance with the airport operator's wildlife hazard management plan, if applicable. See also AC 150/5200-33, Hazardous Wildlife Attractants On or Near Airports, and Certalert 98-05, Grasses Attractive to Hazardous Wildlife. Construction contractors must carefully control and continuously remove waste or loose materials that might attract wildlife. Contractor personnel must be aware of and avoid construction activities that can create wildlife hazards on airports, such as:

a. Trash. Food scraps must be collected from construction personnel activity.

b. Standing Water.

c. Tall Grass and Seeds. Requirements for turf establishment can be at odds with requirements for wildlife control. Grass seed is attractive to birds. Lower quality seed mixtures can contain seeds of plants (such as clover) that attract larger wildlife. Seeding should comply with the guidance in AC 150/5370-10, Standards for Specifying Construction of Airports, Item T-901, Seeding. Contact the local office of the United Sates Department of Agriculture Soil Conservation Service or the State University Agricultural Extension Service (County Agent or equivalent) for assistance and recommendations. These agencies can also provide liming and fertilizer recommendations.

d. Poorly Maintained Fencing and Gates. See 209.b(10)(a) above.

e. Disruption of Existing Wildlife Habitat. While this will frequently be unavoidable due to the nature of the project, the CSPP should specify under what circumstances (location, wildlife type) contractor personnel should immediately notify the airport operator of wildlife sightings.

211. Foreign Object Debris (FOD) Management. Waste and loose materials, commonly referred to as FOD, are capable of causing damage to aircraft landing gears, propellers, and jet engines. Construction contractors must not leave or place FOD on or near active aircraft movement areas. Materials capable of creating FOD must be continuously removed during the construction project. Fencing (other than security fencing) may be necessary to contain material that can be carried by wind into areas where aircraft operate. See AC 150/5210-24, Foreign Object Debris (FOD) Management.

212. Hazardous Materials (HAZMAT) Management. Contractors operating construction vehicles and equipment on the airport must be prepared to expeditiously contain and clean-up spills resulting from fuel or hydraulic fluid leaks. Transport and handling of other hazardous materials on an airport also requires special procedures. See AC 150/5320-15, Management of Airport Industrial Waste.

213. Notification of Construction Activities. The CSPP and SPCD must detail procedures for the immediate notification of airport users and the FAA of any conditions adversely affecting the operational safety of the airport. It must address the notification actions described below, as applicable.

a. List of Responsible Representatives/ points of contact for all involved parties, and procedures for contacting each of them, including after hours.

b. NOTAMs. Only the airport operator may initiate or cancel NOTAMs on airport conditions, and is the only entity that can close or open a runway. The airport operator must coordinate the issuance, maintenance, and cancellation of NOTAMs about airport conditions resulting from construction activities with tenants and the local air traffic facility (control tower, approach control, or air traffic control center), and must provide information on closed or hazardous conditions on airport movement areas to the FAA Flight Service Station (FSS) so it can issue a NOTAM. The airport operator must file and maintain a list of authorized representatives with the FSS. Refer to AC 150/5200-28, Notices to Airmen (NOTAMs) for Airport Operators, for a sample NOTAM form. Only the FAA may issue or cancel NOTAMs on shutdown or irregular operation of FAA owned facilities. Any person having reason to believe that a NOTAM is missing, incomplete, or inaccurate must notify the airport operator. See paragraph 207.a(1) above regarding issuing NOTAMs for partially closed runways versus runways with displaced thresholds.

c. Emergency notification procedures for medical, fire fighting, and police response.

d. Coordination with ARFF. The CSPP must detail procedures for coordinating through the airport sponsor with ARFF personnel, mutual aid providers, and other emergency services if construction requires:

- The deactivation and subsequent reactivation of water lines or fire hydrants, or
- The rerouting, blocking and restoration of emergency access routes, or
- The use of hazardous materials on the airfield.

e. Notification to the FAA.

(1) Part 77. Any person proposing construction or alteration of objects that affect navigable airspace, as defined in Part 77, must notify the FAA. This includes construction equipment and proposed

parking areas for this equipment (i.e. cranes, graders, other equipment) on airports. FAA Form 7460-1, Notice of Proposed Construction or Alteration, can be used for this purpose and submitted to the appropriate FAA Airports Regional or District Office. See Appendix 1, Related Reading Material, to download the form. Further guidance is available on the FAA web site at oeaaa.faa.gov.

(2) Part 157. With some exceptions, Title 14 CFR Part 157, Notice of Construction, Alteration, Activation, and Deactivation of Airports, requires that the airport operator notify the FAA in writing whenever a non-Federally funded project involves the construction of a new airport; the construction, realigning, altering, activating, or abandoning of a runway, landing strip, or associated taxiway; or the deactivation or abandoning of an entire airport. Notification involves submitting FAA Form 7480-1, Notice of Landing Area Proposal, to the nearest FAA Airports Regional or District Office. See Appendix 1, Related Reading Material to download the form.

(3) NAVAIDS. For emergency (short-notice) notification about impacts to both airport owned and FAA owned NAVAIDs, contact: 866-432-2622.

(a) Airport owned/FAA maintained. If construction operations require a shutdown of more than 24 hours, or more than 4 hours daily on consecutive days, of a NAVAID owned by the airport but maintained by the FAA, provide a 45-day minimum notice to FAA ATO/Technical Operations prior to facility shutdown.

(b) FAA owned.

(i) General. The airport operator must notify the appropriate FAA ATO Service Area Planning and Requirements (P&R) Group a minimum of 45 days prior to implementing an event that causes impacts to NAVAIDs. (Impacts to FAA equipment covered by a Reimbursable Agreement (RA) do not have to be reported by the airport operator.)

(ii) Coordinate work for an FAA owned NAVAID shutdown with the local FAA ATO/Technical Operations office, including any necessary reimbursable agreements and flight checks. Detail procedures that address unanticipated utility outages and cable cuts that could impact FAA NAVAIDs. In addition, provide seven days notice to schedule the actual shutdown.

214. Inspection Requirements.

a. Daily Inspections. Inspections should be conducted at least daily, but more frequently if necessary to ensure conformance with the CSPP. A sample checklist is provided in Appendix 3, Safety and Phasing Plan Checklist. See also AC 150/5200-18, Airport Safety Self-Inspection.

b. Final Inspections. New runways and extended runway closures may require safety inspections at certificated airports prior to allowing air carrier service. Coordinate with the FAA Airport Certification Safety Inspector (ACSI) to determine if a final inspection will be necessary.

215. Underground Utilities. The CSPP and/or SPCD must include procedures for locating and protecting existing underground utilities, cables, wires, pipelines, and other underground facilities in excavation areas. This may involve coordinating with public utilities and FAA ATO/Technical Operations. Note that “One Call” or “Miss Utility” services do not include FAA ATO/Technical Operations

216. Penalties. The CSPP should detail penalty provisions for noncompliance with airport rules and regulations and the safety plans (for example, if a vehicle is involved in a runway incursion). Such penalties typically include rescission of driving privileges or access to the AOA.

217. Special Conditions. The CSPP must detail any special conditions that affect the operation of the

airport and will require the activation of any special procedures (for example, low-visibility operations, snow removal, aircraft in distress, aircraft accident, security breach, Vehicle / Pedestrian Deviation (VPD) and other activities requiring construction suspension/resumption).

218. Runway and Taxiway Visual Aids. Includes marking, lighting, signs, and visual NAVAIDS. The CSPP must ensure that areas where aircraft will be operating are clearly and visibly separated from construction areas, including closed runways. Throughout the duration of the construction project, verify that these areas remain clearly marked and visible at all times and that marking, lighting, signs, and visual NAVAIDs remain in place and operational. The CSPP must address the following, as appropriate:

a. General. Airport markings, lighting, signs, and visual NAVAIDs must be clearly visible to pilots, not misleading, confusing, or deceptive. All must be secured in place to prevent movement by prop wash, jet blast, wing vortices, or other wind currents and constructed of materials that would minimize damage to an aircraft in the event of inadvertent contact.

b. Markings. Markings must be in compliance with the standards of AC 150/5340-1, Standards for Airport Markings. Runways and runway exit taxiways closed to aircraft operations are marked with a yellow X. The preferred visual aid to depict temporary runway closure is the lighted X signal placed on or near the runway designation numbers. (See paragraph 218.b(1)(b) below.)

(1) Closed Runways and Taxiways.

(a) Permanently Closed Runways. For runways, obliterate the threshold marking, runway designation marking, and touchdown zone markings, and place Xs at each end and at 1,000-foot (300 m) intervals.

(b) Temporarily Closed Runways. For runways that have been temporarily closed, place an X at the each end of the runway directly on or as near as practicable to the runway designation numbers. Figure 2-1 illustrates.

Figure 2-1 Markings for a Temporarily Closed Runway

(c) Partially Closed Runways and Displaced Thresholds. When threshold markings are needed to identify the temporary beginning of the runway that is available for landing, the markings must comply with AC 150/5340-1. An X is not used on a partially closed runway or a runway with a displaced threshold. See paragraph 207.a(1) above for the difference between partially closed runways and runways with displaced thresholds.

(i) Partially Closed Runways. Pavement markings for temporary closed portions of the runway consist of a runway threshold bar and yellow chevrons to identify pavement areas that are unsuitable for takeoff or landing (see AC 150/5340-1).

(ii) Displaced Thresholds. Pavement markings for a displaced threshold consist of a runway threshold bar and white arrowheads with and without arrow shafts. These markings are required to identify the portion of the runway before the displaced threshold to provide centerline guidance for pilots during approaches, takeoffs, and landing rollouts from the opposite direction. See AC 150/5340-1.

(d) Taxiways.

(i) Permanently Closed Taxiways. AC 150/5300-13 notes that it is preferable to remove the pavement, but for pavement that is to remain, place an X at the entrance to both ends of the closed section. Obliterate taxiway centerline markings, including runway leadoff lines, leading to the closed taxiway. Figure 2-2 illustrates.

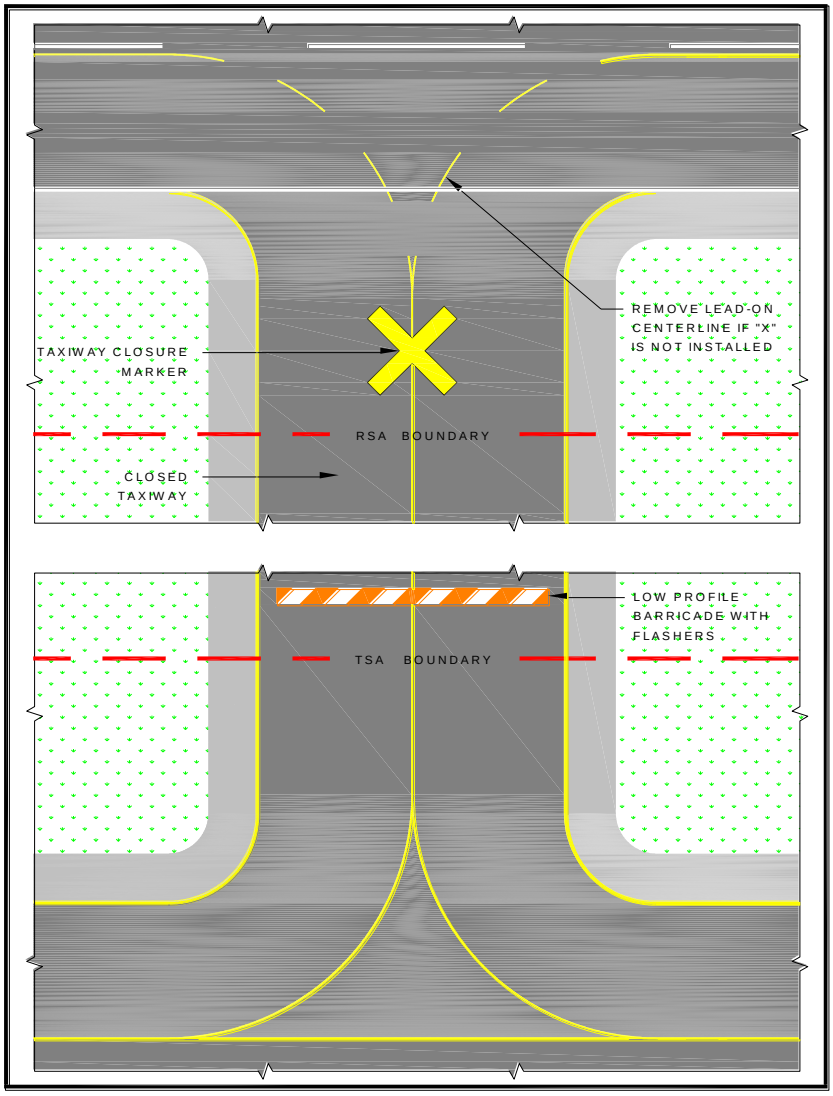

Figure 2-2 Taxiway Closure

(ii) Temporarily Closed Taxiways. Place barricades outside the safety area of intersecting taxiways. For runway/taxiway intersections, place an X at the entrance to the closed taxiway from the runway. If the taxiway will be closed for an extended period, obliterate taxiway centerline markings, including runway leadoff lines, leading to the closed section. If the centerline markings will be reused upon reopening the taxiway, it is preferable to paint over the marking. This will result in less damage to the pavement when the upper layer of paint is ultimately removed.

(e) Temporarily Closed Airport. When the airport is closed temporarily, mark all the runways as closed.

(2) If unable to paint temporary markings on the pavement, construct them from any of the following materials: fabric, colored plastic, painted sheets of plywood, or similar materials. They must be properly configured and appropriately secured to prevent movement by prop wash, jet blast, or other wind currents.

(3) It may be necessary to remove or cover runway markings, including but not limited to, runway designation markings, threshold markings, centerline markings, edge stripes, touchdown zone markings and aiming point markings, depending on the length of construction and type of activity at the airport. When removing runway markings, apply the same treatment to areas between stripes or numbers, as the cleaned area will appear to pilots as a marking in the shape of the treated area.

(4) If it is not possible to install threshold bars, chevrons, and arrows on the pavement, temporary outboard markings may be used. Locate them outside of the runway pavement surface on both sides of the runway. The dimension along the runway direction must be the same as if installed on the pavement. The lateral dimension must be at least one-half that of on-pavement markings. If the markings are not discernible on grass or snow, apply a black background with appropriate material over the ground to ensure they are clearly visible.

(5) The application rate of paint to mark a short-term temporary runway and taxiway markings may deviate from the standard (see Item P-620, "Runway and Taxiway Painting," in AC 150/5370-10), but the dimensions must meet the existing standards.

c. Lighting and Visual NAVAIDs. This paragraph refers to standard runway and taxiway lighting systems. See below for hazard lighting. Lighting must be in conformance with AC 150/5340-30, Design and Installation Details for Airport Visual Aids, and AC 150/5345-50, Specification for Portable Runway and Taxiway Lights. When disconnecting runway and taxiway lighting fixtures, disconnect the associated isolation transformers. Alternately, cover the light fixture in such a way as to prevent light leakage. Avoid removing the lamp from energized fixtures because an excessive number of isolation transformers with open secondaries may damage the regulators and/or increase the current above its normal value. Secure, identify, and place any above ground temporary wiring in conduit to prevent electrocution and fire ignition sources.

(1) Permanently Closed Runways and Taxiways. For runways and taxiways that have been permanently closed, disconnect the lighting circuits.

(2) Temporarily Closed Runways. If available, use a lighted X, both at night and during the day, placed at each end of the runway facing the approach. The use of a lighted X is required if night work requires runway lighting to be on. See AC 150/5345-55, Specification for L-893, Lighted Visual Aid to Indicate Temporary Runway Closure. For runways that have been temporarily closed, but for an extended period, and for those with pilot controlled lighting, disconnect the lighting circuits or secure switches to prevent inadvertent activation. For runways that will be opened periodically, coordinate procedures with the FAA air traffic manager or, at airports without an ATCT, the airport operator. Activate stop bars if available. Figure 2-3 shows a lighted X by day. Figure 2-4 shows a lighted X at night.

Figure 2-3 Lighted X in Daytime

Figure 2-4 Lighted X at Night

(3) Partially Closed Runways and Displaced Thresholds. When a runway is partially closed, a portion of the pavement is unavailable for any aircraft operation, meaning taxiing and landing or

taking off in either direction. A displaced threshold, by contrast, is put in place to ensure obstacle clearance by landing aircraft. The pavement prior to the displaced threshold is available for takeoff in the direction of the displacement, and for landing and takeoff in the opposite direction. Misunderstanding this difference and issuance of a subsequently inaccurate NOTAM can result in a hazardous situation. For both partially closed runways and displaced thresholds, approach lighting systems at the affected end must be placed out of service

(a) Partially Closed Runways. Disconnect edge and threshold lights on that part of the runway at and behind the threshold (that is, the portion of the runway that is closed). Alternately, cover the light fixture in such a way as to prevent light leakage.

(b) Displaced Thresholds. Edge lighting in the area of the displacement emits red light in the direction of approach and yellow light in the opposite direction. Centerline lights are blanked out in the direction of approach if the displacement is 700 ft or less. If the displacement is over 700 ft, place the centerline lights out of service. See AC 150/5340-30 for details on lighting displaced thresholds.

(c) Temporary runway thresholds and runway ends must be lighted if the runway is lighted and it is the intended threshold for night landings or instrument meteorological conditions.

(d) A temporary threshold on an unlighted runway may be marked by retroreflective, elevated markers in addition to markings noted in paragraph 218.b(1)(c) above. Markers seen by aircraft on approach are green. Markers at the rollout end of the runway are red. At certificated airports, temporary elevated threshold markers must be mounted with a frangible fitting (see 14 CFR Part 139.309). At non-certificated airports, the temporary elevated threshold markings may either be mounted with a frangible fitting or be flexible. See AC 150/5345-39, Specification for L-853, Runway and Taxiway Retroreflective Markers.

(e) Temporary threshold lights and end lights and related visual NAVAIDs are installed outboard of the edges of the full-strength pavement only when they cannot be installed on the pavement. They are installed with bases at grade level or as low as possible, but not more than 3 in (7.6 cm) above ground. When any portion of a base is above grade, place properly compacted fill around the base to minimize the rate of gradient change so aircraft can, in an emergency, cross at normal landing or takeoff speeds without incurring significant damage. See AC 150/5370-10.

(f) Maintain threshold and edge lighting color and spacing standards as described in AC 150/5340-30. Battery powered, solar, or portable lights that meet the criteria in AC 150/5345-50 may be used. These systems are intended primarily for visual flight rules (VFR) aircraft operations but may be used for instrument flight rules (IFR) aircraft operations, upon individual approval from the Flight Standards Division of the applicable FAA Regional Office.

(g) Reconfigure yellow lenses (caution zone), as necessary. If the runway has centerline lights, reconfigure the red lenses, as necessary, or place the centerline lights out of service.

(h) Relocate the visual glide slope indicator (VGSI), such as VASI and PAPI; other airport lights, such as Runway End Identifier Lights (REIL); and approach lights to identify the temporary threshold. Another option is to disable the VGSI or any equipment that would give misleading indications to pilots as to the new threshold location. Installation of temporary visual aids may be necessary to provide adequate guidance to pilots on approach to the affected runway. If the FAA owns and operates the VGSI, coordinate its installation or disabling with the local ATO/Technical Operations Office. Relocation of such visual aids will depend on the duration of the project and the benefits gained from the relocation, as this can result in great expense.

(i) Issue a NOTAM to inform pilots of temporary lighting conditions.

(4) Temporarily Closed Taxiways. If possible, deactivate the taxiway lighting circuits. When deactivation is not possible (for example other taxiways on the same circuit are to remain open),

cover the light fixture in such a way as to prevent light leakage.

d. Signs. To the extent possible, signs must be in conformance with AC 150/5345-44, Specification for Runway and Taxiway Signs and AC 150/5340-18, Standard for Airport Sign Systems. Any time a sign does not serve its normal function; it must be covered or removed to prevent misdirecting pilots. Note that information signs identifying a crossing taxiway continue to perform their normal function even if the crossing taxiway is closed. For long term construction projects, consider relocating signs, especially runway distance remaining signs.

219. Marking and Signs for Access Routes. The CSPP should indicate that pavement markings and signs for construction personnel will conform to AC 150/5340-18 and, to the extent practicable, with the Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD) and/or State highway specifications. Signs adjacent to areas used by aircraft must comply with the frangibility requirements of AC 150/5220-23, Frangible Connections, which may require modification to size and height guidance in the MUTCD.

220. Hazard Marking, Lighting and Signing.

a. Hazard Marking and Lighting Prevents Pilots from entering areas closed to aircraft, and prevents construction personnel from entering areas open to aircraft. The CSPP must specify prominent, comprehensible warning indicators for any area affected by construction that is normally accessible to aircraft, personnel, or vehicles. Hazard marking and lighting must also be specified to identify open manholes, small areas under repair, stockpiled material, waste areas, and areas subject to jet blast. Also consider less obvious construction-related hazards and include markings to identify FAA, airport, and National Weather Service facilities cables and power lines; instrument landing system (ILS) critical areas; airport surfaces, such as RSA, OFA, and OFZ; and other sensitive areas to make it easier for contractor personnel to avoid these areas.

b. Equipment.

(1) Barricades, including traffic cones, (weighted or sturdily attached to the surface) are acceptable methods used to identify and define the limits of construction and hazardous areas on airports. Careful consideration must be given to selecting equipment that poses the least danger to aircraft but is sturdy enough to remain in place when subjected to typical winds, prop wash and jet blast. The spacing of barricades must be such that a breach is physically prevented barring a deliberate act. For example, if barricades are intended to exclude vehicles, gaps between barricades must be smaller than the width of the excluded vehicles, generally 4 ft. Provision must be made for ARFF access if necessary. If barricades are intended to exclude pedestrians, they must be continuously linked. Continuous linking may be accomplished through the use of ropes, securely attached to prevent FOD.

(2) Lights must be red, either steady burning or flashing, and must meet the luminance requirements of the State Highway Department. Batteries powering lights will last longer if lights flash. Lights must be mounted on barricades and spaced at no more than 10 ft. Lights must be operated between sunset and sunrise and during periods of low visibility whenever the airport is open for operations. They may be operated by photocell, but this may require that the contractor turn them on manually during periods of low visibility during daytime hours.

(3) Supplement barricades with signs (for example “No Entry,” “No Vehicles”) as necessary.

(4) Air Operations Area – General. Barricades are not permitted in any active safety area. Within a runway or taxiway object free area, and on aprons, use orange traffic cones, flashing or steady burning red lights as noted above, collapsible barricades marked with diagonal, alternating orange and

white stripes; and/or signs to separate all construction/maintenance areas from the movement area. Barricades may be supplemented with alternating orange and white flags at least 20 by 20 in (50 by 50 cm) square and securely fastened to eliminate FOD. All barricades adjacent to any open runway or taxiway / taxilane safety area, or apron must be as low as possible to the ground, and no more than 18 in high, exclusive of supplementary lights and flags. Barricades must be of low mass; easily collapsible upon contact with an aircraft or any of its components; and weighted or sturdily attached to the surface to prevent displacement from prop wash, jet blast, wing vortex, or other surface wind currents. If affixed to the surface, they must be frangible at grade level or as low as possible, but not to exceed 3 in (7.6 cm) above the ground. Figure 2-5 and Figure 2-6 show sample barricades with proper coloring and flags.

Figure 2-5 Interlocking Barricades

Figure 2-6 Low Profile Barricades

(5) Air Operations Area – Runway/Taxiway Intersections. Use highly reflective barricades with lights to close taxiways leading to closed runways. Evaluate all operating factors when determining how to mark temporary closures that can last from 10 to 15 minutes to a much longer period of time. However, even for closures of relatively short duration, close all taxiway/runway intersections with barricades. The use of traffic cones is appropriate for short duration closures.

(6) Air Operations Area – Other. Beyond runway and taxiway object free areas and

aprons, barricades intended for construction vehicles and personnel may be many different shapes and made from various materials, including railroad ties, sawhorses, jersey barriers, or barrels.

(7) Maintenance. The construction specifications must include a provision requiring the contractor to have a person on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades. The contractor must file the contact person's information with the airport operator. Lighting should be checked for proper operation at least once per day, preferably at dusk.

221. Protection of Runway and Taxiway Safety Areas. Runway and taxiway safety areas, Obstacle Free zones (OFZ), object free areas (OFA), and approach surfaces are described in AC 150/5300-13. Protection of these areas includes limitations on the location and height of equipment and stockpiled material. An FAA airspace study may be required. Coordinate with the appropriate FAA Airports Regional or District Office if there is any doubt as to requirements or dimensions (See paragraph 213.e above.) as soon as the location and height of materials or equipment are known. The CSPP should include drawings showing all safety areas, object free areas, obstacle free zones and approach departure surfaces affected by construction.

a. Runway Safety Area (RSA). A runway safety area is the defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway (see AC 150/5300-13). Construction activities within the existing RSA are subject to the following conditions:

(1) No construction may occur within the existing RSA while the runway is open for aircraft operations. The RSA dimensions may be temporarily adjusted if the runway is restricted to aircraft operations requiring an RSA that is equal to the RSA width and length beyond the runway ends available during construction. (see AC 150/5300-13). The temporary use of declared distances and/or partial runway closures may provide the necessary RSA under certain circumstances. Coordinate with the appropriate FAA Airports Regional or District Office to have declared distances information published. See AC 150/5300-13 for guidance on the use of declared distances.

(2) The airport operator must coordinate the adjustment of RSA dimensions as permitted above with the appropriate FAA Airports Regional or District Office and the local FAA air traffic manager and issue a NOTAM.

(3) The CSPP and SPCD must provide procedures for ensuring adequate distance for protection from blasting operations, if required by operational considerations.

(4) Excavations.

(a) Open trenches or excavations are not permitted within the RSA while the runway is open. If possible, backfill trenches before the runway is opened. If the runway must be opened before excavations are backfilled, cover the excavations appropriately. Covering for open trenches must be designed to allow the safe operation of the heaviest aircraft operating on the runway across the trench without damage to the aircraft.

(b) Construction contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by the airport operator, and light them with red lights during hours of restricted visibility or darkness.

(5) Erosion Control. Soil erosion must be controlled to maintain RSA standards, that is, the RSA must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations, and capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and fire fighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft.

b. Runway Object Free Area (ROFA). Construction, including excavations, may be permitted in the ROFA. However, equipment must be removed from the ROFA when not in use, and material should not be stockpiled in the ROFA if not necessary. Stockpiling material in the OFA requires submittal of a 7460-1 form and justification provided to the appropriate FAA Airports Regional or District Office for approval.

c. Taxiway Safety Area (TSA). A taxiway safety area is a defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway. (See AC 150/5300-13.) Construction activities within the TSA are subject to the following conditions:

(1) No construction may occur within the TSA while the taxiway is open for aircraft operations. The TSA dimensions may be temporarily adjusted if the taxiway is restricted to aircraft operations requiring a TSA that is equal to the TSA width available during construction (see AC 150/5300-13, Table 4-1).

(2) The airport operator must coordinate the adjustment of the TSA width as permitted above with the appropriate FAA Airports Regional or District Office and the FAA air traffic manager and issue a NOTAM.

(3) The CSPP and SPCD must provide procedures for ensuring adequate distance for protection from blasting operations.

(4) Excavations.

(a) Open trenches or excavations are not permitted within the TSA while the taxiway is open. If possible, backfill trenches before the taxiway is opened. If the taxiway must be opened before excavations are backfilled, cover the excavations appropriately. Covering for open trenches must be designed to allow the safe operation of the heaviest aircraft operating on the taxiway across the trench without damage to the aircraft.

(b) Construction contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by the airport operator, and light them with red lights during hours of restricted visibility or darkness.

(5) Erosion Control. Soil erosion must be controlled to maintain TSA standards, that is, the TSA must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations, and capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and fire fighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft.

d. Taxiway Object Free Area (TOFA). Unlike the Runway Object Free Area, aircraft wings regularly penetrate the taxiway object free area during normal operations. Thus the restrictions are more stringent. Except as provided below, no construction may occur within the taxiway object free area while the taxiway is open for aircraft operations.

(1) The taxiway object free area dimensions may be temporarily adjusted if the taxiway is restricted to aircraft operations requiring a taxiway object free area that is equal to the taxiway object free area width available.

(2) Offset taxiway pavement markings may be used as a temporary measure to provide the required taxiway object free area. Where offset taxiway pavement markings are provided, centerline lighting or reflectors are required.

(3) Construction activity may be accomplished without adjusting the width of the taxiway object free area, subject to the following restrictions:

(a) Appropriate NOTAMs are issued.

(b) Marking and lighting meeting the provisions of paragraphs 218 and 220 above are implemented.

(c) Five-foot clearance is maintained between equipment and materials and any part of an aircraft (includes wingtip overhang). In these situations, flaggers must be used to direct construction equipment, and wing walkers will be necessary to guide aircraft. Wing walkers should be airline/aviation personnel rather than construction workers. If such clearance can only be maintained if an aircraft does not have full use of the entire taxiway width (with its main landing gear at the edge of the pavement), then it will be necessary to move personnel and equipment for the passage of that aircraft.

e. Obstacle Free Zone (OFZ). In general, personnel, material, and/or equipment may not penetrate the OFZ while the runway is open for aircraft operations. If a penetration to the OFZ is necessary, it may be possible to continue aircraft operations through operational restrictions. Coordinate with the FAA through the appropriate FAA Airports Regional or District Office.

f. Runway Approach/Departure Areas and Clearways. All personnel, materials, and/or equipment must remain clear of the applicable threshold siting surfaces, as defined in Appendix 2, "Threshold Siting Requirements," of AC 150/5300-13. Objects that do not penetrate these surfaces may still be obstructions to air navigation and may affect standard instrument approach procedures. Coordinate with the FAA through the appropriate FAA Airports Regional or District Office.

(1) Construction activity in a runway approach/departure area may result in the need to partially close a runway or displace the existing runway threshold. Partial runway closure, displacement of the runway threshold, as well as closure of the complete runway and other portions of the movement area also require coordination through the airport operator with the appropriate FAA air traffic manager (FSS if non-towered) and ATO/Technical Operations (for affected NAVAIDS) and airport users.

(2) Caution regarding partial runway closures. When filing a NOTAM for a partial runway closure, clearly state to OCC personnel that the portion of pavement located prior to the threshold is not available for landing and departing traffic. In this case, the threshold has been moved for both landing and takeoff purposes (this is different than a displaced threshold). There may be situations where the portion of closed runway is available for taxiing only. If so, the NOTAM must reflect this condition).

(3) Caution regarding displaced thresholds. : Implementation of a displaced threshold affects runway length available for aircraft landing over the displacement. Depending on the reason for the displacement (to provide obstruction clearance or RSA), such a displacement may also require an adjustment in the landing distance available and accelerate-stop distance available in the opposite direction. If project scope includes personnel, equipment, excavation, other work. within the existing RSA of any usable runway end, do not implement a displaced threshold unless arrivals and departures toward the construction activity are prohibited. Instead, implement a partial closure.

222. Other Limitations on Construction. The CSPP must specify any other limitations on construction, including but not limited to:

a. Prohibitions.

(1) No use of tall equipment (cranes, concrete pumps, and so on) unless a 7460-1 determination letter is issued for such equipment.

(2) No use of open flame welding or torches unless fire safety precautions are provided and the airport operator has approved their use.

(3) No use of electrical blasting caps on or within 1,000 ft (300 m) of the airport property.

See AC 150/5370-10.

(4) No use of flare pots within the AOA.

b. Restrictions.

(1) Construction suspension required during specific airport operations.

(2) Areas that cannot be worked on simultaneously.

(3) Day or night construction restrictions.

(4) Seasonal construction restrictions.

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Chapter 3. Guidelines for Writing a CSPP

301. General Requirements. The CSPP is a standalone document written to correspond with the subjects outlined in Chapter 2, Section 1, paragraph 204. The CSPP is organized by numbered sections corresponding to each subject listed in Chapter 2, Section 1, paragraph 204, and described in detail in Chapter 2, Section 2. Each section number and title in the CSPP matches the corresponding subject outlined in Chapter 2, paragraph 204 (for example, 1. Coordination, 2. Phasing, 3. Areas and Operations Affected by the Construction Activity, and so on.). With the exception of the project scope of work outlined in Section 2. Phasing, only subjects specific to operational safety during construction should be addressed.

302. Applicability of Subjects. Each section should, to the extent practical, focus on the specific subject. Where an overlapping requirement spans several sections, the requirement should be explained in detail in the most applicable section. A reference to that section should be included in all other sections where the requirement may apply. For example, the requirement to protect existing underground FAA Instrument Landing System (ILS) cables during trenching operations could be considered FAA ATO coordination (Section 1. Coordination, paragraph 205.c), an area and operation affected by the construction activity (Section 3. Areas and Operations Affected by the Construction Activity, paragraph 207.a(4)), a protection of a NAVAID (Section 4. Protection of Navigational Aids (NAVAIDs),paragraph 208), or a notification to the FAA of construction activities (Section 9. Notification of Construction Activities, paragraph 210.e(3)(b)). However, it is more specifically an underground utility requirement (Section 11. Underground Utilities, paragraph 215). The procedure for protecting underground ILS cables during trenching operations should therefore be described in Section 11: "*The contractor must coordinate with the local FAA System Support Center (SSC) to mark existing ILS cable routes along Runway 17-35. The ILS cables will be located by hand digging whenever the trenching operation moves within 10 feet of the cable markings.*" All other applicable sections should include a reference to Section 11: "*ILS cables shall be identified and protected as described in Section 11*" or "*See Section 11 for ILS cable identification and protection requirements.*" Thus, the CSPP should be considered as a whole, with no need to duplicate responses to related issues.

303. Graphical Representations. Construction safety drawings should be included in the CSPP as attachments. When other graphical representations will aid in supporting written statements, the drawings, diagrams, and/or photographs should also be attached to the CSPP. References should be made in the CSPP to each graphical attachment and may be made in multiple sections.

304. Reference Documents. The CSPP must not incorporate a document by reference unless reproduction of the material in that document is prohibited. In that case, either copies of or a source for the referenced document must be provided to the contractor.

305. Restrictions. The CSPP should not be considered as a project design review document. The CSPP should also avoid mention of permanent ("as-built") features such as pavements, markings, signs, and lighting, except when such features are intended to aid in maintaining operational safety during the construction.

306. Coordination. Include in this section a detailed description of conferences and meetings both before and during the project. Include appropriate information from AC 150/5300-9. Discuss coordination procedures and schedules for each required FAA ATO airway facility shutdown and restart and all required flight inspections.

307. Phasing. Include in this section a detailed scope of work description for the project as a whole and each phase of work covered by the CSPP. This includes all locations and durations of the work proposed. Attach drawings to graphically support the written scope of work. Detail in this section the sequenced phases of the proposed construction. Include a reference to paragraph 308 below, as appropriate.

308. Areas and Operations Affected By Construction. Focus in this section on identifying the areas and operations affected by the construction. Describe corresponding mitigation that is not covered in detail elsewhere in the CSPP. Include references to paragraphs below as appropriate. Attach drawings as necessary to graphically describe affected areas and mechanisms proposed. Tables and charts such as the following may be helpful in highlighting issues to be addressed.

Table 3-1 Sample Operations Effects

Project	Runway 15-33 Reconstruction	
Phase	Phase II: Reconstruct Runway 15 End	
Scope of Work	Reconstruct 1,000 ft of north end of Runway 15-33 with Portland Cement Concrete (PCC).	
Operational Requirements	**Normal (Existing)**	**Phase II (Anticipated)**
Runway 15 Average Aircraft Operations	Carrier: 52 /day GA: 26 /day Military: 11 /day	Carrier: 52 / day GA: 20 / day Military: 0 /day
Runway 33 Average Aircraft Operations	Carrier: 40 /day GA: 18 /day Military: 10 /day	Carrier: 20 /day GA: 5 /day Military: 0 /day
Runway 15-33 ARC	C-IV	C-IV
Runway 15 Approach Visibility Minimums	¾ mile	1 mile
Runway 33 Approach Visibility Minimums	¾ mile	1 mile
Runway 15 Declared Distances	TORA: 7,820	TORA: 6,420
	TODA: 7,820	TODA: 6,420
	ASDA: 7,820	ASDA: 6,420
	LDA: 7,820	LDA: 6,420
Runway 33 Declared Distances	TORA: 8,320	TORA: 6,920
	TODA: 8,320	TODA: 6,920
	ASDA: 8,320	ASDA: 6,920
	LDA: 7,820	LDA: 6,420
Runway 15 Approach Procedures	ILS	LOC only
	RNAV	N/A
	VOR	N/A
Runway 33 Approach Procedures	ILS	Visual only
	RNAV	N/A
	VOR	N/A
Runway 15 NAVAIDs	ILS/DME, MALSR, RVR	LOC/DME, PAPI (temp), RVR

Runway 33 NAVAIDs	ILS/DME, MALSF, PAPI, RVR	MALSF, PAPI, RVR
Taxiway G ADG	IV	IV (N/A between T/W H and R/W 15 end)
Taxiway E ADG	IV	IV
ATCT (hours open)	06:00 – 24:00 local	06:00 – 24:00 local
ARFF Index	D	D
Special Conditions	Air National Guard (ANG) military operations	Military operations relocated to alternate ANG Base
	Airline XYZ requires VGSI	Airline XYZ requires VGSI

Complete the following chart for each phase to determine the area that must be protected along the runway edges:

Runway	**Aircraft Approach Category* A, B, C, or D**	**Airplane Design Group* I, II, III, or IV**	**RSA Width in Feet Divided by 2***
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
*See AC 150/5300-13 to complete the chart for a specific runway.			

Complete the following chart for each phase to determine the area that must be protected before the runway threshold:

Runway End Number	**Airplane Design Group* I, II, III, or IV**	**Aircraft Approach Category* A, B, C, or D**	**Minimum Safety Area Prior to the Threshold***	**Minimum Distance to Threshold Based on Required Approach Slope***	
_____	_____	_____	_____ ft	_____ ft	_____: 1
_____	_____	_____	_____ ft	_____ ft	_____: 1
_____	_____	_____	_____ ft	_____ ft	_____: 1
_____	_____	_____	_____ ft	_____ ft	_____: 1
*See AC 150/5300-13 to complete the chart for a specific runway.					

309. Navigation Aid (NAVAID) Protection. List in this section all NAVAID facilities that will be affected by the construction. Identify NAVAID facilities that will be placed out of service at any time prior to or during construction activities. Identify individuals responsible for coordinating each shutdown and when each facility will be out of service. Include a reference to paragraph 306 above for FAA ATO NAVAID shutdown, restart, and flight inspection coordination. Outline in detail procedures to protect each NAVAID facility remaining in service from interference by construction activities. Include a reference to paragraph 314 for the issuance of NOTAMs as required. Include a reference to paragraph 316 for the protection of underground cables and piping serving NAVAIDs. If temporary visual aids are proposed to replace or supplement existing facilities, include a reference to paragraph 319. Attach drawings to graphically indicate the affected NAVAIDS and the corresponding critical areas.

310. Contractor Access. This will necessarily be the most extensive section of the CSPP. Provide

sufficient detail so that a contractor not experienced in working on airports will understand the unique restrictions such work will require. Due to this extent, it should be broken down into subsections as described below:

a. Location of Stockpiled Construction Materials. Describe in this section specific locations for stockpiling material. Note any height restrictions on stockpiles. Include a reference to paragraph 321 for hazard marking and lighting devices used to identify stockpiles. Include a reference to paragraph 311 for provisions to prevent stockpile material from becoming wildlife attractants. Include a reference to paragraph 312 for provisions to prevent stockpile material from becoming FOD. Attach drawings to graphically indicate the stockpile locations.

b. Vehicle and Pedestrian Operations. While there are many items to be addressed in this major subsection of the CSPP, all are concerned with one main issue: keeping people and vehicles from areas of the airport where they don't belong. This includes preventing unauthorized entry to the AOA and preventing the improper movement of pedestrians or vehicles on the airport. In this section, focus on mechanisms to prevent construction vehicles and workers traveling to and from the worksite from unauthorized entry into movement areas. Specify locations of parking for both employee vehicles and construction equipment, and routes for access and haul roads. In most cases, this will best be accomplished by attaching a drawing. Quote from AC 150/5210-5 specific requirements for contractor vehicles rather than referring to the AC as a whole, and include special requirements for identifying Hazardous Material (HAZMAT) vehicles. Quote from, rather than incorporate by reference, AC 150/5210-20 as appropriate to address the airport's rules for ground vehicle operations, including its training program. Discuss the airport's recordkeeping system listing authorized vehicle operators.

c. Two-Way Radio Communications. Include a special section to identify all individuals who are required to maintain communications with Air Traffic (AT) at airports with active towers, or monitor Common Traffic Advisory Frequencies (CTAF) at airports without or with closed ATCT. Include training requirements for all individuals required to communicate with AT. Individuals required to monitor AT frequencies should also be identified. If construction employees are also required to communicate by radio with Airport Operations, this procedure should be described in detail. Usage of vehicle mounted radios and/or portable radios should be addressed. Communication procedures for the event of disabled radio communication (that is, light signals, telephone numbers, others) must be included. All radio frequencies should by identified (Tower, Ground Control, CTAF, UNICOM, ATIS, and so on).

d. Airport Security. Address security as it applies to vehicle and pedestrian operations. Discuss TSA requirements, security badging requirements, perimeter fence integrity, gate security, and other needs. Attach drawings to graphically indicate secured and/or Security Identification Display Areas (SIDA), perimeter fencing, and available access points.

311. Wildlife Management. Discuss in this section wildlife management procedures. Describe the maintenance of existing wildlife mitigation devices, such as perimeter fences, and procedures to limit wildlife attractants. Include procedures to notify Airport Operations of wildlife encounters. Include a reference to paragraph 310 for security (wildlife) fence integrity maintenance as required.

312. Foreign Object Debris (FOD) Management. In this section, discuss methods to control and monitor FOD: worksite housekeeping, ground vehicle tire inspections, runway sweeps, and so on. Include a reference to paragraph 315 for inspection requirements as required.

313. Hazardous Materials (HAZMAT) Management. Describe in this section HAZMAT management procedures: fuel deliveries, spill recovery procedures, Material Safety Data Sheet (MSDS) availability, and other considerations. Any specific airport HAZMAT restrictions should also be

identified. Include a reference to paragraph 310 for HAZMAT vehicle identification requirements. Quote from, rather than incorporate by reference, AC 150/5320-15.

314. Notification of Construction Activities. List in this section the names and telephone numbers of points of contact for all parties affected by the construction project. We recommend a single list that includes all telephone numbers required under this section. Include emergency notification procedures for all representatives of all parties potentially impacted by the construction. Identify individual representatives – and at least one alternate – for each party. List both on-duty and off-duty contact information for each individual, including individuals responsible for emergency maintenance of airport construction hazard lighting and barricades. Describe procedures to coordinate immediate response to events that might adversely affect the operational safety of the airport (such as interrupted NAVAID service). Explain requirements for and the procedures for the issuance of Notices to Airmen (NOTAMs), notification to FAA required by 14 CFR Part 77 and Part 157 and in the event of affected NAVAIDs. For NOTAMs, identify an individual, and at least one alternate, responsible for issuing and cancelling each specific type of Notice to Airmen (NOTAM) required. Detail notification methods for police, fire fighting, and medical emergencies. This may include 911, but should also include direct phone numbers of local police departments and nearby hospitals. The local Poison Control number should be listed. Procedures regarding notification of Airport Operations and/or the ARFF Department of such emergencies should be identified, as applicable. If airport radio communications are identified as a means of emergency notification, include a reference to paragraph 310. Differentiate between emergency and nonemergency notification of ARFF personnel, the latter including activities that affect ARFF water supplies and access roads. Identify the primary ARFF contact person and at least one alternate. If notification is to be made through Airport Operations, then detail this procedure. Include a method of confirmation from the ARFF department.

315. Inspection Requirements. Describe in this section inspection requirements to ensure airfield safety compliance. Include a requirement for routine inspections by the resident engineer (RE) and the construction contractors. If the engineering consultants and/or contractors have a Safety Officer who will conduct such inspections, identify this individual. Describe procedures for special inspections, such as those required to reopen areas for aircraft operations. Part 139 requires daily airfield inspections at certificated airports, but these may need to be more frequent when construction is in progress. Discuss the role of such inspections on areas under construction. Include a requirement to immediately remedy any deficiencies, whether caused by negligence, oversight, or project scope change.

316. Underground Utilities. Explain how existing underground utilities will be located and protected. Identify each utility owner and include contact information for each company/agency in the master list. Address emergency response procedures for damaged or disrupted utilities. Include a reference to paragraph 314 above for notification of utility owners of accidental utility disruption as required.

317. Penalties. Describe in this section specific penalties imposed for noncompliance with airport rules and regulations, including the CSPP: SIDA violations, Vehicle/Pedestrian Deviations (VPD), and others.

318. Special Conditions. Identify any special conditions that may trigger specific safety mitigation actions outlined in this CSPP: low visibility operations, snow removal, aircraft in distress, aircraft accident, security breach, VPD, and other activities requiring construction suspension/resumption. Include a reference to paragraph 310 above for compliance with airport safety and security measures and for radio communications as required. Include a reference to paragraph 319 below for emergency notification of all involved parties, including police/security, ARFF, and medical services.

319. Runway and Taxiway Visual Aids. Include marking, lighting, signs, and visual NAVAIDS.

Detail temporary runway and taxiway marking, lighting, signs, and visual NAVAIDs required for the construction. Discuss existing marking, lighting, signs, and visual NAVAIDs that are temporarily, altered, obliterated, or shut down. Consider non-federal facilities and address requirements for reimbursable agreements necessary for alteration of FAA facilities and for necessary flight checks. Identify temporary TORA signs or runway distance remaining signs if appropriate. Identify required temporary visual NAVAIDs such as REIL or PAPI. Quote from, rather than incorporate by reference, AC 150/5340-1, Standards for Airport Markings, AC 150/5340-18, Standards for Airport Sign Systems, and AC 150/5340-30, as required. Attach drawings to graphically indicate proposed marking, lighting, signs, and visual NAVAIDs.

320. Marking and Signs for Access Routes. Detail plans for marking and signs for vehicle access routes. To the extent possible, signs should be in conformance with the Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD) and/or State highway specifications, not hand lettered. Detail any modifications to the guidance in the MUTCD necessary to meet frangibility/height requirements.

321. Hazard Marking and Lighting. Specify all marking and lighting equipment, including when and where each type of device is to be used. Specify maximum gaps between barricades and the maximum spacing of hazard lighting. Identify one individual and at least one alternate responsible for maintenance of hazard marking and lighting equipment in the master telephone list. Include a reference to paragraph 314 above. Attach drawings to graphically indicate the placement of hazard marking and lighting equipment.

322. Protection of Runway and Taxiway Safety Areas. This section should focus exclusively on procedures for protecting all safety areas, including those altered by the construction: methods of demarcation, limit of access, movement within safety areas, stockpiling and trenching restrictions, and so on. Reference AC 150/5300-13: Airport Design as required. Include a reference to paragraph 310 above for procedures regarding vehicle and personnel movement within safety areas. Include a reference to paragraph 310 above for material stockpile restrictions as required. Detail requirements for trenching, excavations, and backfill. Include a reference to paragraph 321 for hazard marking and lighting devices used to identify open excavations as required. If runway and taxiway closures are proposed to protect safety areas, or if temporary displaced thresholds and/or revised declared distances are used to provide adequate Runway Safety Area, include a reference to paragraphs 314 and 319 above. Detail procedures for protecting the runway OFZ, runway OFA, taxiway OFA and runway approach surfaces including those altered by the construction: methods of demarcation, limit of cranes, storage of equipment, and so on. Quote from, rather than incorporate by reference, AC 150/5300-13: Airport Design as required. Include a reference to paragraph 323 for height (i.e. crane) restrictions as required. One way to address the height of equipment that will move during the project is to establish a three-dimensional “box” within which equipment will be confined that can be studied as a single object. Attach drawings to graphically indicate the safety area, OFZ, and OFA boundaries.

323. Other Limitations on Construction. This section should describe what limitations must be applied to each area of work and when each limitation will be applied: limitations due to airport operations, height (i.e. crane) restrictions, areas which cannot be worked at simultaneously, day/night work restrictions, winter construction, and other limitations. Include a reference to paragraph 307 above for project phasing requirements based on construction limitations as required.

Appendix 1. Related Reading Material

Obtain the latest version of the following free publications from the FAA on its Web site at http://www.faa.gov/airports/.

AC	Title and Description
AC 150/5200-28	Notices to Airmen (NOTAMs) for Airport Operators
	Guidance for using the NOTAM System in airport reporting.
AC 150/5200-30	Airport Winter Safety and Operations
	Guidance for airport owners/operators on the development of an acceptable airport snow and ice control program and on appropriate field condition reporting procedures.
AC 150/5200-33	Hazardous Wildlife Attractants On or Near Airports
	Guidance on locating certain land uses that might attract hazardous wildlife to public-use airports.
AC 150/5210-5	Painting, Marking, and Lighting of Vehicles Used on an Airport.
	Guidance, specifications, and standards for painting, marking, and lighting vehicles operating in the airport air operations areas.
AC 150/5210-20	Ground Vehicle Operations on Airports
	Guidance to airport operators on developing ground vehicle operation training programs.
AC 150/5300-13	Airport Design
	FAA standards and recommendations for airport design, establishes approach visibility minimums as an airport design parameter, and contains the Object Free area and the obstacle free-zone criteria.
AC 150/5310-24	Airport Foreign Object Debris Management
	Guidance for developing and managing an airport foreign object debris (FOD) program
AC 150/5220-4	Water Supply Systems for Aircraft Fire and Rescue Protection.
	Guidance on selecting a water source and meeting standards for a distribution system to support aircraft rescue and fire fighting service operations on airports.
AC 150/5320-15	Management of Airport Industrial Waste
	Basic information on the characteristics, management, and regulations of industrial wastes generated at airports. Guidance for developing a Storm Water Pollution Prevention Plan (SWPPP) that applies best management practices to eliminate, prevent, or reduce pollutants in storm water runoff with particular airport industrial activities.
AC 150/5340-1	Standards for Airport Markings
	FAA standards for markings used on airport runways, taxiways, and aprons.
AC 150/5340-18	Standards for Airport Sign Systems
	FAA standards for the siting and installation of signs on airport runways and taxiways.
AC 150/5345-28	Precision Approach Path Indicator (PAPI) Systems
	FAA standards for PAPI systems, which provide pilots with visual glide slope guidance during approach for landing.

AC	Title and Description
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
	Guidance and recommendations on the installation of airport visual aids.
AC 150/5345-39	Specification for L-853, Runway and Taxiway Retroreflective Markers
AC 150/5345-44	Specification for Runway and Taxiway Signs
	FAA specifications for unlighted and lighted signs for taxiways and runways.
AC 150/5345-53	Airport Lighting Certification Program
	Details on the Airport Lighting Equipment Certification Program (ALECP).
AC 150/5345-50	Specification for Portable Runway and Taxiway Lights
	FAA standards for portable runway and taxiway lights and runway end identifier lights for temporary use to permit continued aircraft operations while all or part of a runway lighting system is inoperative.
AC 150/5345-55	Specification for L-893, Lighted Visual Aid to Indicate Temporary Runway Closure
AC 150/5370-10	Standards for Specifying Construction of Airports
	Standards for construction of airports, including earthwork, drainage, paving, turfing, lighting, and incidental construction.
FAA Order 5200.11	FAA Airports (ARP) Safety Management System (SMS)
	Basics for implementing SMS within ARP. Includes roles and responsibilities of ARP management and staff as well as other FAA lines of business that contribute to the ARP SMS.
FAA Certalert 98-05	Grasses Attractive to Hazardous Wildlife
	Guidance on grass management and seed selection.
FAA Form 7460-1	Notice of Proposed Construction or Alteration
FAA Form 7480-1	Notice of Landing Area Proposal

Obtain the latest version of the following free publications from the Electronic Code of Federal Regulations at http://ecfr.gpoaccess.gov/.

Title 14 CFR Part 139	Certification of Airports
Title 49 CFR Part 1542	Airport Security

Obtain the latest version of the Manual on Uniform Traffic Control Devices from the Federal Highway Administration at http://mutcd.fhwa.dot.gov/.

Appendix 2. Definition of Terms

Term	Definition
7460-1	Notice Of Proposed Construction Or Alteration. For on-airport projects, the form submitted to the FAA regional or airports division office as formal written notification of any kind of construction or alteration of objects that affect navigable airspace, as defined in 14 CFR Part 77, safe, efficient use, and preservation of the navigable airspace. (See guidance available on the FAA web site at oeaaa.faa.gov.) The form may be downloaded at http://www.faa.gov/airports/resources/forms/, or filed electronically at: https://oeaaa.faa.gov.
7480-1	Notice Of Landing Area Proposal. Form submitted to the FAA Airports Regional Division Office or Airports District Office as formal written notification whenever a project without an airport layout plan on file with the FAA involves the construction of a new airport; the construction, realigning, altering, activating, or abandoning of a runway, landing strip, or associated taxiway; or the deactivation or abandoning of an entire airport The form may be downloaded at http://www.faa.gov/airports/resources/forms/.
AC	Advisory Circular
ACRC	Aircraft Reference Code
ACSI	Airport Certification Safety Inspector
ADG	Airplane Design Group
AIP	Airport Improvement Program
ALECP	Airport Lighting Equipment Certification Program
ANG	Air National Guard
AOA	Air Operations Area. Any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operations area includes such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runways, taxiways, or aprons.
ARFF	Aircraft Rescue and Fire Fighting
ARP	FAA Office of Airports
ASDA	Accelerate-Stop Distance Available
ATCT	Airport Traffic Control Tower
ATIS	Automatic Terminal Information Service
ATO	Air Traffic Organization
Certificated Airport	An airport that has been issued an Airport Operating Certificate by the FAA under the authority of 14 CFR Part 139, Certification of Airports.
CFR	Code of Federal Regulations
Construction	The presence and movement of construction-related personnel, equipment, and materials in any location that could infringe upon the movement of aircraft.
CSPP	Construction Safety And Phasing Plan. The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.

Term	Definition
CTAF	Common Traffic Advisory Frequency
Displaced Threshold	A threshold that is located at a point on the runway other than the designated beginning of the runway. The portion of pavement behind a displaced threshold is available for takeoffs in either direction or landing from the opposite direction.
DOT	Department of Transportation
EPA	Environmental Protection Agency
FOD	Foreign Object Debris
HAZMAT	Hazardous Materials
IFR	Instrument Flight Rules
ILS	Instrument Landing System
LDA	Landing Distance Available
LOC	Localizer antenna array
Movement Area	The runways, taxiways, and other areas of an airport that are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading aprons and aircraft parking areas (reference 14 CFR Part 139).
MSDS	Material Safety Data Sheet
MUTCD	Manual on Uniform Traffic Control Devices
NAVAID	Navigation Aid
NAVAID Critical Area	An area of defined shape and size associated with a NAVAID that must remain clear and graded to avoid interference with the electronic signal.
Non-Movement Area	The area inside the airport security fence exclusive of the Movement Area. It is important to note that the non-movement area includes pavement traversed by aircraft.
NOTAM	Notices to Airmen
Obstruction	Any object/obstacle exceeding the obstruction standards specified by 14 CFR Part 77, subpart C.
OE / AAA	Obstruction Evaluation / Airport Airspace Analysis
OFA	Object Free Area. An area on the ground centered on the runway, taxiway, or taxi lane centerline provided to enhance safety of aircraft operations by having the area free of objects except for those objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. (See AC 150/5300-13, for additional guidance on OFA standards and wingtip clearance criteria.)
OFZ	Obstacle Free Zone. The airspace below 150 ft (45 m) above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway and for missed approaches. The OFZ is subdivided as follows: Runway OFZ, Inner Approach OFZ, Inner Transitional OFZ, and Precision OFZ. Refer to AC 150/5300-13 for guidance on OFZ.
OSHA	Occupational Safety and Health Administration
P&R	Planning and Requirements Group

Term	Definition
PAPI	Precision Approach Path Indicators
PFC	Passenger Facility Charge
PLASI	Pulse Light Approach Slope Indicators
Project Proposal Summary	A clear and concise description of the proposed project or change that is the object of Safety Risk Management.
RE	Resident Engineer
REIL	Runway End Identifier Lights
RNAV	Area Navigation
ROFA	Runway Object Free Area
RSA	Runway Safety Area. A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway, in accordance with AC 150/5300-13.
SIDA	Security Identification Display Area
SMS	Safety Management System
SPCD	Safety Plan Compliance Document. Details developed and submitted by a contractor to the airport operator for approval providing details on how the performance of a construction project will comply with the CSPP.
SRM	Safety Risk Management
Taxiway Safety Area	A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway, in accordance with AC 150/5300-13.
TDG	Taxiway Design Group
Temporary	Any condition that is not intended to be permanent.
Temporary Runway End	The beginning of that portion of the runway available for landing and taking off in one direction, and for landing in the other direction. Note the difference from a displaced threshold.
Threshold	The beginning of that portion of the runway available for landing. In some instances, the landing threshold may be displaced.
TODA	Takeoff Distance Available
TOFA	Taxiway Object Free Area
TORA	Takeoff Run Available. The length of the runway less any length of runway unavailable and/or unsuitable for takeoff run computations. See AC 150/5300-13 for guidance on declared distances.
TSA	Taxiway Safety Area Transportation Security Administration
UNICOM	A radio communications system of a type used at small airports.
VASI	Visual Approach Slope Indicators

Term	Definition
VGSI	Visual Glide Slope Indicator. A device that provides a visual glide slope indicator to landing pilots. These systems include precision approach path indicators (PAPI), visual approach slope indicators (VASI), and pulse light approach slope indicators (PLASI).
VFR	Visual Flight Rules
VOR	VHF Omnidirectional Radio Range
VPD	Vehicle / Pedestrian Deviation

Appendix 3. Safety and Phasing Plan Checklist

This appendix is keyed to Section 2. Plan Requirements. In the electronic version of this AC, clicking on the paragraph designation in the Reference column will access the applicable paragraph. There may be instances where the CSPP requires provisions that are not covered by the list in this appendix.

This checklist is intended as an aid, not as a required submittal.

Coordination	Reference	Addressed			Remarks
General Considerations					
Requirements for predesign, prebid, and preconstruction conferences to introduce the subject of airport operational safety during construction are specified.	205	☐ Yes	☐ No	☐ NA	
Operational safety is a standing agenda item for construction progress meetings.	205	☐ Yes	☐ No	☐ NA	
Scheduling of the construction phases is properly addressed.	206	☐ Yes	☐ No	☐ NA	
Areas and Operations Affected by Construction Activity					
Drawings showing affected areas are included.	207.a	☐ Yes	☐ No	☐ NA	
Closed or partially closed runways, taxiways, and aprons are depicted on drawings.	207.a(1)	☐ Yes	☐ No	☐ NA	
Access routes used by ARFF vehicles affected by the project are addressed.	207.a(2)	☐ Yes	☐ No	☐ NA	
Access routes used by airport and airline support vehicles affected by the project are addressed.	207.a(3)	☐ Yes	☐ No	☐ NA	
Underground utilities, including water supplies for fire fighting and drainage.	207.a(4)	☐ Yes	☐ No	☐ NA	
Approach/departure surfaces affected by heights of temporary objects are addressed.	207.a(5)	☐ Yes	☐ No	☐ NA	
Construction areas, storage areas, and access routes near runways, taxiways, aprons, or helipads are properly depicted on drawings.	207.a	☐ Yes	☐ No	☐ NA	
Temporary changes to taxi operations are addressed.	207.b(1)	☐ Yes	☐ No	☐ NA	

Coordination	Reference	Addressed			Remarks
Detours for ARFF and other airport vehicles are identified.	207.b(2)	☐ Yes	☐ No	☐ NA	
Maintenance of essential utilities and underground infrastructure is addressed.	207.b(3)	☐ Yes	☐ No	☐ NA	
Temporary changes to air traffic control procedures are addressed.	207.b(4)	☐ Yes	☐ No	☐ NA	
NAVAIDS					
Critical areas for NAVAIDs are depicted on drawings.	208	☐ Yes	☐ No	☐ NA	
Effects of construction activity on the performance of NAVAIDS, including unanticipated power outages, are addressed.	208	☐ Yes	☐ No	☐ NA	
Protection of NAVAID facilities is addressed.	208	☐ Yes	☐ No	☐ NA	
The required distance and direction from each NAVAID to any construction activity is depicted on drawings.	208	☐ Yes	☐ No	☐ NA	
Procedures for coordination with FAA ATO/Technical Operations, including identification of points of contact, are included.	208, 213.a, 213.e(3)(a), 218.a	☐ Yes	☐ No	☐ NA	
Contractor Access					
The CSPP addresses areas to which contractor will have access and how the areas will be accessed.	209	☐ Yes	☐ No	☐ NA	
The application of 49 CFR Part 1542 Airport Security, where appropriate, is addressed.	209	☐ Yes	☐ No	☐ NA	
The location of stockpiled construction materials is depicted on drawings.	209.a	☐ Yes	☐ No	☐ NA	
The requirement for stockpiles in the ROFA to be approved by FAA is included.	209.a	☐ Yes	☐ No	☐ NA	
Requirements for proper stockpiling of materials are included.	209.a	☐ Yes	☐ No	☐ NA	

Coordination	Reference	Addressed			Remarks
Construction site parking is addressed.	209.b(1)	☐ Yes	☐ No	☐ NA	
Construction equipment parking is addressed.	209.b(2)	☐ Yes	☐ No	☐ NA	
Access and haul roads are addressed.	209.b(3)	☐ Yes	☐ No	☐ NA	
A requirement for marking and lighting of vehicles to comply with AC 150/5210-5, Painting, Marking and Lighting of Vehicles Used on an Airport, is included.	209.b(4)	☐ Yes	☐ No	☐ NA	
Proper vehicle operations, including requirements for escorts, are described.	209.b(5), 209.b(6)	☐ Yes	☐ No	☐ NA	
Training requirements for vehicle drivers are addressed.	209.b(7)	☐ Yes	☐ No	☐ NA	
Two-way radio communications procedures are described.	209.b(9)	☐ Yes	☐ No	☐ NA	
Maintenance of the secured area of the airport is addressed.	209.b(10)	☐ Yes	☐ No	☐ NA	
Wildlife Management					
The airport operator's wildlife management procedures are addressed.	210	☐ Yes	☐ No	☐ NA	
Foreign Object Debris Management					
The airport operator's FOD management procedures are addressed.	211	☐ Yes	☐ No	☐ NA	
Hazardous Materials Management					
The airport operator's hazardous materials management procedures are addressed.	212	☐ Yes	☐ No	☐ NA	
Notification of Construction Activities					
Procedures for the immediate notification of airport user and local FAA of any conditions adversely affecting the operational safety of the airport are detailed.	213	☐ Yes	☐ No	☐ NA	

Coordination	Reference	Addressed			Remarks
Maintenance of a list by the airport operator of the responsible representatives/points of contact for all involved parties and procedures for contacting them 24 hours a day, seven days a week is specified.	213.a	☐ Yes	☐ No	☐ NA	
A list of local ATO/Technical Operations personnel is included.	213.a	☐ Yes	☐ No	☐ NA	
A list of ATCT managers on duty is included.	213.a	☐ Yes	☐ No	☐ NA	
A list of authorized representatives to the OCC is included.	213.b	☐ Yes	☐ No	☐ NA	
Procedures for coordinating, issuing, maintaining and cancelling by the airport operator of NOTAMS about airport conditions resulting from construction are included.	208, 213.b, 218.b(4)(i)	☐ Yes	☐ No	☐ NA	
Provision of information on closed or hazardous conditions on airport movement areas by the airport operator to the OCC is specified.	213.b	☐ Yes	☐ No	☐ NA	
Emergency notification procedures for medical, fire fighting, and police response are addressed.	213.c	☐ Yes	☐ No	☐ NA	
Coordination with ARFF personnel for non-emergency issues is addressed.	213.d	☐ Yes	☐ No	☐ NA	
Notification to the FAA under 14 CFR parts 77 and 157 is addressed.	213.e	☐ Yes	☐ No	☐ NA	
Reimbursable agreements for flight checks and/or design and construction for FAA owned NAVAIDs are addressed.	213.e(3)(b)	☐ Yes	☐ No	☐ NA	
Inspection Requirements					
Daily inspections by both the airport operator and contractor are specified.	214.a	☐ Yes	☐ No	☐ NA	
Final inspections at certificated airports are specified when required.	214.b	☐ Yes	☐ No	☐ NA	
Underground Utilities					
Procedures for protecting existing underground facilities in excavation areas are described.	215	☐ Yes	☐ No	☐ NA	

Coordination	Reference	Addressed			Remarks
Penalties					
Penalty provisions for noncompliance with airport rules and regulations and the safety plans are detailed.	216	☐ Yes	☐ No	☐ NA	
Special Conditions					
Any special conditions that affect the operation of the airport or require the activation of any special procedures are addressed.	217	☐ Yes	☐ No	☐ NA	
Runway and Taxiway Visual Aids - Marking, Lighting, Signs, and Visual NAVAIDs					
The proper securing of temporary airport markings, lighting, signs, and visual NAVAIDs is addressed.	218.a	☐ Yes	☐ No	☐ NA	
Frangibility of airport markings, lighting, signs, and visual NAVAIDs is specified.	218.a, 218.c, 219, 220.b(4)	☐ Yes	☐ No	☐ NA	
The requirement for markings to be in compliance with AC 150/5340-1, Standards for Airport Markings is specified.	218.b	☐ Yes	☐ No	☐ NA	
The requirement for lighting to conform to AC 150/5340-30, Design and Installation Details for Airport Visual Aids, AC 150/5345-50, Specification for Portable Runway and Taxiway Lights , and AC 150/5345-53 Airport Lighting Certification Program, is specified.	218.b(1)(f)	☐ Yes	☐ No	☐ NA	
The use of a lighted X is specified where appropriate.	218.b(1)(b), 218.b(3)	☐ Yes	☐ No	☐ NA	
The requirement for signs to conform to AC 150/5345-44, Specification for Runway and Taxiway Signs, AC 50/5340-18, Standards for Airport Sign Systems, and AC 150/5345-53, Airport Lighting Certification Program, is specified.	218.c	☐ Yes	☐ No	☐ NA	
Marking and Signs For Access Routes					
The CSPP specifies that pavement markings and signs intended for construction personnel should conform to AC 150/5340-18 and, to the extent practicable, with the MUTCD and/or State highway specifications.	219	☐ Yes	☐ No	☐ NA	
Hazard Marking and Lighting					
Prominent, comprehensible warning indicators for any area affected by construction that is normally accessible to aircraft, personnel, or vehicles are specified.	220.a	☐ Yes	☐ No	☐ NA	

Coordination	Reference	Addressed			Remarks
Hazard marking and lighting are specified to identify open manholes, small areas under repair, stockpiled material, and waste areas.	220.a	☐ Yes	☐ No	☐ NA	
The CSPP considers less obvious construction-related hazards.	220.a	☐ Yes	☐ No	☐ NA	
Equipment that poses the least danger to aircraft but is sturdy enough to remain in place when subjected to typical winds, prop wash and jet blast is specified.	220.b(1)	☐ Yes	☐ No	☐ NA	
The spacing of barricades is specified such that a breach is physically prevented barring a deliberate act.	220.b(1)	☐ Yes	☐ No	☐ NA	
Red lights meeting the luminance requirements of the State Highway Department are specified.	220.b(2)	☐ Yes	☐ No	☐ NA	
Barricades, temporary markers, and other objects placed and left in areas adjacent to any open runway, taxiway, taxi lane, or apron are specified to be as low as possible to the ground, and no more than 18 in high.	220.b(4)	☐ Yes	☐ No	☐ NA	
Barricades marked with diagonal, alternating orange and white stripes are specified to indicate construction locations in which no part of an aircraft may enter.	220.b(4)	☐ Yes	☐ No	☐ NA	
Highly reflective barriers with lights are specified to barricade taxiways leading to closed runways.	220.b(5)	☐ Yes	☐ No	☐ NA	
Markings for temporary closures are specified.	220.b(5)	☐ Yes	☐ No	☐ NA	
The provision of a contractor's representative on call 24 hours a day for emergency maintenance of airport hazard lighting and barricades is specified.	220.b(7)	☐ Yes	☐ No	☐ NA	
Protection of Runway and Taxiway Safety Areas					
The CSPP clearly states that no construction may occur within a safety area while the associated runway or taxiway is open for aircraft operations.	221.a(1), 221.c(1)	☐ Yes	☐ No	☐ NA	
The CSPP specifies that the airport operator coordinates the adjustment of RSA or TSA dimensions with the ATCT and the appropriate FAA Airports Regional or District Office and issues a local NOTAM.	221.a(2), 221.c(2)	☐ Yes	☐ No	☐ NA	

Coordination	Reference	Addressed			Remarks
Procedures for ensuring adequate distance for protection from blasting operations, if required by operational considerations, are detailed.	221.c(3)	☐ Yes	☐ No	☐ NA	
The CSPP specifies that open trenches or excavations are not permitted within a safety area while the associated runway or taxiway is open.	221.a(4)	☐ Yes	☐ No	☐ NA	
Appropriate covering of excavations in the RSA or TSA that cannot be backfilled before the associated runway or taxiway is open is detailed.	221.a(4)	☐ Yes	☐ No	☐ NA	
The CSPP includes provisions for prominent marking of open trenches and excavations at the construction site.	221.a(4)	☐ Yes	☐ No	☐ NA	
Grading and soil erosion control to maintain RSA/TSA standards are addressed.	221.c(5)	☐ Yes	☐ No	☐ NA	
The CSPP specifies that equipment is to be removed from the ROFA when not in use.	221.b	☐ Yes	☐ No	☐ NA	
The CSPP clearly states that no construction may occur within a taxiway safety area while the taxiway is open for aircraft operations.	221.c	☐ Yes	☐ No	☐ NA	
Appropriate details are specified for any construction work to be accomplished in a taxiway object free area.	221.d	☐ Yes	☐ No	☐ NA	
Measures to ensure that personnel, material, and/or equipment do not penetrate the OFZ or threshold siting surfaces while the runway is open for aircraft operations are included.	221.e	☐ Yes	☐ No	☐ NA	
Provisions for protection of runway approach/departure areas and clearways are included.	221.f	☐ Yes	☐ No	☐ NA	
Other Limitations on Construction					
The CSPP prohibits the use of open flame welding or torches unless adequate fire safety precautions are provided and the airport operator has approved their use.	222.a(2)	☐ Yes	☐ No	☐ NA	
The CSPP prohibits the use of flare pots within the AOA at any time.	222.a(4)	☐ Yes	☐ No	☐ NA	
The CSPP prohibits the use of electrical blasting caps on or within 1,000 ft (300 m) of the airport property.	222.a(3)	☐ Yes	☐ No	☐ NA	

Appendix 4. Construction Project Daily Safety Inspection Checklist

The situations identified below are potentially hazardous conditions that may occur during airport construction projects. Safety area encroachments, unauthorized and improper ground vehicle operations, and unmarked or uncovered holes and trenches near aircraft operating surfaces pose the most prevalent threats to airport operational safety during airport construction projects. The list below is one tool that the airport operator or contractor may use to aid in identifying and correcting potentially hazardous conditions. It should be customized as appropriate for each project.

Potentially Hazardous Conditions

Item	Action Required	or	None
Excavation adjacent to runways, taxiways, and aprons improperly backfilled.			☐
Mounds of earth, construction materials, temporary structures, and other obstacles near any open runway, taxiway, or taxi lane; in the related Object Free area and aircraft approach or departure areas/zones; or obstructing any sign or marking.			☐
Runway resurfacing projects resulting in lips exceeding 3 in (7.6 cm) from pavement edges and ends.			☐
Heavy equipment (stationary or mobile) operating or idle near AOA, in runway approaches and departures areas, or in OFZ.			☐
Equipment or material near NAVAIDs that may degrade or impair radiated signals and/or the monitoring of navigation and visual aids. Unauthorized or improper vehicle operations in localizer or glide slope critical areas, resulting in electronic interference and/or facility shutdown.			☐
Tall and especially relatively low visibility units (that is, equipment with slim profiles) — cranes, drills, and similar objects — located in critical areas, such as OFZ and approach zones.			☐
Improperly positioned or malfunctioning lights or unlighted airport hazards, such as holes or excavations, on any apron, open taxiway, or open taxi lane or in a related safety, approach, or departure area.			☐
Obstacles, loose pavement, trash, and other debris on or near AOA. Construction debris (gravel, sand, mud, paving materials) on airport pavements may result in aircraft propeller, turbine engine, or tire damage. Also, loose materials may blow about, potentially causing personal injury or equipment damage.			☐

Item	Action Required	or	None
Inappropriate or poorly maintained fencing during construction intended to deter human and animal intrusions into the AOA. Fencing and other markings that are inadequate to separate construction areas from open AOA create aviation hazards.			☐
Improper or inadequate marking or lighting of runways (especially thresholds that have been displaced or runways that have been closed) and taxiways that could cause pilot confusion and provide a potential for a runway incursion. Inadequate or improper methods of marking, barricading, and lighting of temporarily closed portions of AOA create aviation hazards.			☐
Wildlife attractants — such as trash (food scraps not collected from construction personnel activity), grass seeds, tall grass, or standing water — on or near airports.			☐
Obliterated or faded temporary markings on active operational areas.			☐
Misleading or malfunctioning obstruction lights. Unlighted or unmarked obstructions in the approach to any open runway pose aviation hazards.			☐
Failure to issue, update, or cancel NOTAMs about airport or runway closures or other construction related airport conditions.			☐
Failure to mark and identify utilities or power cables. Damage to utilities and power cables during construction activity can result in the loss of runway / taxiway lighting; loss of navigation, visual, or approach aids; disruption of weather reporting services; and/or loss of communications.			☐
Restrictions on ARFF access from fire stations to the runway / taxiway system or airport buildings.			☐
Lack of radio communications with construction vehicles in airport movement areas.			☐
Objects, regardless of whether they are marked or flagged, or activities anywhere on or near an airport that could be distracting, confusing, or alarming to pilots during aircraft operations.			☐
Water, snow, dirt, debris, or other contaminants that temporarily obscure or derogate the visibility of runway/taxiway marking, lighting, and pavement edges. Any condition or factor that obscures or diminishes the visibility of areas under construction.			☐
Spillage from vehicles (gasoline, diesel fuel, oil) on active pavement areas, such as runways, taxiways, aprons, and airport roadways.			☐

Item	Action Required	or	None
Failure to maintain drainage system integrity during construction (for example, no temporary drainage provided when working on a drainage system).			☐
Failure to provide for proper electrical lockout and tagging procedures. At larger airports with multiple maintenance shifts/workers, construction contractors should make provisions for coordinating work on circuits.			☐
Failure to control dust. Consider limiting the amount of area from which the contractor is allowed to strip turf.			☐
Exposed wiring that creates an electrocution or fire ignition hazard. Identify and secure wiring, and place it in conduit or bury it.			☐
Site burning, which can cause possible obscuration.			☐
Construction work taking place outside of designated work areas and out of phase.			☐

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U.S. Department of Transportation

Federal Aviation Administration

Advisory Circular

Subject: Standards for Airport Markings	**Date:** 9/27/2013	**AC No:** 150/5340-1L
	Initiated by: AAS-100	**Change:**

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

This advisory circular (AC) contains the Federal Aviation Administration (FAA) standards for markings used on airport runways, taxiways, and aprons.

2. Does this AC cancel any prior ACs?

This AC cancels AC 150/5340-1K, Standards for Airport Markings, dated September 3, 2010.

3. To whom does this AC apply?

The FAA recommends the guidelines and standards contained herein for the marking of airport runways, taxiways, and aprons. The use of these standards is the only method of compliance with the marking of runways, taxiways, and aprons for airports certificated under Title 14 Code of Federal Regulations Part 139, Certification of Airports (Part 139). These standards are to be used on all new airport projects that are under development and are to be implemented at all Part 139 certificated airports. Further, 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 Charge (PFC) Program. (See Grant Assurance No. 34, Policies, Standards, and Specifications, and PFC Assurance No. 9, Standards and Specifications.)

4. What are the principal changes in this AC? Changes are reflected by vertical bars located in the margins. This Revision:

a. Clarifies that runway surface markings on light colored pavement require black borders and glass beads (see paragraph 1.4). Airports certificated under Title 14 of the Code of Federal Regulations, Part 139, Certification of Airports, must meet these requirements within two years from the effective date of this AC.

b. Expanded and illustrated the removal of markings discussion (see paragraph 1.3.f).

c. Re-emphasizes that taxiway edge markings at entrance taxiways to a runway, including paved NO TAXI Islands are only to use dual continuous edge lines and not dual dashed edge lines (see paragraph 4.4.a). Airports certificated under Title 14 of the Code of Federal Regulations, Part 139, Certification of Airports, can meet the requirements upon the next repainting project.

d. Adds a new paragraph 4.12 for ramp control markings in use by the industry and air/ramp controllers which supplements existing guidance in paragraph 4.9, Surface Painted Apron Entrance Point Signs. Note, as in this paragraph, the terms "apron" and "ramp" are used interchangeably throughout this AC. The meaning is the same. Airports certificated under Title 14 of the Code of Federal Regulations, Part 139, Certification of Airports, can meet the requirements upon the next repainting project.

e. Replaces previous references to Airport Reference Code (ARC) with Runway Design Code (RDC) and Airplane Design Groups (ADG) with Taxiway Design Groups (TDG) for taxiway designs per revised AC 150/5300-13A, Airport Design. Taxiways marked according to previous standards based on Airplane Design Groups may retain their present marking schemes until such time as the taxiway is otherwise modified under Taxiway Design Group standards. The change in design concepts principally affects taxiway fillets.

f. Placed existing Figures 1-25 and new Figure A-5 within new Appendix A. Re-lettered old Appendices A, B and C as new Appendix B, Appendix C, and Appendix D respectively, with no new figures.

g. Adds runway marking criteria per new Figure A-5 referenced by AC 150/5300-13A, Airport Design, for intersecting runways. Airports certificated under Title 14 of the Code of Federal Regulations, Part 139, Certification of Airports, can meet the requirements upon the next repainting project.

h. Clarifies that the intermediate holding position marking for taxiway/taxiway intersections interrupts the taxiway edge marking (see paragraph 3.6.d). Airports certificated under Title 14 of the Code of Federal Regulations, Part 139, Certification of Airports, must meet these requirements within three years from the effective date of this AC.

i. Revises guidance for intersections of ILS/MLS holding position markings and non-movement area boundary markings with taxiway edge markings (see paragraph 3.4.d and paragraph 5.4.e).

j. Adds hyperlinks to internal and external references (allowing the reader to access documents located on the internet and to maneuver within this document) that are provided throughout this document and are identified with underlined text. When navigating within this document, return to the previously viewed page by pressing the "ALT" and "←" keys simultaneously.

k. Other marking changes per this revision, such as Figure A-5 and paragraphs 2.6, 3.3(d)(1) and 3.6(d), can meet the requirements upon the next repainting project.

5. How to use this AC.

a. This AC includes color-coded text boxes to emphasize safety initiatives, solutions to painting difficulties, and general remarks.

(1) Green (Painting) – explains painting precautions and solutions, such as when proportioning is permissible for runway surface markings.

(2) Red (Safety) – emphasizes safety initiatives.

(3) Gray (General) – contains general remarks.

b. All references to other FAA ACs and Orders are interpreted as the current version.

c. Most figures in this advisory circular are full scale AutoCAD drawings saved as MS Word versions. For some figures, certain details may appear to be missing (missing or broken lines) when either printed or viewed on a computer monitor. To view all the details in these figures, use the appropriate ZOOM function. In some instances, where there is a large surface area, a ZOOM value of over 250% may be necessary to view all details. Both this advisory circular and the original AutoCAD files for all figures are available for download at the FAA web site:

http://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.list/parentTopicID/85.

6. How are metrics represented?

Throughout this AC, customary English units are used followed with "soft" (rounded) conversion to metric units. The English units govern.

7. How can I get this and other FAA publications?

You can view a list of all ACs at http://www.faa.gov/regulations_policies/advisory_circulars/. You can view the Federal Aviation Regulations at http://www.faa.gov/regulations_policies/faa_regulations/.

Michael J. O'Donnell
Director of Airport Safety and Standards

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Chapter 1. Surface Markings for Airfield Pavements and Paved Airfield Roadways.

1.1. General.

This chapter provides the standards for surface markings used on paved airfield pavements (runways, taxiways, aprons) and paved airfield roadways. The standards for the surface markings assume that runways, taxiways, and aprons are built in accordance to the standard dimensions and layouts (e.g., clearances, fillets) in Advisory Circular (AC) 150/5300-13, Airport Design. The airport operator should expect difficulties when painting surface markings on non-standard infrastructure, such as a runway with a non-standard width. To assist airport operators, this advisory circular offers a few workable solutions for existing non-standard situations. Surface markings for large airplane parking positions and surface markings for unpaved airfield runways will be addressed at a future date in additional chapters.

Note: Use the zoom feature to view detail in any figure.

1.2. Definitions.

The following definitions apply to terms used in this AC.

a. Certificated Airport. An airport that has been issued an Airport Operating Certificate by the FAA under the authority of 14 CFR Part 139, Certification of Airports.

b. Commercial Service Airports and Passenger Enplanements. Defined in FAA Order 5100.38, Airport Improvement Program Handbook.

c. Displaced Threshold. A threshold that is located at a point on the runway other than the designated beginning of the runway.

d. Island. An unused paved or grassy area between taxiways, between runways, or between a taxiway and a runway. Paved islands are clearly marked as unusable, either by painting or the use of artificial turf. For the purposes of this AC, islands are also referred to as "NO-TAXI" islands.

e. Movement Area. The runways, taxiways, and other areas of an airport that are used for taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and aircraft parking areas (reference 14 CFR Part 139).

f. Non-precision Runway. For the purposes of this AC, a runway end having an instrument approach procedure that provides course guidance without vertical path guidance. See AC 150/5300-13 for additional information.

g. Precision Runway. For the purposes of this AC, a runway end having an instrument approach procedure that provides course and vertical path guidance conforming to Instrument Landing System (ILS) or Microwave Landing System (MLS) precision approach standards in International Civil Aviation Organization (ICAO) Annex 10, Compliance Statement, Aeronautical Telecommunications. See AC 150/5300-13 for additional information about precision approaches.

h. Threshold. The beginning of that portion of the runway that is available for landing. In some instances, the landing threshold may not coincide with the end of the opposite direction runway (see paragraph 1.2.c).

i. Visual Runway. A runway end without an existing or planned (on the Airport Layout Plan) straight-in instrument approach procedure.

1.3. Surface marking practices.

The following subparagraphs address common practices used in airport markings.

a. In some situations, these standards may call for markings with different meanings to be installed close together. Ensure that sufficient space is left between such markings such that an observer will not be confused. **Note:** The taxiway edge marking and non-movement area marking never coincide. See paragraph 5.4.

b. Increasing the Friction Coefficient of Surface Markings. AC 150/5370-10, Standards for Specifying Construction of Airports, Item P-620, Runway and Taxiway Painting, provides airport operators information to increase the friction coefficient of surface markings. Common practices include the spreading of silica sand on the marked surface immediately after painting and the use of glass beads in the marking materials. Glass beads or silica sand are required when durable markings (epoxy and methylacrylate based paints) are used. These paints are usually applied at 18 to 30 mils in dry thickness.

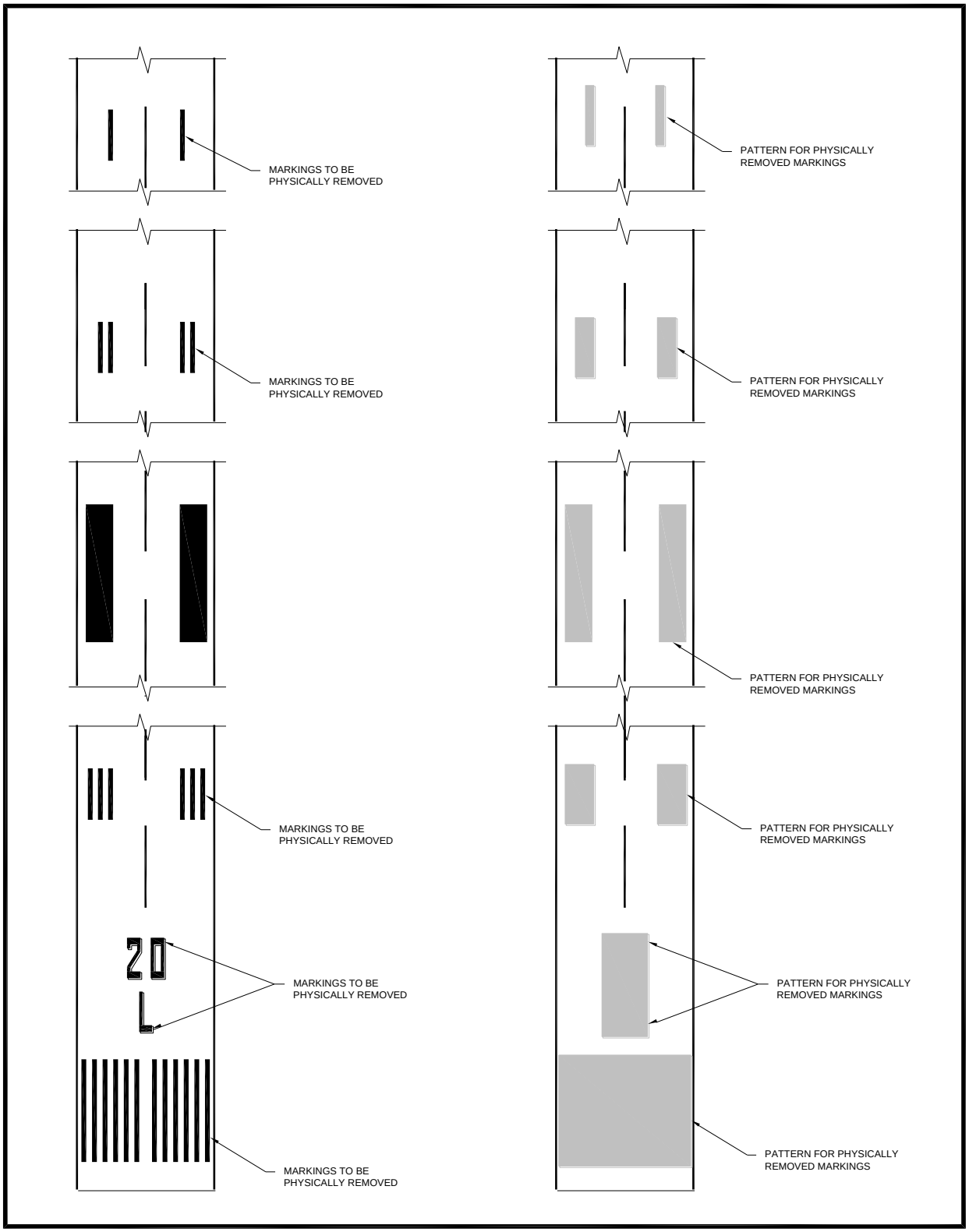
c. Paint Color Specifications, Requirements for Surface Preparation, Paint Application Rates and Methods, and Requirements for Preformed Thermal Plastic Markings. AC 150/5370-10 provides the paint color specifications, requirements for surface preparation, paint application rates, the various methods for applying paint, and the performance requirements for using only preformed thermoplastic markings. Precaution: Reflective tapes such as those commonly used for highways and city street applications are not to be used on the airside because of the potential for foreign object damage caused by loosened painted tape.

d. Striated Markings. Striated markings, which may be used in areas subject to frost heave, consist of painted stripes 4 inches (10 cm) to 8 inches (20 cm) in width that are separated by unpainted stripes. The width of the unpainted stripe may not exceed the width of the painted stripe. The width of the painted and unpainted stripes must be the same throughout the specific marking. Each edge of the marking must be a painted stripe. That is, a painted stripe is to begin and end within the width of the markings. Precaution: Because striated markings offer reduced visibility compared to non-striated markings, more frequent maintenance is required to maintain an acceptable level of visibility. Hence, striated markings are never used on Category II and Category III runways. The mixing of striated and non-striated markings is not permitted within a surface marking scheme. For example, in a 2-digit landing designator, one digit cannot be striated while the other is not. It is permitted to mix different marking schemes. For example, the landing designator is striated and the aiming point is not.

e. Temporary Markings. When selecting a material for temporary markings, consider the difficulty of removing the temporary marking when it is no longer needed. Some airports have had some success using water-based paint. Striated markings may also be used for

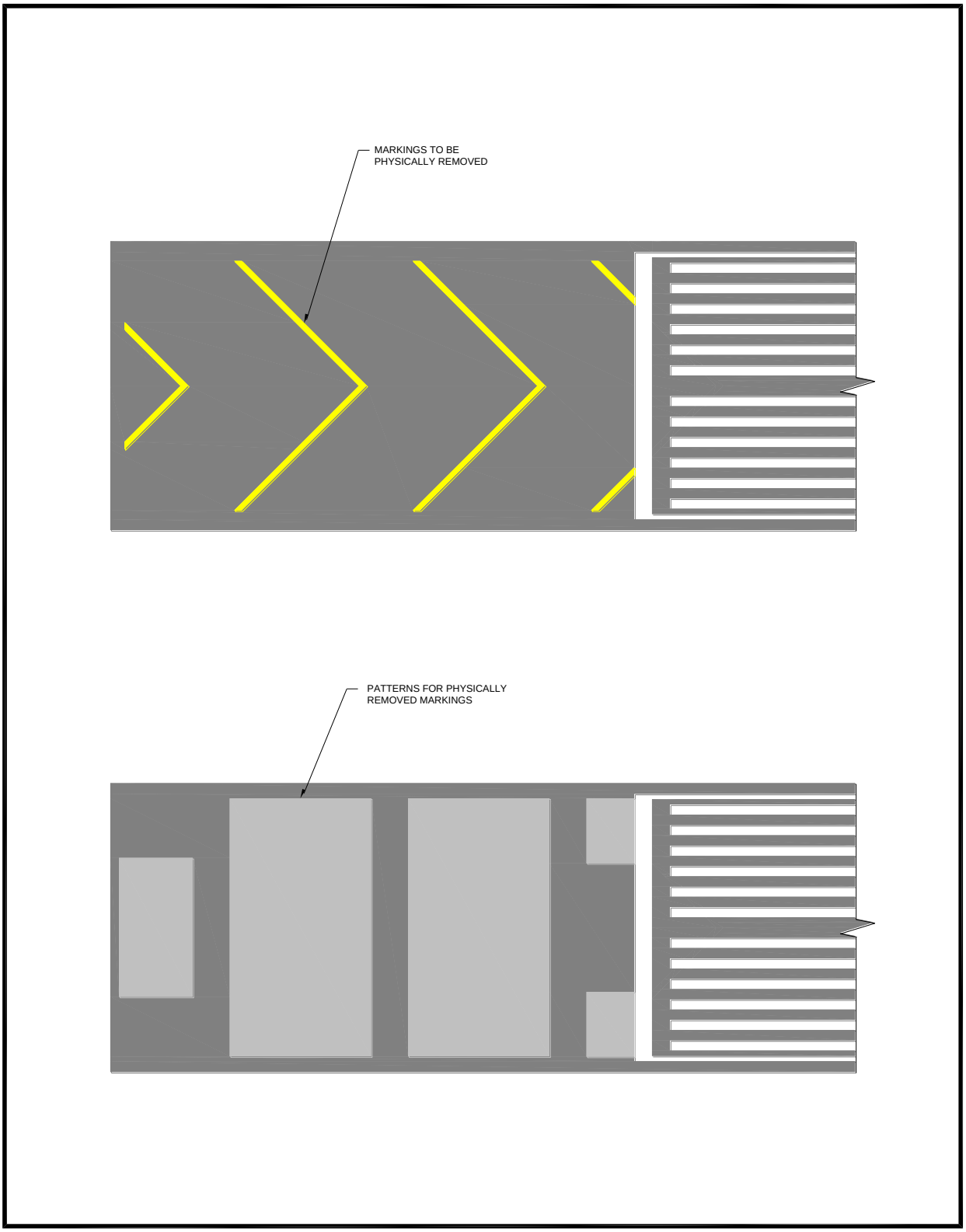
temporary markings, but they are never used to denote a closed runway or other closed pavement or for Category II or Category III runways.

f. Removal of Markings. Pavement markings that are no longer needed are not to be painted over but instead are to be physically removed. The FAA does not endorse painting over the old markings because this inadequate practice merely preserves the old marking which, in some cases, has misled pilots and required extra maintenance. Physical removal of markings is achieved by water blasting, shot blasting, sand blasting, chemical removal, or other acceptable means that do not harm the pavement. The physical removal of any old marking(s) must include a pre-determined larger size and shape of a removal area that encompasses the old marking(s) and by grouping adjacent markings together into a larger rectangular removal area. The rationale behind this practice is to eliminate the continued visual appearance of the removed marking(s). When a runway end or threshold is being moved, all of the markings that are being removed must be strikingly larger in size, grouped together with adjacent markings and be rectangular in shape. For example, use a single, larger rectangular removal area to encompass the entire runway designator 7 or 14L and provide a separate large rectangular area comprising all of the runway threshold markings along with a separate large rectangular area for the touchdown zone markings on the same side of the runway centerline. Also, the size and shape for the removal area for (1) Patterns A, B, and C holding position markings and (2) yellow arrow heads having a runway threshold bar or a runway demarcation bar must be much strikingly larger than the marking(s) being removed. For example, use a single, larger rectangular removal area to encompass all yellow arrow heads and the adjacent white runway threshold bar marking. See Figure 1-1, Figure 1-2, and Figure 1-3 for examples of marking removal patterns.



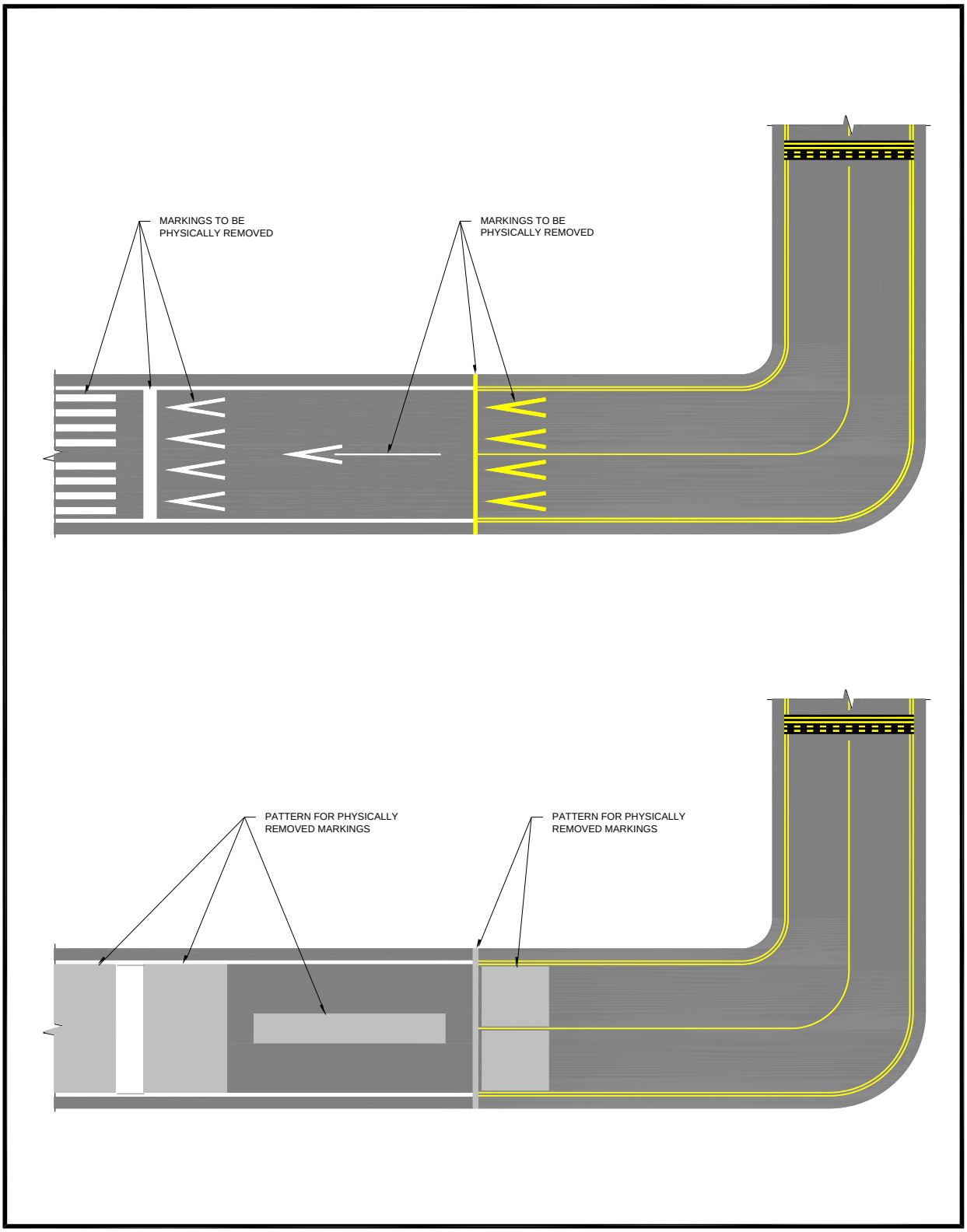
Note: For further details, see paragraph 1.3.f.

Figure 1-1. Example of marking removal patterns



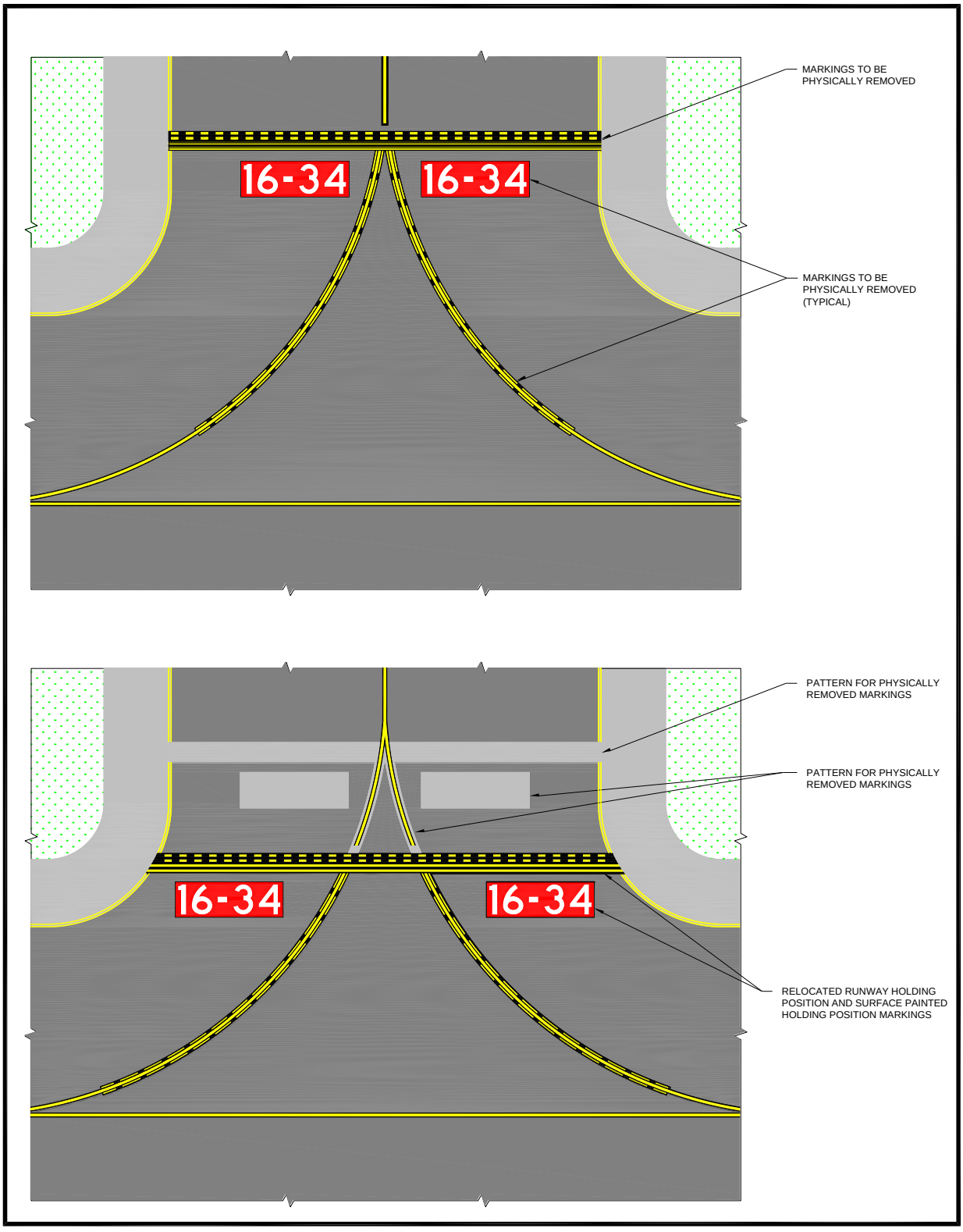
Note: For further details, see paragraph 1.3.f.

Figure 1-2. Example of marking removal patterns



Note: For further details, see paragraph 1.3.f.

Figure 1-3. Example of marking removal patterns



Note: For further details, see paragraph 1.3.f.

Figure 1-4. Example of marking removal patterns

g. Painted Numbering System for Record Keeping of Surface Painted Markings. To facilitate the daily inspection, scheduled maintenance, necessary repairs, etc. for surface markings the airport operator may use a numbering system or alphanumeric system that is located in a corner of the surface marking. Figure 1-5 shows a numbering system adopted by one airport for identifying each surface marking listed in their Sign Plan. If employed, the height of the inscription should be small and inconspicuous to all viewers except an individual standing next to the surface marking.

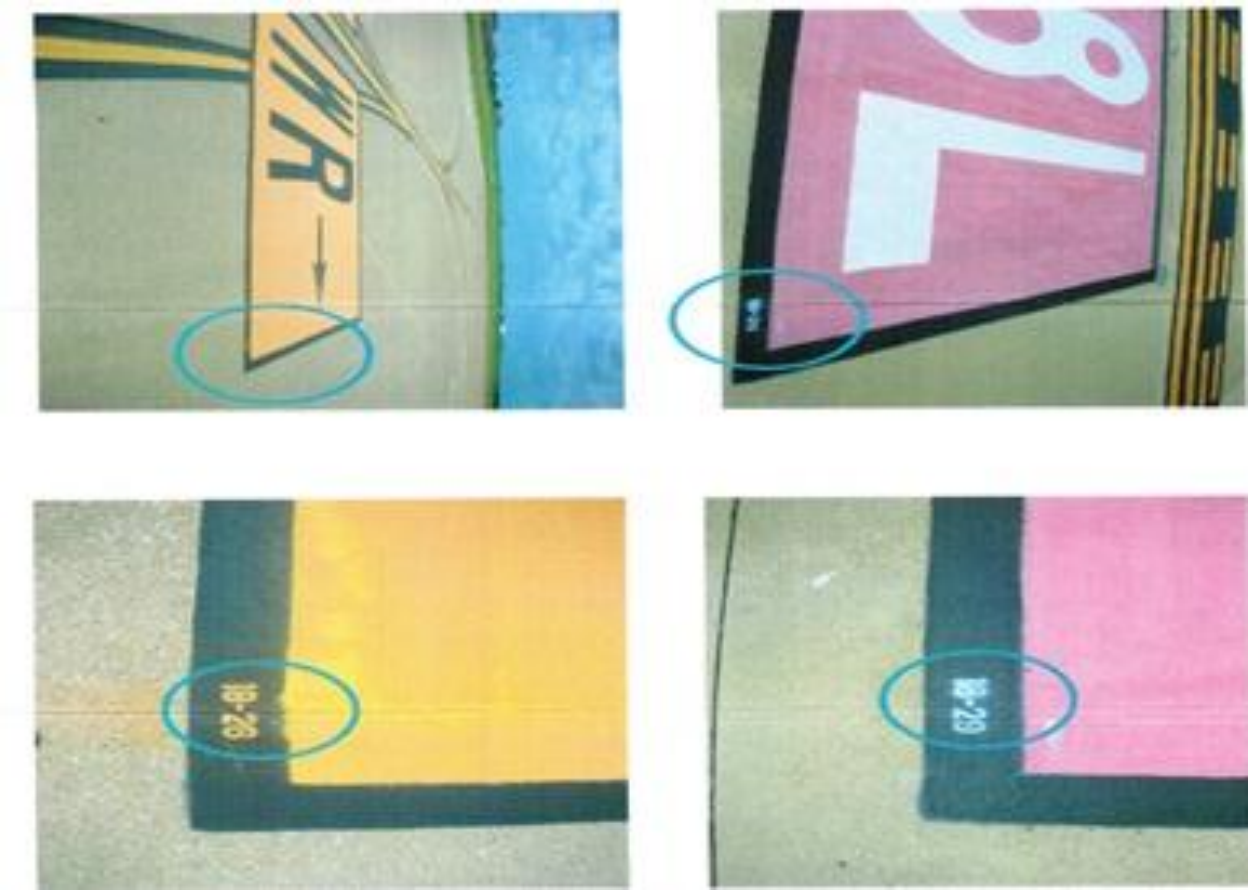


Figure 1-5. Example of painted numbering system for surface painted markings

1.4. Requirements and recommendations for enhanced conspicuity of surface markings on concrete pavements and light colored pavements.

Surface markings that cannot be seen by pilots and other individuals operating on paved airfield surfaces are ineffective. Two proven techniques that help airport operators enhance the conspicuity of surface markings are (1) outlining surface markings with black borders on concrete pavements and light-colored pavements and (2) placing glass beads in paint. However, glass beads are not to be used in black paint, including numerals and inscriptions found in Appendix B. Table 1-1 serves as a general guide for determining when existing asphalt concrete surfaces or asphalt treated surfaces may be classified as a light-colored pavement, i.e., when to outline a required surface marking with a black border.

Table 1-1. General guidelines for determining light-colored pavements

Painting a Black Border			
Pavement Surface Type	Age of Pavement Surface [1]		
	New	Up to 2 years old	Over 2 years old
Portland Cement Concrete	Yes	Yes	Yes
Asphalt Concrete	No	No	Yes
Asphalt Treated	No	No	Yes

Note 1: This table serves only as a general guide since an existing asphalt pavement at one airport location may not experience the same rate of surface color deterioration as at another airport location.

a. Technique 1 – Outlining Surface Markings with Black Borders on Concrete Pavements and Light-Colored Pavements. The degree of contrast (conspicuity) between surface markings on light-colored pavements, in particular on concrete pavements and older asphalt pavements, can be increased by outlining all edges of the surface marking with a black border. Appendix B provides illustrations of recommended patterns for various surface markings outlined in black. Black borders, except for enhanced taxiway centerline applications, are 6 inches (15 cm) or greater in width to enhance the conspicuity of certain painted surface markings on concrete pavements and light-colored pavements. The borders for the outside dashes of the enhanced taxiway centerline marking can range from 3 to 6 inches (7.5 to 15 cm). See Table 1-2 for surface markings that are required or recommended to have black borders.

(1) Surface Markings that Require Black Borders.

(i) Runway centerline marking (per paragraph 2.4).

(ii) Runway threshold marking (per paragraph 2.5).

(iii) Runway displaced threshold marking (per paragraph 2.9).

(iv) Runway threshold bar marking (per paragraph 2.9.a).

(v) Runway aiming point marking (per paragraph 2.6).

(vi) Runway landing designator marking (per paragraph 2.3).

(vii) Runway touchdown zone markings (per paragraph 2.7).

(viii) All holding position markings (per paragraphs 3.2, 3.3, 3.4, and 3.5) and the non-movement area boundary marking (per paragraph 5.4).

(ix) Intermediate holding position marking for taxiway/taxiway intersections (per paragraph 3.6).

(x) All taxiway centerline markings on taxi routes designated as surface movement guidance and control system (SMGCS) routes (per paragraph 4.2).

(xi) Enhanced taxiway centerline marking (per paragraph 4.3).

(xii) Surface painted holding position sign marking (per paragraph 4.5).

(xiii) Geographic position marking (per paragraph 4.11).

(2) Surface Markings Recommended for Black Borders. This advisory circular strongly recommends outlining all other markings not listed paragraph 1.4.a(1), particularly taxiway centerlines per paragraph 4.2.

Table 1-2. Requirements and recommendations for black borders and glass beads

Marking	Black Border	Glass Beads
Runway centerline marking (per paragraph 2.4).	Required	Required
Runway threshold marking (per paragraph 2.5).	Required	Required
Runway displaced threshold marking (per paragraph 2.9).	Required	Required
Runway threshold bar marking (per paragraph 2.9.a).	Required	Required
Runway aiming point marking (per paragraph 2.6).	Required	Required
Runway landing designator marking (per paragraph 2.3).	Required	Required
Runway touchdown zone markings (per paragraph 2.7).	Required	Required
Runway edge marking (per paragraph 2.8).		Recommended
Runway demarcation bar marking (per paragraph 2.9.c).		Recommended
All holding position markings (per paragraphs 3.2, 3.3, 3.4, and 3.5).	Required	Required
Intermediate holding position marking for taxiway/taxiway intersections (per paragraph 3.6).	Required	
Taxiway centerline markings (per paragraph 4.2).	Recommended	Required
All taxiway centerline markings on taxi routes designated as surface movement guidance and control system (SMGCS) routes (per paragraph 4.2).	Required	Required
Enhanced taxiway centerline markings per paragraph 4.3.	Required	Required
Taxiway edge marking (per paragraph 4.4).		Recommended
Geographic position marking (per paragraph 4.11).	Required	Required
Surface painted signs for holding position signs (paragraph 4.5), taxiway direction signs (paragraph 4.6), taxiway location signs (paragraph 4.7), gate destination signs (paragraph 4.8), and apron entrance point signs (paragraph 4.9).	Required	Required
Non-movement area boundary marking (per paragraph 5.4).	Required	Required
All other markings not listed paragraph 1.4.a(1).	Recommended	

b. Technique 2 – Use of Glass Beads on Permanent Pavement Markings. Glass beads identified in Item P-620 of AC 150/5370-10 are an effective means of enhancing the conspicuity of surface markings when aircraft and vehicles operate at night, during low-visibility

conditions, or when the pavement surface is wet. The glass beads used in the below applications should meet the specifications found in AC 150/5370-10, Item P-620. Due to the additional increase in marking conspicuity caused by certain glass beads, the FAA recommends that runway holding position markings contain either Type III or Type IV glass beads as determined by the airport operator. If Type IV glass beads that have a larger diameter are used, then they should only be applied in higher-built materials, such as TT-P-1952E-Type III waterborne paint, epoxy, methyl methylacrylate, or preformed thermoplastic. Precaution: Glass beads should never be used in black paint, including numerals and inscriptions found in Appendix B. See Table 1-2 for surface markings that are required or recommended to have glass beads.

Glass Bead Requirement Per AC 150/5370-10, Paragraph 620-3.5, Application (General)
"Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate(s) shown in Item P-620, Table 1 of AC 150/5370-10. Glass beads shall not be applied to black paint or green paint, including numerals and inscriptions found in Appendix B. Type III beads shall not be applied to red or pink paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment should be performed."

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Chapter 2. Surface Markings for Runways.

2.1. Application.

The minimum requirements for surface marking schemes used for runways are a direct function of the approach category for each runway threshold and the existence of displaced thresholds, stopways, blast pads, or extra wide shoulders. Runways having the same approach category off both runway thresholds will show the same surface marking scheme from threshold to threshold (with some exceptions, such as the runway designator.) In comparison, runways with different approach categories will show two different surface marking schemes. The complete runway surface marking schemes required by a runway combine Table 2-1 requirements with the physical structure, such as blast pads or stopways, and usage of the runway.

a. Table 2-1 identifies the minimum required surface marking schemes for paved runways according to their threshold approach category. Figure A-1, Figure A-2, Figure A-3, and Figure A-6 provide the dimensional standards for the surface marking schemes. An airport operator may paint a runway with additional surface marking schemes than required, such as a visual runway with runway edge markings or the aiming point marking, if deemed necessary by the FAA. Furthermore, surface markings beyond those described in Table 2-1 are required to support particular operations, such as a displaced threshold, or to identify runway related features, such as blast pads or stopways.

Table 2-1. Minimum required runway surface marking schemes for paved runways

	Threshold Approach Category		
Runway Surface Marking Scheme	Visual Approach	Non-precision Approach (and approaches with vertical guidance not lower than ¾ -statute mile visibility)	Precision Approach (Approaches with lower than ¾ -statute mile visibility)
Landing Designator (par. 2.3)	X	X	X
Centerline (par. 2.4)	X	X	X
Threshold Markings (par. 2.5)	Note 1	X	X
Aiming Point (par. 2.6)	Note 2	Note 3	X
Touchdown Zone (par. 2.7)			X
Edge Markings (par. 2.8)	Note 4	Note 4	X

Note 1: Required on runways serving approach categories C and D airplanes and for runways used, or intended to be used, by international commercial air transport.
Note 2: Required on 4,200-foot (1,280 m) or longer runways serving approach categories C and D airplanes.
Note 3: Required on 4,200-foot (1,280 m) or longer instrumented runways.
Note 4: Used when the full runway pavement width may not be available for use as a runway.

b. Runways with a displaced threshold, blast pad, stopway, or extra wide shoulders require additional marking schemes not identified in Table 2-1. These surface marking schemes and others not in Table 2-1 are discussed separately in this advisory circular. See AC 150/5300-13 for detailed information about the location of displaced thresholds, blast pads, and stopways.

Application of Proportioning Runway Markings for Non-Standard Runway Widths (Painting)

The dimensional size for the runway surface marking promulgated by this advisory circular is based on the assumption that the runway has a standard runway width as prescribed by AC 150/5300-13. For convenience, the standard widths are shown in Table 2-2. below.

Airport operators with non-standard runway widths may, for specified surface markings, proportionally adjust the marking's width to be less than the standard scheme. Under substandard conditions, the width of marking is in direct proportion to the available runway width. However, the corresponding length for the marking is never reduced.

Subsequent paragraphs in this advisory circular will specify, via a green-shaded solution box, those runway surface markings that may be proportioned. The absence of a green-shaded solution box in a subsequent paragraph implies that runway surface marking, such as the runway centerline, is not to be decreased in width even if other nearby runway surface markings are proportionally adjusted.

2.2. Interruption of runway surface markings.

At the intersection of two runways, the surface markings of one runway are, with the possible exception of runway edge markings (such as closed V-shaped runways), fully displayed through the intersection while the surface markings of the other runway are completely interrupted. This process of removing runway surface markings from one runway establishes an order of precedence among the different runways.

a. Order of Precedence. The order of precedence for displaying the runway surface marking schemes of one runway over the other runway at the intersection of these runways should follow this order:

(1) Precision approach runway, Category III.

(2) Precision approach runway, Category II.

(3) Precision approach runway, Category I.

(4) Non-precision approach runway.

(5) Visual runway.

For an intersection of runways of the same precedence, the preferred higher precedence runway is the one having the lowest approach minimums or the runway end most often used.

b. Lesser Precedence Runways. The manner in which a lesser precedence runway intersects a higher precedence runway may require the shifting or complete removal of certain surface markings that fall within the intersection. As shown in Figure A-4, the most affected surface markings are the runway centerline, runway edge markings, aiming point markings, and

runway touchdown zone markings. The latter two runway markings may have implications when shifted or removed. See paragraphs 2.2.c and 2.6 for shifting an aiming point marking, and see paragraph 2.7 for removing touchdown zone markings.

c. Consequences When Shifting the Aiming Point Markings. Figure A-4 shows one possible conflict that could occur when the aiming point markings are relocated.

(1) When the aiming point markings of a given runway that are in the intersection of two runways need to be moved more than 200 feet (61 m) away from the existing threshold, the airport operator will have to displace the existing threshold or designate a new runway end (threshold) in order to retain the distance between the threshold and the aiming point marking as illustrated in the bottom illustration of Figure A-4. The preferred distance to be maintained between the newly designated threshold and the shifted aiming point marking is 1,020 feet (311 m); see paragraph 2.6.

(2) Runways with an approach landing aid, such as Precision Approach Path Indicators (PAPIs) or Visual Approach Slope Indicators (VASIs), which are co-located with the aiming point markings, can be negatively affected when an excessive shifting of the aiming point marking occurs. The consequence could be a non-compatible threshold crossing height for landing airplanes. When the aiming point markings are shifted more than 60 feet (18.3 m), the co-located PAPI or VASI should be evaluated for relocation to provide a correct vertical guidance to pilots. See AC 150/5340-30, Design and Installation Details for Airport Visual Aids, to determine if the impact of shifted aiming point markings warrants a relocation of the co-located PAPI (or other runway approach aids).

(3) For landing safety, the FAA requires that whenever the distance between the threshold and aiming point markings is 1,220 feet (372 m) or more, the airport operators place a note in the Airport/Facility Directory (A/FD) to inform pilots about the increased distance existing between the threshold and the aiming point markings.

d. Closed V-Shaped Runway Ends Configuration. The closed V-shaped runway ends configuration is a pavement geometry where two runway ends commence from the same location but proceed in different directions (see Figure 2-1). This undesirable geometry requires a special shifting procedure of the runway landing designator marking of the lesser precedence runway farther down the runway than prescribed by paragraph 2.3. The special procedure is as follows. On the lesser order runway, locate the point on its runway centerline that is perpendicular to the inside common corner of the two intersecting runways. Once this base point is located, move this base point 20 feet (6.5 m) down the runway centerline to relocate the bottom of the letter or number(s) used for the runway landing designator. For an intersection of runways of the same precedence, the preferred higher precedence runway is the one having the lowest approach minimums or the runway end most often used.

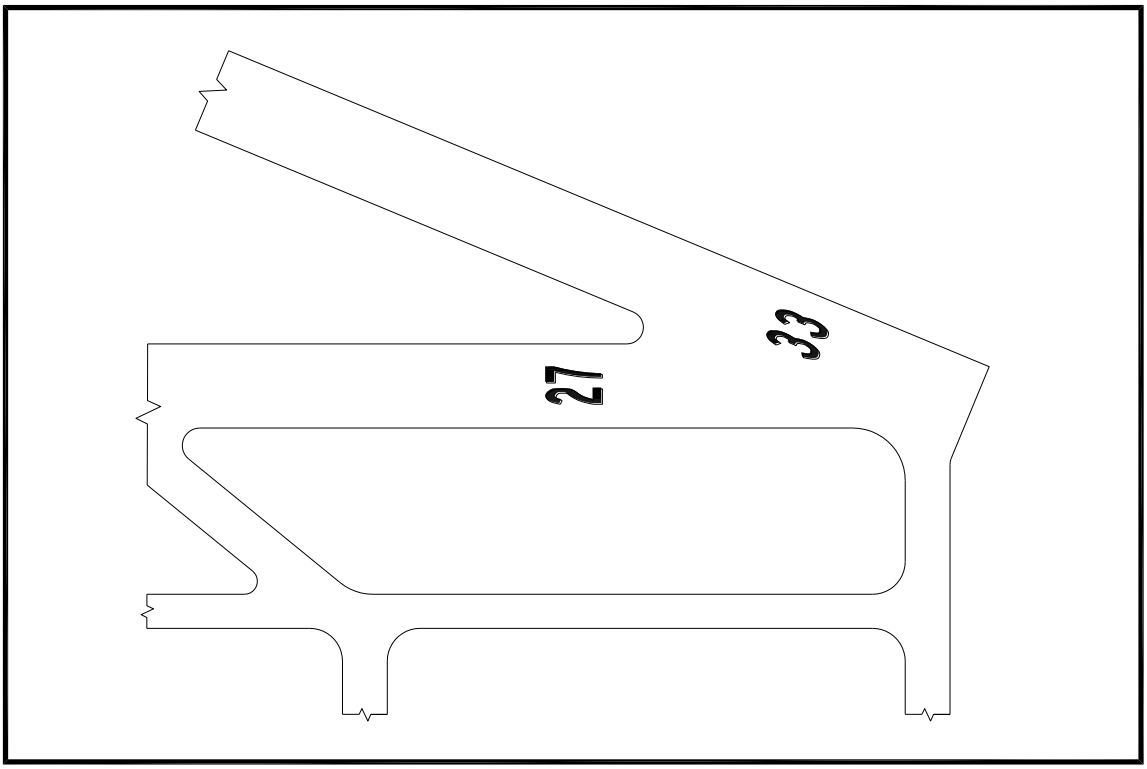


Figure 2-1. Closed V geometry

Wrong-Runway Takeoffs Mitigation (Safety)
In an effort to eliminate the possibility of a "wrong-runway" takeoff operation by pilots, the airport operator should reconstruct closed V-shaped runway geometries to a different geometry, possibly an X-shaped geometry.

2.3. Runway landing designator marking.

a. Purpose. The runway landing designator marking identifies a runway end.

b. Requirement. See Table 2-1.

c. Location. Runway landing designator marking(s) must be located from the runway threshold per Figure A-1, Figure A-2, Figure A-3, or from the displaced threshold per Figure A-8. All these figures show the start location for both types of thresholds.

d. Color. Runway landing designator markings are white. See paragraph 1.4 for required and recommended techniques to enhance visibility of this surface marking.

e. Characteristics.

(1) A runway landing designator marking consists of a number comprising one or two digits. When parallel runways exist, the number is further supplemented with a letter.

(2) A single-digit runway landing designation number is never preceded by a zero.

(3) For single runways, dual parallel runways, and triple parallel runways, the designator number is the whole number nearest the one-tenth of the magnetic azimuth along the runway centerline when viewed from the direction of approach. For example, where the magnetic azimuth along the runway centerline is 183 degrees, the runway designator marking would be 18; for a magnetic azimuth of 87 degrees, the runway designation marking would be 9. For a magnetic azimuth ending in the number "5" such as 185 degrees, the runway designator marking may be either 18 or 19.

(4) On four or more parallel runways, one set of adjacent runways is numbered to the nearest one-tenth of the magnetic azimuth and the other set of adjacent runways is numbered to the next nearest one-tenth of the magnetic azimuth.

(5) For parallel runways, each runway landing designator number must be supplemented by a letter, in the order shown from left to right when viewed from the direction of approach as prescribed by the following marking criteria. Different labeling patterns than those prescribed below are permissible under certain circumstances as identified in paragraph 2.3.e(6)

(i) Two parallel runways having a magnetic azimuth of 182 degrees are designated "18L" and "18R."

(ii) Three parallel runways having a magnetic azimuth of 87 degrees are designated "9L," "9C," and "9R."

(iii) Four parallel runways having a magnetic azimuth of 324 degrees are designated "32L," "32R," "33L," and "33R."

(iv) Five parallel runways having a magnetic azimuth of 138 degrees are designated "13L," "13R," "14L," "14C," and "14R" or "14L," "14R," "13L," "13C," and "13R." Other combinations exist for this case. See paragraph 2.3.e(6).

(v) Six parallel runways having a magnetic azimuth of 83 degrees are designated "8L," "8C," "8R," "9L," "9C," and "9R. See paragraph 2.3.e(6).

(vi) Seven parallel runways having a magnetic azimuth of 85 degrees – the runways would be designated "8L," "8C," "8R," "9L," "9C," "9R," and "10." Other combinations exist for this case. See paragraph 2.3.e(6).

(6) There are certain runway placements where the surface marking schemes for parallel runways provided in paragraph 2.3.e(5) may not be appropriate because their orientation may lead to pilot confusion. For example, the marking scheme recommended for parallel runways on the same side of a terminal is to follow paragraph 2.3.e(5). However, when two parallel runways are separated by a large distance, as by a central terminal or several terminals, it is preferable to designate the runways as non-parallel runways to avoid pilot confusion. Another case that may cause pilot confusion is a turf runway that is parallel to paved visual runway but at a great distance from a higher precedence paved runway. In general, the

airport operator should carefully choose how to mark parallel runways to eliminate pilot confusion.

The appearance of the letters and numbers used for runway landing designator markings are in the form and proportion as shown in Figure A-6. The spacing between numbers and letters are as shown in Figure A-1, Figure A-2, Figure A-3, and Figure A-6. However, with the exception of the numerals 6 and 9, all numerals and the letters L, C, and R are 60 feet (18.3 m) in height. Numerals 6 and 9, which are 63 feet (18.9 m) in height, follow the Rule of 69. That is, although the numerals 6 and 9 are taller, the 3-foot tips of the numerals are ignored so that their separations from the threshold markings, the letters L-C-R, the first runway centerline, and the start of the runway threshold remain as shown in Figure A-1, Figure A-2, and Figure A-3.

Application of Proportioning Runway Markings for Airplane Design Group (ADG) I Runway Width (Painting)
Due to the space limitations on very narrow runways, the size and spacing of the numbers and letters are reduced only when necessary such that the painted runway landing designator is no closer than 2 feet (0.6 m) from the runway edge or runway edge markings. For example, this problem may occur when painting certain dual-numbered runway landing designators spaced 15 feet (4.5 m) apart on an ADG I runway width of 60 feet (18.3 m). In such cases, first reduce the 15-foot (4.5-m) spacing to 10 feet (3.1 m) and retain the size of numerals and letter per Figure A-6. Second, reduce the 15-foot (4.5-m) spacing to 10 feet (3.1 m) and reduced the size of numerals and letter proportionally to maintain the 2-foot (0.6-m) edge or runway edge markings clearance.

2.4. Runway centerline marking.

a. Purpose. The runway centerline marking identifies the physical center of the runway width and provides alignment guidance to pilots during takeoff and landing operations. For lighting provisions, see AC 150/5340-30.

b. Requirement. See Table 2-1.

c. Location. A runway centerline marking is located along the physical center of the runway width and spaced between the runway landing designation markings as shown in Figure A-1, Figure A-2, and Figure A-3.

d. Color. The runway centerline marking is white. See paragraph 1.4 for required and recommended techniques to enhance this surface marking.

e. Characteristics. A runway centerline marking consists of a line of uniformly spaced stripes and gaps and of uniform width.

(1) The stripes are 120 feet (36.5 m) in length and the gaps are 80 feet (24.3 m) in length.

(2) The minimum width of the stripes is:

- 36 inches (90 cm) for precision runways.
- 18 inches (45 cm) for non-precision runways.
- 12 inches (30 cm) for visual runways.

(3) To accommodate varying runway lengths, all adjustments to the uniform pattern of runway centerline stripes and gaps are made near the runway midpoint (defined as the distance between the two thresholds or displaced thresholds). Under such cases, reduce the lengths of both the stripes and gaps starting from midpoint and proceed toward the runway thresholds. Reduced stripes must be at least 80 feet (24 m) in length, and the reduced gaps must be at least 40 feet (12.3 m) in length. The affected stripes and gaps within the section should show a uniform pattern.

2.5. Runway threshold marking.

a. Purpose. A runway threshold marking, commencing 20 feet (6 m) from the actual start point of runway threshold, closely identifies the actual beginning point of the runway threshold used for landings. For lighting provisions, see AC 150/5340-30.

b. Requirement. See Table 2-1.

c. Location. The runway threshold marking starts 20 feet (6 m) from the actual start point of the runway threshold as shown in Figure A-1 and Figure A-2. This value remains the same even though a 10-foot (3-m) white threshold bar is introduced, such as for displaced thresholds or the addition of a blast pad or stopway, as shown in Figure A-9. Previously, when a displaced threshold was painted or a blast pad or stopway added, the 20-foot (6-m) dimension was increased to 30 feet (9 m) to accommodate the requirement for painting the runway threshold bar. When any runway threshold or displaced threshold is remarked with threshold bar markings, or when a blast pad or stopway is added, the separation is 10 feet (3 m) as shown in Figure A-8.

d. Color. The components of a runway threshold marking are white. See paragraph 1.4 for required and recommended techniques to enhance this surface marking.

e. Characteristics. The runway threshold marking consists of a pattern of longitudinal stripes of uniform dimensions spaced symmetrically about the runway centerline. The number of longitudinal stripes and their spacing is determined by the runway width.

(1) Table 2-2. provides the number of longitudinal stripes for runways having standard runway widths as defined by AC 150/5300-13. Figure A-1 illustrates the pattern for a 150-foot (45-m) wide runway. See paragraph 2.5.e(3) for painting guidance applicable to non-standard runway widths.

Table 2-2. Number of runway threshold stripes for standard runway widths

Standard runway widths	Number of symmetrical stripes
60 feet (18.3 m)	4
75 feet (22.9 m)	6
100 feet (30.5 m)	8
150 feet (45.7 m)	12
200 feet (61 m)	16

(2) For standard runway widths, the longitudinal stripes are 150 feet (45.7 m) long and 5.75 feet (1.75 m) wide with the outer edges spaced (stripe-gap) 5.75 feet (1.75 m) apart. However, the two longitudinal stripes nearest the runway centerline are doubled spaced, i.e., outer edges of the near-most pair are 11.5 feet (3.5 m) apart. Figure A-1 illustrates the stripe-gap pattern for 150-foot (46-m) wide runways. The stripe-gap pattern allows sufficient room to paint runway edge markings without interfering with the outermost longitudinal stripes.

Application of Proportioning Runway Markings for Non-Standard Runway Widths (Painting)

For standard 75-foot (23-m) wide runways that use 36-inch (90-cm) wide runway edge markings, the stripe-gap pattern of 5.75 feet (1.75 m) is reduced to 5.50 feet (1.68 m).

(3) For non-standard runway widths, the same stripe-gap pattern is continued from the runway centerline until the outermost longitudinal stripe is not closer than 4 feet (1.2 m) from the runway edge. For example, for a non-standard 125-foot (38-m) wide runway, the stripe-gap pattern yields a total of 10 longitudinal stripes symmetrical about the runway centerline. In no case should the stripe-gap pattern exceed 92 feet (27 m) on either side of the runway centerline. The value of 92 feet (27 m) is the width for the pattern used on the standard 200-foot (61-m) wide runways.

(4) When there is pavement in excess of 5 feet (1.5 m) prior to the actual start of the runway threshold and (a) pilots may confuse the pavement as part of the actual runway or (b) the pavement does not have the same load bearing capacity as the runway, then painting of a runway threshold bar per paragraph 2.9 is required. In contrast, if the installation of landing threshold lights requires pavement to support the light fixtures and the supportive pavement abuts the start point of the runway threshold, then the supportive pavement is not considered a part of the runway. In this instance, the painting of a runway threshold bar is not required.

2.6. Runway aiming point marking.

a. Purpose. A runway aiming point marking provides a visual aiming point for landing operations.

b. Requirement. See Table 2-1.

c. Location. The preferred beginning of the aiming point marking starts 1,020 feet (311 m) from the runway threshold as shown in Figure A-1, Figure A-2, and Figure A-3. However, this preferred separation is not adequate for all cases as partially discussed below.

Note: The term preferred assumes the following conditions: standard visual glide slope of 3 degrees; no obstacle in the approach area affecting the obstacle clearance surface of the PAPI; standard threshold crossing heights per AC 150/5340-30; sufficient runway length so not to force the placement of the aiming point marking; no rapid terrain drop off near the approach threshold that encounters severe turbulence; no elevation differences between the threshold and the installation zone of the PAPI.

(1) Intersecting Runways. A separation tolerance of plus or minus 200 feet (61 m) is allowed when it is necessary to shift the aiming point marking to avoid overlapping aiming point markings at dual runway intersection as shown in Figure A-4 and Figure A-5, and discussed in paragraph 2.2.c. However, depending on the threshold crossing heights and the available runway approach aids, the shifting of the aiming point markings may negatively impact the threshold crossing heights for approaching airplanes. One potential impact of the shift is to the co-located runway approach aids, such as the PAPI, in which the previous vertical guidance offered by the aiming point marking to pilots is now incompatible with the threshold crossing height associated with the runway approach aid. Under such conditions, adjustment in the location of the affected runway approach aid may be necessary after an evaluation so that the co-located relationship between the PAPI (and other approach aids) and the shifted aiming point marking permits an acceptable landing operation for both landing aids.

(2) Compatible Threshold Crossing Heights. See AC 150/5340-30 to determine if the impact of a relocated aiming point marking warrants relocating the co-located PAPI (or other runway approach aids).

d. Color. The runway aiming point marking is white. See paragraph 1.4 for required and recommended techniques to enhance this surface marking.

e. Characteristics.

(1) The runway aiming point marking consists of two conspicuous rectangular markings, 150 feet (45.7 m) in length for runways of at least 4,200 feet (1280 m) in length between the thresholds (or a displaced threshold(s)) and 100 feet (30.5 m) in length for lesser lengths between the thresholds (or a displaced threshold(s)), that are located symmetrically on each side of the runway centerline as shown in Figure A-1, Figure A-2, and Figure A-3. See Table 2-2. for the dimensions of standard runway widths per AC 150/5300-13.

(2) The width of each rectangular marking is as follows:

(i) 30 feet (9.1 m) for standard runway widths of 150 feet (45.7 m) or greater.

(ii) 20 feet (6 m) for standard runway widths of 100 feet (30.5 m).

(iii) 15 feet (5 m) for standard runway widths of 75 feet (22.9 m).

(iv) 12 feet (3.7 m) for a standard runway width of 60 feet (18.3 m).

(3) The lateral spacing between the inner sides of the runway aiming point markings is as follows:

(i) For runways of 150 feet (45.7 m) or more in width, the lateral spacing between the inner sides of the rectangular bars centered on the runway centerline is 72 feet (21.9 m).

(ii) For runways of 100 feet (30.5 m) in width, the lateral spacing between the inner sides of the rectangular bars centered on the runway centerline is 48 feet (14.6 m).

(iii) For runways of 75 feet (22.9 m) in width, the lateral spacing between the inner sides of the rectangular bars centered on the runway centerline is 36 feet (11.0 m).

(iv) For runways of 60 feet (18.3 m) in width, the lateral spacing between the inner sides of the rectangular bars centered on the runway centerline is 28.8 feet (8.8 m).

Application of Proportioning Runway Markings for Non-Standard Runway Widths and for Standard Runway Widths less than 150 feet (45.7 m) (Painting)

For runways with widths below 150 feet (45.7 m), the width of the rectangular bars and their lateral spacing between the inner sides of the rectangular bars are adjusted in proportion to the available runway width by using the 150-foot (45.7-m) width runway parameters to determine the percentage decrease in lateral spacing and width of each marking. For example, a non-standard 70-foot wide runway would apply 70/150 = 0.467 to obtain a lateral spacing of 72 × 0.467 = 33.6 feet (10.25 m) between the pair and an individual width of 30 × 0.467 = 14 feet (4.27 m).

If runway edge markings are also painted, which are not reduced, then the adjustment should add the width of the corresponding runway edge markings plus a minimum 1-foot (0.3-m) clearance between the outer edge of the aiming point marking and the runway edge marking.

Lateral spacing – in no case is the lateral spacing less than 30 feet (9.1 m) except for runways less than 75 feet (22.9 m).

Lengths – in all cases, the length of the aiming point marking remains unchanged.

2.7. Runway touchdown zone marking.

a. Purpose. For landing operations, the touchdown zone marking identifies the touchdown zone along a precision runway in 500-foot (152-m) increments. For lighting provisions, see AC 150/5340-30.

b. Requirement. See Table 2-1.

c. Location. The touchdown zone marking consists of symmetrically arranged pairs of rectangular bars in groups of one, two, and three along the runway centerline as shown in Figure A-1. As shown, there are five groupings with the aiming point marking serving as an independent, sixth pair.

(1) The touchdown zone marking scheme maintains a 900-foot (275-m) "no-marking zone" from the midpoint of the runway back toward the threshold. That is, those pairs of surface markings that extend within 900 feet (275 m) of the runway midpoint are eliminated. The intent of this painting practice is to preserve a 1,800-foot (550-m) unmarked area so pilots do not confuse the surface markings during a landing with the surface markings for the other approach procedure. The same practice applies equally to a displaced threshold, i.e., the midpoint is located between the thresholds or displaced thresholds and not the runway ends. Taking this into consideration, the painted pattern for the runway touchdown zone marking depends on the (a) authorized approach off each runway and (b) the available length between the runway thresholds or displaced threshold, i.e., the midpoint. The surface marking patterns for the two possible cases are provided in Table 2-3 (case #1) and Table 2-4 (case #2).

Case #1 – Only one runway end requires the runway touchdown zone marking scheme. Apply Table 2-3 criteria, which take into account the "no-marking zone" of 900 feet (275 m) from the midpoint back toward the threshold.

Table 2-3. Groupings of touchdown zone markings required when installed from one threshold

Distance Between Thresholds (or displaced thresholds)	Markings for Precision Approach End (includes displaced threshold)	Other Runway End Visual or Non-precision
6,065 ft (1849 m) or greater[1]	Full set of markings	Aiming point marking
5,565 ft (1697 m) to 6,064 ft (1848 m)	Less one grouping of rectangular bar markings[2]	Aiming point marking
5,065 ft (1544 m) to 5,564 ft (1696 m)	Less two groupings of rectangular bar markings	Aiming point marking
4,565 ft (1391 m) to 5,064 ft (1543 m)	Less three groupings of rectangular bar markings	Aiming point marking

Note 1: The value of 6,065 feet is derived as follows. For the non-precision or visual runway end, the table assumes the 900-foot "no-marking zone" criterion plus the length of a preferred aiming point marking, which starts 1,020 feet from the start of the threshold to obtain a length of 1,920 feet. Add to this the length of the aiming point marking. Per paragraph 2.6.e(1), the length of the aiming point marking is either 150 feet or 100 feet. This table uses a length of 150 feet because all the entries in column #1 are greater than 4,200 feet. Therefore, adding 150 feet to 1,920 feet obtains a length of 2,070 feet. For the precision end, which equals 3,995 feet, it assumes the 900-foot "no-marking zone" followed by the standard 75-foot-long rectangular bar for a total length of 975 feet. Add to this value the full 3,000-foot touchdown zone marking scheme and the 20-foot separation between the actual starting point of the runway threshold (or displaced threshold) and the bottom edge of threshold marking to obtain 3,995 feet.

Distance Between Thresholds (or displaced thresholds)	Markings for Precision Approach End (includes displaced threshold)	Other Runway End Visual or Non-precision
Summing the values 3,995 and 2,070 yields 6,065 feet. **Note 2:** Each reduction in a pair of rectangular bar markings from the precision end equates to a 500-foot (152-m) reduction between the thresholds. The painting rationale for this table is to ignore the midpoint between the thresholds so the precision instrumented landing is favored over non-precision or visual landings. That is, the length of the non-precision/visual side of the runways always remains at 2,070 feet in length to promote the painting of a full set of touchdown zone markings.		

Case #2 – Both runway ends require runway touchdown zone markings. Apply Table 2-4 criteria, which take into account the "no-marking zones" of 1,800 feet (550 m) from the threshold-to-threshold midpoint.

Table 2-4. Groupings of touchdown zone markings required when installed from both thresholds

Distance Between Thresholds (or displaced thresholds)	Markings for Each Threshold (or displaced threshold)
7,990 ft (2436 m) or greater[1]	Full set of markings
6,990 ft (2130 m) to 7,989 ft (2435 m)	Less one grouping of rectangular bars from each side nearest to the runway midpoint[2]
5,990 ft (1826 m) to 6,989 ft (2129 m)	Less two groupings of rectangular bars from each side nearest to the runway midpoint[2]
4,990 ft (1521 m) to 5,989 ft (1825 m)	Less three groupings of rectangular bars from each side nearest to the runway midpoint[2]
Note 1: The value of 7,990 feet is derived as follows. Proceed from the runway midpoint in one direction, and you will have the 900-foot "no-marking zone" criterion followed by the standard 75-foot long rectangular bar for a total length of 975 feet. Add to this value the full 3,000-foot touchdown zone marking scheme plus the 20-foot separation between the actual starting point of the runway threshold (or displaced threshold) and the edge of threshold marking to obtain 3,995 feet. Double this value for both directions to obtain 7,990 feet. **Note 2:** Each reduction in a grouping of rectangular bar markings from both sides equates to a 1,000-foot (305-m) reduction between the thresholds. The painting rationale for this table is to preserve the midpoint between the thresholds, thereby promoting an equal treatment of painting groupings of rectangular bar markings for both sides.	

(2) Because the location of the aiming point marking may be adjusted from the threshold to accommodate different approach slopes and/or heights over the threshold and to possibly take into account non-zero runway gradients, the location of an adjusted aiming point marking will vary. Please see AC 150/5340-30. Under such conditions, an adjusted aiming point

will, in most cases, continue to be located between the first and the second touchdown zone markings. However, when the accumulative effect of the adjustments is severe (defined as when a touchdown zone marking coincides with or is within 160 feet (48.8 m) of the adjusted aiming point marking), that touchdown zone marking must not be painted. For the pilot community, this practice permits the aiming point marking to retain its prominent visual landing aid as compared to a touchdown zone marking.

d. Color. All rectangular bars are white. See paragraph 1.4 for required and recommended techniques to enhance this marking.

e. Characteristics.

(1) For runway widths of 150 feet (45.7 m) or greater, each rectangular bar is 75 feet (22.9 m) long and 6 feet (1.8 m) wide. The lateral spacing between the inner sides of the rectangular bars on the same side of the runway centerline is 5 feet (1.5 m).

(2) For runway widths less than 150 feet (45.7 m), the length of the marking remains unchanged, but the width and the lateral spacing between the markings are reduced proportionally to the decrease in runway width by using 150-foot (45.7 m) parameters to determine the percentage decrease.

(3) The lateral spacing between the inner sides of the rectangular bars centered along the runway centerline is equal to that of the aiming point marking (criteria repeated below from paragraph 2.6.e(3)). In all cases, the length of the rectangular bars (and the aiming point markings) remains unchanged. See Table 2-2. for the dimensions of standard runway widths.

(i) For runways of 150 feet (45.7 m) or more in width, the lateral spacing between the inner sides of the rectangular bars centered on the runway centerline is 72 feet (21.6 m).

(ii) For runways of 100 feet (30.5 m) in width, the lateral spacing between the inner sides of the rectangular bars centered on the runway centerline is 48 feet (14.6 m).

(iii) For runways of 75 feet (22.9 m) in width, the lateral spacing between the inner sides of the rectangular bars centered on the runway centerline is 36 feet (11.0 m).

(iv) For runways of 60 feet (18.3 m) in width, the lateral spacing between the inner sides of the rectangular bars centered on the runway centerline is 28.8 feet (8.8 m).

Application of Proportioning Runway Markings for Non-Standard Runway Widths (Painting)
For runways with widths below 150 feet (45.7 m), the width of the rectangular bars and their lateral spacing between the inner sides of the rectangular bars are adjusted in proportion to the available runway width by using the 150-foot (45.7 m) width runway parameters to determine the percentage decrease in lateral spacings and width of the marking. For example, a nonstandard 70-foot wide runway would apply 70/150 = 0.467 to obtain a lateral spacing for the centered pair of 72 × 0.467 = 33.6 feet (10.25 m), a lateral spacing for other pairs of 5 × 0.467 = 2.3 feet (0.7 m), and a width of 6 feet × 0.467 = 2.8 feet (0.85 m). This adjustment must be such that the inner sides of the innermost rectangular bars to the runway centerline align themselves with the inner side of the aiming point marking. Given that the runway edge markings are painted, the adjustment should be such that the clearance between the runway side strip and the outer edge of the three-bar grouping is a minimum of 1-foot (0.3-m). In no case should the three-bar group be painted farther out from the runway centerline than the aiming point marking.

2.8. Runway edge marking.

a. Purpose. The runway edge marking provides enhanced visual contrast between the runway edge and the surrounding terrain or runway shoulders and delineates the width of suitable paved area for runway operations. For lighting provisions, see AC 150/5340-30.

b. Requirement. See Table 2-1.

c. Location. The runway edge marking consists of two parallel stripes, one placed along each edge of the usable runway with the outer edge of each stripe approximately on the edge of the paved useable runway. For extra wide runways, such as military runways converted for public use, the maximum distance between the outer edges of the parallel stripes is 200 feet (61 m). Figure A-1 illustrates the runway edge marking.

d. Color. The stripes of the runway edge marking are white. See paragraph 1.4 for required and recommended techniques to enhance this marking.

e. Characteristics. The runway edge marking has a minimum width of 36 inches (90 cm) for runways of 100 feet (30.5 m) or wider in width and at least 18 inches (45 cm) on smaller width runways (see Table 2-2. for standard runway widths).

(1) For runways with a displaced threshold, the edge markings continue through the paved area prior to the displaced threshold as shown Figure A-8. This continuation of the edge markings is required because this paved area is used for takeoffs and landing rollouts from the other direction.

(2) Where an aligned taxiway, as shown in Figure A-8 and Figure A-10, precedes a runway threshold, both edge markings will terminate. The point of termination of the edge markings is determined by the taxiway geometry. **Prohibited:** The conversion of a runway

section into an aligned taxiway or the construction of a new aligned taxiway. See AC 150/5300-13. The FAA further recommends that existing aligned taxiways be removed or reconfigured into usable runways, for example, as shown in Figure A-7 and Figure A-11. When a taxiway connects to a runway or the runway has turn pads or turnarounds, the runway edge marking remains continuous between the runway and these adjoining infrastructures.

(3) For intersecting runways, see guidance in paragraph 2.2.

2.9. Runway displaced threshold marking.

The marking scheme for a runway with a displaced threshold, when required by paragraph 2.1, includes a runway threshold bar and arrowheads with and without arrow shafts. Figure A-7, Figure A-10, and Figure A-11 illustrate the various applications of displaced thresholds and the requirement for additional marking components. For lighting provisions, see AC 150/5340-30.

a. Runway Threshold Bar Marking.

(1) Purpose. The runway threshold bar marking delineates the beginning section of the runway available for landing from the unusable section on the approach side of the displaced threshold or prepared surfaces for a blast pad, stopway, EMAS or end of an aligned taxiway.

(2) Requirement. Install a runway threshold bar marking when there is an unusable section, blast pad, stopway, EMAS, or aligned taxiway on the approach side of the threshold.

(3) Location. The runway threshold bar marking is an elongated rectangular bar that is located perpendicular to the runway centerline and on the landing portion of the runway. The outboard edge of the marking is aligned with the location labeled "start of runway displaced threshold" as shown in Figure A-8.

(4) Color. The runway threshold bar marking is white. See paragraph 1.4 for required and recommended techniques to enhance this marking.

(5) Characteristics. The runway threshold bar marking is 10 feet (3.1 m) in width and extends between the runway edges or between the runway edge markings.

b. Arrow Marking. The arrow marking (arrowheads with and without arrow shafts) performs three possible functions, that is, two cases for displaced thresholds and one case for a runway threshold with an aligned taxiway.

(1) Purposes.

(i) Figure A-8 illustrates the predominant case in which the threshold is displaced from the runway end. In this case white arrowheads with and without arrow shafts are required to identify the portion of the runway before the displaced threshold to provide centerline guidance for pilots during approaches, takeoffs, and landing rollouts from the opposite direction.

(ii) Figure A-10 illustrates the rare case in which a displaced threshold is preceded by an aligned taxiway. In this case white arrowheads with and without arrow shafts and yellow arrowheads without arrow shafts are required to identify the runway portion from the aligned taxiway portion. Furthermore, a yellow runway demarcation bar is required to identify the start of the runway. See paragraph 2.9.c for runway demarcation bar criteria.

(iii) Figure A-8 illustrates the rare case in which a runway threshold is preceded by an aligned taxiway. In this case yellow arrowheads without arrow shafts are required to identify the runway portion from the aligned taxiway portion.

General Comment
The conversion of a runway section into an aligned taxiway or the construction of a new aligned taxiway is prohibited. See AC 150/5300-13.

(2) Requirement. Install this marking when the threshold is displaced or preceded by an aligned taxiway.

(3) Locations.

(i) For the predominant case, arrow shafts and arrowheads are located on the portion of the runway before the displaced threshold.

(ii) For the rare cases, only arrowheads are used on the portion of the aligned taxiway before the threshold bar marking or the demarcation bar marking.

(4) Colors.

(i) For the predominant case, the arrow shaft and arrowhead are white. See paragraph 1.4 for required and recommended techniques to enhance these markings.

(ii) For the rare cases, the arrowhead is yellow.

(5) Characteristics. The dimensions and spacing requirements for arrow shafts and arrowheads are as shown in Figure A-8 (function one), Figure A-8 (function two), and Figure A-10 (function three).

c. Runway Demarcation Bar Marking.

(1) Purpose. A demarcation bar delineates a runway with a displaced threshold from a blast pad, stopway, or an aligned taxiway that precedes the runway.

(2) Requirement. Install a demarcation bar marking when the threshold is displaced or preceded by a blast pad, stopway, or aligned taxiway.

(3) Location. The demarcation bar is an elongated rectangular bar on a blast pad, stopway, or an aligned taxiway that is perpendicular to the runway centerline at the point of intersection with the start of the runway as shown in Figure A-11. In another application, as

shown in Figure A-10, the portion of aligned taxiway before the demarcation bar is not part of the usable runway.

(4) Color. The demarcation bar marking is yellow. See paragraph 1.4 for required and recommended techniques to enhance this marking.

(5) Characteristics. The demarcation bar marking is 3 feet (0.9 m) wide and extends across the entire width of the blast pad, stopway, or aligned taxiway.

2.10. Chevron markings for blast pads, stopways, and EMAS.

a. Purposes. The chevron marking identifies paved blast pads, stopways, and EMAS (engineered materials arresting systems) in relation to the end of the runway. For lighting provisions, see AC 150/5340-30, and for EMAS design, see AC 150/5220-22, Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns.

b. Requirement. Install chevron markings on blast pads, stopways, and EMAS.

c. Location. The chevron marking is located on the blast pad and stopway that are aligned with and contiguous to the runway end as shown in Figure A-9 and Figure A-11. The chevron scheme for an EMAS installation is also centered along the extended runway centerline (not shown in Figure A-9 and Figure A-11.

d. Color. Chevron markings are yellow. See paragraph 1.4 for required and recommended techniques to enhance this marking.

e. Characteristics. Dimensionally, stopways equal the width of the runway while blast pads equal the runway width plus the shoulder widths (see AC 150/5300-13). The dimensions and spacing requirements for chevron markings are shown in Figure A-9. The recommended minimum length for a stopway is 150 feet (45.7 m) to allow for at least two chevron stripes. For cases where (1) standard length blast pads, per AC 150/5300-13, are installed off runway ends designed exclusively for small airplanes (Airplane Design Groups I and II– small) or (2) existing stopways are less than 150 feet (45.7 m) in length on runway widths of 75 feet (22.9 m) or less, the width of the chevrons and the spacing between the chevrons shown in Figure A-9 can be reduced by two-thirds. The intent of the reduction in dimensions is to provide pilots with at least two visible chevrons.

2.11. Runway shoulder marking.

a. Purpose. The runway shoulder marking is used, when needed, as a supplement to further delineate a paved runway shoulder that pilots have mistaken or are likely to mistake as usable runway. This marking is used only in conjunction with the runway edge marking.

b. Requirement. Runway shoulder markings are optional.

c. Location. The runway shoulder marking is located between the runway edge marking and the outer edge of the paved shoulder as shown in Figure A-12.

d. Color. Runway shoulder markings are yellow. See paragraph 1.4 for required and recommended techniques to enhance this marking.

e. Characteristics. The runway shoulder marking consists of stripes 3 feet (0.9 m) in width and spaced 100 feet (30.5 m) apart along the edge of the runway. The stripes start at the runway midpoint, are slanted at an angle of 45 degrees to the runway centerline, and are oriented as shown in Figure A-12.

Chapter 3. Holding Position Markings.

3.1. Applications of holding position markings.

The purposes for the different holding position markings are to prevent aircraft and vehicles from entering into critical areas associated with a runway and navigational aids or to control traffic at the intersection of taxiways. This advisory circular describes six operational situations (cases) using three different holding position marking schemes. Cases 1, 2, and 3 employ the same marking scheme referred to as Pattern A – runway holding position marking. Cases 4 and 5 employ a different marking scheme referred to as Pattern B – ILS/MLS or POFZ holding position marking. The latter operational situation, Case 5, uses Pattern B in which it usually appears as an L-shaped ladder. Case 6 uses a different marking scheme referred to as Pattern C – intermediate holding position marking for taxiway/taxiway intersections. Figure A-13 and Figure A-14 show the four different marking patterns.

- **Case 1:** In terms of taxiing on a runway, an aircraft will need to hold short of an intersecting runway (see paragraph 3.2).

- **Case 2:** In terms of landing on a runway used for land and hold short operations (LAHSO), the aircraft will need to hold short of an intersecting runway or, in some rare cases, at a specified hold spot on the landing runway (see paragraph 3.2).

- **Case 3** (most common application for Cases 1, 2, and 3): In terms of taxiing on a taxiway, an aircraft will need to hold short prior to entering an active runway (see paragraph 3.3).

- **Case 4:** In terms of taxiing on a taxiway, an aircraft will need to hold short before entering the critical area of an Instrument Landing System (ILS)/Microwave Landing System (MLS) (see paragraph 3.4).

- **Case 5:** In terms of taxiing on a taxiway, an aircraft will need to hold short before entering the critical area of a Precision Obstacle Free Zone (POFZ) (see paragraph 3.5). Although the surface marking pattern is the same as Case 4, the pattern in many applications is L-shaped, instead of only linear in shape.

- **Case 6:** In terms of taxiing on a taxiway, an aircraft will need to hold short of a taxiway/taxiway intersection (see paragraph 3.6).

3.2. Case 1 and Case 2 – Applications of Pattern A for the runway holding position marking on runways.

a. Purpose. Pattern A, when painted on a runway as shown in Figure A-13, identifies the location where a pilot (or vehicle driver) is to stop and hold when (1) the runway is operationally closed for an interval of time so that ATCT can control taxiing operations through a runway/runway intersection or (2) the runway is used for land and hold short operations (LAHSO). For necessary corresponding signage and lighting provisions, see AC 150/5340-18, Standards for Airport Sign Systems, and AC 150/5340-30.

Safety Initiatives (Safety)
Note 1: Land and hold short operations (LAHSO) require a letter of agreement between the airport operator and the airport traffic control tower (ATCT).
Note 2: Since the design standard for a full-length parallel taxiway reduces both wrong-runway takeoffs and runway incursions, we do not recommend the use of an operationally closed runway as a taxiway, especially when a parallel taxiway exists. Such an operation can potentially confuse pilots because this taxiing operation introduces yellow-colored taxiway surface markings onto the runway itself. Hence, to avoid the potential for operational errors by pilots, the airport operator should take measures to meet the full-length parallel taxiway design standard. In some cases, the operational capacity for a given runway could indicate the need for dual parallel taxiways to avoid this type of taxiing operation.
Note 3: To avoid a runway incursion event at runway/runway intersections when an operationally closed runway is used as a taxiway, the intersection must have the runway holding position marking and corresponding signs whether or not pilots taxi through the runway/runway intersection. Additionally, this marking should only be used in those instances where documentation supports the need for the operational use of the runway as a taxiway. The operational use of a runway as a taxiway must be described in a Letter of Agreement with the ATCT.

b. Location. In all Case 1 and Case 2 applications, the criteria given below assume that the centerlines of the intersecting runways are perpendicular. Hence, for runway/runway intersections that are non-perpendicular, additional distance may be required to ensure that all airplane features, such as wingtips, remain outside the protected area of the intersecting runway.

(1) Operationally Closed Runways Used for Taxiing Operations. The location of the runway holding position marking on operationally closed runway is in accordance with the holdline criteria per AC 150/5300-13 for the intersecting runway's runway design code.

(2) Runways Used for LAHSO.

(i) The location of the runway holding position marking on the runway used for LAHSO is in accordance with the holdline criteria per AC 150/5300-13 for the intersecting runway's runway design code. On rare cases the location of the runway holding position marking for LAHSO is based on a predetermined hold-short point along the landing runway to protect an approach/departure flight path or to overcome painting difficulties as described below in paragraph 3.2.b(2)(ii). In no case should the location of the predetermined hold-short point be within the holdline criteria per AC 150/5300-13 for the intersecting runway's runway design code.

(ii) Certain airfield geometries for runways that are used for taxiing or LAHSO operations have intersecting taxiway(s) that hamper the painting of the runway holding position marking (and installation of accompanying necessary signage) in accordance with the applicable holdline criterion. One such geometry occurs when a crossing taxiway or its fillet

intersects the runway where the marking or sign is to be placed. One solution is to move the hold-short point farther away from the runway/runway intersection so that both the marking and the installed signage clear the common crossing area. Under this solution (1) the marking is always painted at a greater distance than the holdline criteria in AC 150/5300-13, and (2) the required corresponding signage retains only the runway designations, i.e., never uses a taxiway designation.

c. Color. The Pattern A marking scheme, as shown in Figure A-13, is yellow and, when painted on light-colored pavements, is outlined in black. See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this surface marking on light-colored pavements.

d. Characteristics.

(1) The marking is identical to the runway holding position marking installed on a taxiway as described in paragraph 3.3 and shown in Figure A-13. The solid lines, as compared to the dashed lines, are always on the side where the aircraft is to hold.

(2) The marking is installed perpendicular to the runway centerline and interrupts all runway markings except for the runway designation marking. If the runway holding position marking should interrupt the mentioned exceptions, then paint the runway holding position marking farther away than specified by AC 150/5300-13 to avoid any interruption of these specified markings. The painting practice is to avoid "over striping" existing runway surface markings.

(3) The runway holding position marking extends across the full width of the runway but not onto the runway shoulders or onto any intersecting taxiway fillet.

3.3. Case 3 – Applications of Pattern A for the runway holding position marking on taxiways.

a. Purposes. Pattern A, when painted on a taxiway as shown in Figure A-13, serves several roles. For a taxiway that intersects a runway at an airport with an operating airport traffic control tower (ATCT), the Pattern A marking scheme identifies the location on a taxiway where pilots and vehicle drivers are to stop until they receive a clearance from ATCT to proceed onto the runway. Under this role, Pattern A may be supplemented with the Geographic Position Marking as part of the airport's Surface Movement Guidance Control System (SMGCS) Plan as described in paragraph 4.11 and as shown in Figure D-8. For a taxiway that intersects a runway at an airport without an operating airport traffic control tower, Pattern A identifies the location where a pilot and vehicle drivers are to stop to ensure that they have adequate separation with other aircraft before proceeding onto the runway. For a taxiway that does not intersect a runway but crosses through a runway approach area or the runway safety area, the Pattern A marking scheme identifies the location on a taxiway where pilots and vehicle drivers are to stop to receive clearance from the airport traffic control tower before proceeding through the protected area. This application serves to stop a taxiing aircraft from penetrating the runway safety area (a runway incursion) or any of several airspace surfaces, for example, those used to define the runway threshold, runway inner approach obstacle free zone, or the runway inner transitional

obstacle free zone. If the marking is located closer than prescribed by AC 150/5300-13, such as when the taxiing aircraft penetrates a Terminal Instrument Procedures (TERPS) surface, then the airport operator can expect higher approach minimums to the impacted runway end. AC 150/5300-13 includes a discussion of these airspace surfaces. Except as specified in paragraph 3.2, the runway holding position marking must not be used for any other situations than the roles described in this paragraph. For signage and lighting provisions, see AC 150/5340-18 and AC 150/5340-30.

b. Location. Pattern A for the runway holding position marking is located as follows:

(1) For a taxiway that intersects a runway, the Pattern A runway holding position markings must be located on all such taxiways in accordance with the holdline criteria per AC 150/5300-13 for the runway's runway design code. This measurement is taken to the edge of the holding position marking farthest from the runway, at the taxiway centerline. Because the location is based on the approach visibility minimums, approach category, and airplane design group, the airport operator should use the lowest approach visibility minima and critical aircraft intended to use the runway. Pattern A is used also on turnarounds and holding bays as shown in AC 150/5300-13, especially for airports with an airport traffic control tower or for any runways used at night and in low-visibility conditions. Locating a runway holding position marking other than what is required by this paragraph must be approved by the FAA.

(2) For a taxiway not intersecting a runway but crossing through a runway safety area or a runway approach surface, the Pattern A runway holding position markings must be located on all such taxiways in accordance with the more protective area obtained by either the holdline criteria per AC 150/5300-13 for the runway's runway design code or the boundary of the approach surface's critical area. Locating a Pattern A runway holding position marking other than what is required by this paragraph must be approved by the FAA Airports Regional Office or Airports District Office.

14 Code of Federal Regulation (CFR) Part 139 Certificated Airports Runway Incursion Mitigation Requirement (Safety)
The extended runway holding position marking, as illustrated in Figure D-4, is mandatory and is the only acceptable means of compliance for 14 CFR Part 139 certificated airports serving ADGs V and VI airplanes. The enhanced runway holding position marking applies only to those taxiway entrances for a given runway that serve these airplane design groups. This surface painted marking is part of the taxiway centerline marking standard under 14 CFR Section 139.311(a)(2).

c. Color. The Pattern A marking scheme, as shown in Figure A-13, is yellow and, when painted on light-colored pavements, outlined in black. See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this surface marking.

d. Characteristics.

(1) Pattern A for the runway holding position marking consists of a set of two continuous lines, two dashed lines, and three spaces that are all parallel, extend across the entire width of the taxiway, measure 12 inches (30 cm) in width, and are separated as shown in Figure A-13. It is located laterally such that a dash is centered on the taxiway centerline. Where the marking extends unbroken over more than one taxiway centerline, locate the marking such that a dash is centered on one taxiway centerline. At airports that do not have an operating ATCT and are not certificated under 14 CFR Part 139, the width and separation measurement may be reduced from 12 inches (30 cm) to 6 inches (15 cm). For clarification, all airports certificated under 14 CFR Part 139, whether or not there is an operating ATCT, are required to use the 12-inch measurement.

(2) The taxiway centerline marking is interrupted by the runway holding position marking as shown in Figure A-13.

(3) For taxiways having taxiway edge markings, interrupt the taxiway edge marking as shown in Figure A-23 so that the Pattern A marking continues to the edge of the defined taxiway width. For taxiways that connect to runways that serve Airplane Design Groups (ADG) V or VI airplanes as defined by AC 150/5300-13, the marking is further extended onto both paved shoulders as shown in Figure D-4. For both airplane design groups, the length of the marking from the taxiway centerline onto the paved shoulder measures 62.5 feet (19 m). The 62.5-foot (19-m) measurement takes into account the downward viewing angle from the cockpit while the pilots are seated in the normal position as well as other safety factors, such as aircraft wander from the taxiway centerline. For taxiways with widths greater than 75 feet (22.9 m), the runway holding position marking is extended 25 feet (7.5 m) [62.5 viewing angle minus (1/2)(75) standard taxiway width equals 25 feet] onto the paved taxiway shoulders. Only those taxiway entrances to runways that serve ADGs V or VI are to be further enhanced. Typical airplane models within ADGs V and VI include the Airbus 330-200/-300, A-340-200/-300/-500/-600, A-380, Boeing-747-100/-200/-400, B-777-200/-300, and B-787-8/-9.

(i) If the runway holding position marking is outlined in black, then the taxiway edge markings abut the black outline on both sides of this marking. That is, it abuts the black border of the solid yellow line on one side and abuts the black border of the dashed yellow line on the other side (see Figure A-13).

(ii) If the runway holding position marking is not outlined in black, then the taxiway edge markings abut the holding position marking on both sides. That is, the taxiway edge markings abut the solid yellow line on one side and abut the dashed yellow line on the other side.

(4) The orientation of Pattern A is for the solid continuous lines to be painted on the side where the aircraft and vehicles will hold before proceeding to the runway. That is, dashed lines are painted closer to the runway.

(5) Pattern A is painted perpendicular to the taxiway centerline but may be canted from the perpendicular in unusual situations, such as an extremely acute, angled taxiway. For such unusual situations, it may be necessary to install additional runway holding position

signs, runway guard lights, or stop bars to emphasize the location of the surface painted runway holding position marking.

(6) Pattern A on converging taxiways, as shown in Figure D-13, meet at an angle when two or more taxiways intersect the same runway hold line. On any angled taxiway to the runway, consideration must be given to locate the painted marking so no portion of an aircraft, e.g., wing tip or tail, penetrates the runway safety area or any protected surface. See AC 150/5300-13 for detailed requirements and information about clearance requirements by aircraft on taxi routes.

(7) For taxiways connecting to runways serving ADGs V and VI, having a light fixture or a sign located on the taxiway shoulder that aligns with the extended runway holding position marking, as shown in Figure D-4, the extended runway holding position marking should extend no closer than 5 feet (1.5 m) to the edge of the light fixture or sign.

(8) For taxiways connecting to runways serving ADGs V and VI whose taxiway shoulder markings interfere with or are within 10 feet (3.1 m) from the extended runway holding position marking, as shown in Figure D-4, the taxiway shoulder markings are to be removed (omitted) from that location.

3.4. Case 4 – Applications of Pattern B for the ILS/MLS holding position marking.

a. Purposes. Pattern B for the ILS/MLS holding position marking as shown in Figure A-13 identifies the location on a taxiway or holding bay where a pilot or vehicle driver is to stop when they have received instructions from the airport traffic control tower (ATCT) to hold before entering an ILS/MLS critical area. The intent of the marking is to protect the signal of the ILS/MLS navigational aid by identifying the holding position for CAT I operations and protecting the approved TERPS for CAT II/III operations. For signage and lighting provisions, see AC 150/5340-18 and AC 150/5340-30.

b. Location. Pattern B for the ILS/MLS holding position marking is located on the taxiway or holding bay at the boundary of the ILS/MLS critical area and, as appropriate, at the holding position for CAT I and CAT II/III operations. The entire marking is located inside the boundary of the protected area.

(1) Where the distance between the runway holding position marking (Pattern A) on a taxiway and the holding position marking (Pattern B) for an ILS (or MLS) critical area is 50 feet (15 m) or less, one holding position may be established, provided it will not affect capacity. In this case, the runway holding position (Pattern A) is moved back to the ILS/MLS holding position (Pattern B) and only the runway holding position markings (Pattern A) are installed.

(2) If a taxiway or holding bay penetrates both an ILS/MLS critical area and the Precision Obstacle Free Zone (POFZ) critical area (see Pattern B, Figure A-13), such as when the threshold is displaced, paint only one pattern instead of two patterns only if the single pattern can protect both critical areas. The pattern to be painted is the one whose location offers the most conservative, protective boundary (for example, farthest from the runway).

(3) The FAA will designate the ILS/MLS critical area and POFZ boundaries and, as appropriate, determine the correct holding position location for CAT II/III operations for the airport operator. See AC 150/5300-13 for general information about the ILS/MLS and POFZ critical areas.

c. Color. The Pattern B marking scheme as shown in Figure A-13 is yellow and, when used on light-colored pavements, outlined in black. See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this surface marking.

d. Characteristics.

(1) Pattern B for the ILS/MLS holding position marking consists of a set of two parallel lines that are 2 feet (0.6 m) wide and spaced 4 feet (1.2 m) apart. These parallel lines are connected by perpendicular sets of two lines that are 1 foot (0.3 m) wide and spaced 1 foot (0.3 m) apart and repeat every 10 feet (3 m). The Pattern B marking for ILS/MLS applications must extend across the entire width of the taxiway or holding bay (see Figure A-13). It is located laterally such that a set of perpendicular lines (parallel to the taxiway centerline) are equidistant from the taxiway centerline. Where the marking extends unbroken over more than one taxiway centerline, locate the marking such that one set of perpendicular lines is equidistant from one taxiway centerline. At airports that do not have an ATCT and are not certificated under 14 CFR Part 139, the airport operator may reduce the dimension for the width of the parallel yellow lines and spaces from 2 feet (0.6 m) to 1 foot (0.3 m) and from 4 feet (1.2 m) to 2 feet (0.6 m). For clarification, all airports certificated under 14 CFR Part 139, whether or not there is an operating ATCT, are required to use the larger measurements.

(2) The taxiway centerline marking is interrupted by the ILS/MLS holding position marking as shown in Figure A-13.

(3) For taxiways having taxiway edge markings, interrupt the taxiway edge marking so that the Pattern B marking continues to the edge of the defined taxiway width as shown in Figure A-13. For taxiways that connect to runways that serve Airplane Design Groups (ADG) V or VI airplanes as defined by AC 150/5300-13, the marking is further extended onto both paved shoulders (similar to Pattern A as shown in Figure D-4) only when the Pattern A marking is omitted per paragraph 3.4.b(1). In that case, for both airplane design groups, the length of the marking from the taxiway centerline onto the paved shoulder measures 62.5 feet (19 m). The 62.5-foot (19-m) measurement takes into account the downward viewing angle from the cockpit while the pilots are seated in the normal position as well as other safety factors, such as aircraft wander from the taxiway centerline. For taxiways with widths greater than 75 feet (22.9 m), the ILS/MLS holding position marking is extended 25 feet (7.5 m) [62.5 viewing angle minus (1/2)(75) standard taxiway width equals 25 feet] onto the paved taxiway shoulders. Typical airplane models within ADGs V and VI include the Airbus 330-200/-300, A-340-200/-300/-500/-600, A-380, Boeing-747-100/-200/-400, B-777-200/-300, and B-787-8/-9.

(i) If the ILS/MLS holding position marking is outlined in black, then the taxiway edge markings abut the black outline on both sides of this marking (see Figure A-13).

(ii) If the ILS/MLS holding position marking is not outlined in black, a 6-inch gap is left between the holding position marking and the taxiway edge marking (see Figure A-13).

(4) Pattern B is painted perpendicular to the taxiway centerline but may be canted from the perpendicular in unusual situations, such as an extremely acute, angled taxiway. For such unusual situations, it may be necessary to install additional runway holding position signs, runway guard lights, or stop bars to emphasize the location of the surface painted runway holding position marking.

(5) Pattern B on converging taxiways meet at an angle when two or more taxiways intersect the same ILS/MLS hold line. On any angled taxiway to the runway, consideration must be given to locate the painted marking so no portion of an aircraft, e.g., wing tip or tail, penetrates the protected surface. See AC 150/5300-13 for detailed requirements and information about clearance requirements by aircraft on taxi routes.

(6) For taxiways connecting to runways serving ADGs V and VI whose taxiway shoulder markings interfere with or are within 10 feet (3.1 m) from the extended ILS/MLS holding position marking (see paragraph 3.4.d(3)), the taxiway shoulder markings are to be removed (omitted) from that location.

3.5. Case 5 – Applications of Pattern B for Precision Obstacle Free Zone (POFZ) holding position marking.

a. Purposes. Pattern B for the POFZ holding position marking as shown in Figure A-13 identifies the location on a taxiway or holding bay where a pilot or vehicle driver is to stop when they have received instructions from the airport traffic control tower (ATCT) to hold before entering the POFZ critical area. The marking is used also at non-towered airport where the runway end has an approved vertical guidance of ¾-statue mile approach visibility minimum or less. The intent of the marking is to protect the authorized landing minima (TERPS) for a given runway end. See AC 150/5300-13 for detailed information about the POFZ critical area. For signage and lighting provisions, see AC 150/5340-18 and AC 150/5340-30. Install this marking when a POFZ exists.

b. Location. Pattern B for the POFZ holding position marking is located on the taxiway or holding bay at the boundary of the POFZ critical area as defined by AC 150/5300-13 and, when appropriate, at the holding position for CAT I and CAT II/III operations. Figure A-17 shows the most common application for this marking, which is L-shaped. Because of the variety of taxiway entrance/holding bay geometries, the Pattern B marking must not be painted over a surface painted holding position sign.

(1) Certain airfield geometries may cause a taxiway or holding bay to penetrate both an ILS/MLS critical area and the Precision Obstacle Free Zone (POFZ) critical area, such as when the threshold is displaced. Under such situations, paint only one pattern instead of two patterns only if the single pattern can protect both critical areas. The pattern to be painted is the one whose location offers the most conservative, protective boundary (for example, farthest from the runway). Under this application the ILS/MLS holding position

(Pattern B) marking or POFZ holding position (Pattern B) marking, which now serves a dual function, cannot be replaced with, or used in lieu of, a runway holding position (Pattern A) marking.

(2) The FAA Airports Regional Office or Airports District Office will designate the ILS/MLS critical area and POFZ boundaries and, as appropriate, determine the correct holding position location for CAT II/III operations for the airport operator.

(3) The Pattern B marking for POFZ applications must extend across only those portions of a taxiway or holding bays that run along the boundary of the POFZ as shown in Figure A-14 and Figure A-17.

c. Color. The Pattern B marking scheme is yellow and, when used on light-colored pavements, outlined in black. See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this surface marking.

d. Characteristics. Pattern B for the POFZ holding position marking consists of a set of two parallel lines that are 2 feet (0.6 m) wide and spaced 4 feet (1.2 m) apart. These parallel lines are connected by perpendicular sets of two lines that are 1 foot (0.3 m) wide and spaced 1 foot (0.3 m) apart and repeated every 10 feet (3 m). It is located laterally such that a set of perpendicular lines (parallel to the taxiway centerline) are equidistant from the taxiway centerline. Where the marking extends unbroken over more than one taxiway centerline, locate the marking such that one set of perpendicular lines is equidistant from one taxiway centerline. Figure A-13, provides the discontinuation (separation) of a POFZ holding position marking, which follows the same criteria as the ILS/MLS holding position marking, with an intersecting taxiway centerline or taxiway edge markings. Figure A-17 illustrates the general separation of a Pattern B marking from an entrance taxiway serving a runway. At airports that do not have an ATCT and are not certificated under 14 CFR Part 139, the airport operator may reduce the dimension for the width of the parallel yellow lines and spaces from 2 feet (0.6 m) to 1 foot (0.3 m) and from 4 feet (1.2 m) to 2 feet (0.6 m). For clarification, all airports certificated under 14 CFR Part 139, whether or not there is an operating ATCT, are required to use the larger measurements.

3.6. Case 6 – Applications for Pattern C for the taxiway/taxiway intersection intermediate holding position marking.

a. Purpose. Pattern C for the intermediate holding position marking, as shown in Figure A-13 for taxiway/taxiway intersections, is used to support the operational need by the airport traffic control tower to manage taxiing aircraft through a congested intersection or for other reasons deemed necessary by the FAA. For example, Figure A-15 shows the intersection between a taxiway and a holding pad used for deicing aircraft. Pilots when instructed by the airport traffic control tower to "hold short of (taxiway designation)" must stop so no part of the aircraft extends beyond the boundary of the intermediate holding position marking. For signage and lighting provisions, see AC 150/5340-18 and AC 150/5340-30.

b. Location. For the taxiway being marked, the intermediate holding position marking for taxiway/taxiway intersection is located according to the taxiway centerline to fixed

or movable object criteria in AC 150/5300-13 for the most demanding airplane design group serving the airport (per the definition in AC 150/5300-13).

c. Color. The intermediate holding position marking is yellow and, when used on light-colored pavements, outlined in black. See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this surface marking.

d. Characteristics. The intermediate holding position marking for taxiway/taxiway intersections consist of a single dashed line extending across the width of the taxiway per Figure A-14 and Figure C-7. The single dashed lines are 1 foot (0.3 m) wide, 3 feet (0.9 m) long, and spaced 3 feet (0.9 m) apart. The marking is located laterally such that a dash is centered on the taxiway centerline. Where the marking extends unbroken over more than one taxiway centerline, locate the marking such that a dash is centered on one taxiway centerline. As shown in Figure A-14, all intersecting taxiway centerlines are spaced 6 to 12 inches (15 cm to 30 cm) on either side of this marking. When the taxiway has taxiway edge markings, the taxiway edge markings are interrupted.

Chapter 4. Surface Markings for Taxiways.

4.1. Application.

All taxiways regardless of their width have a centerline marking, and whenever a taxiway intersects a runway, the taxiway should have a surface painted runway holding position marking. For 14 CFR Part 139 certificated airports, all taxiways that intersect a runway must have a surface painted runway holding position sign and an enhanced taxiway centerline marking. Taxiway edge markings are installed wherever there is a need to separate the taxiway from a pavement that is not intended for aircraft use or to delineate the edge of the taxiway that is not otherwise clearly visible. Examples of other taxiway surface markings that should be installed when appropriate and deemed necessary by the FAA (in some cases, with input from the tower manager of the airport traffic control tower (ATCT)) include the Pattern A, B, and C holding position markings discussed in Chapter 3, the intermediate holding position markings for taxiway/taxiway intersections, geographic position marking, and the taxiway shoulder marking.

4.2. Taxiway centerline markings.

a. Purpose. The taxiway centerline marking provides pilots continuous visual guidance to permit taxiing along a designated path. See AC 150/5300-13 for standard fillet design, AC 150/5340-30 for lighting provisions and AC 150/5340-18 for signage provisions.

b. Requirement. All taxiways, regardless of their width, have a surface painted taxiway centerline.

c. Location. On a straight section of a taxiway, the taxiway centerline marking is located along the physical centerline of the paved taxiway. This statement assumes the taxiway was built to standard, i.e., symmetrical with a taxiway centerline. On curved sections of a taxiway, the taxiway centerline marking continues from the centerline marking of the straight portion of the taxiway along a curved centerline defined in AC 150/5300-13.

(1) For taxiways that intersect other taxiways, the adequacy of the fillet design determines the centerline painting scheme as shown in Figure A-18. The standard design is cockpit-over-centerline steering, which reduces the number of airplane main gear excursions from the taxiway.

(i) At taxiway intersections with fillets that do not meet the fillet design standards of AC 150/5300-13 for the Taxiway Design Group (TDG) of the taxiway —that is, judgmental over-steering is performed by pilots—the centerline marking continues straight through the intersection as shown at the top Figure A-18. This practice applies to intersecting taxiways that are or are not of the same TDG.

(ii) Where fillets are designed to the TDG of the taxiway, the taxiway centerline marking follows the taxiway curve as shown on the bottom of Figure A-18 to permit cockpit-over-centerline steering operations. This practice applies to intersecting taxiways that are of the same TDG.

Note: AC 150/5300-13 states that cockpit-over-centerline steering is the standard methodology for painting taxiway centerlines in taxiway intersections. To reduce taxiway excursions on turns, airport operators should (1) construct standard fillets and (2) paint taxiway centerlines according to cockpit-over-centerline design.

(2) For taxiways that intersect runways, different painting requirements or restrictions apply.

(i) For a taxiway that intersects a runway at a runway end, as shown in Figure A-16 and Figure A-17, the taxiway centerline is terminated either at the runway edge or at the outer edge of the runway edge marking. However, the taxiway centerline (lead-on and lead-off) will continue onto the runway under the following conditions:

(a) Where there is a displaced threshold, as shown in Figure A-7 and Figure A-11, the taxiway centerline marking continues onto the displaced area of the runway and extends parallel to the displaced threshold markings (arrow heads and arrow shafts) for a distance of 200 feet (61 m) beyond the point of tangency or terminates at the point of contact with the displaced threshold bar, whichever is less. As shown in Figure A-8, the lead-on and lead-off taxiway centerlines are 3 feet (1 m) from the runway arrow markings as measured near-edge to near-edge. This lead-on or lead-off taxiway centerline line is interrupted for all runway markings with some exceptions (see paragraph 4.2.c(2)(i)(b)).

(b) For low-visibility taxiing operations, when the runway visual range (RVR) is below 1,200 feet (366 m), the taxiway centerline marking continues across all runway markings with the exception of the runway designation marking and, unless required by a SMGCS Plan, the runway threshold marking (longitudinal stripes). The painted taxiway centerline marking must follow the path of the in-pavement lighting criteria of AC 150/5340-30. That is, if the in-pavement lighting is curved, the painted taxiway centerline is curved. In this situation, the taxiway centerline marking continues onto the runway and extends parallel to the runway centerline marking for a distance of 200 feet (61 m) beyond the point of tangency and is 3 feet (1 m) from the runway centerline as measured near-edge to near-edge. For some airfield geometry, such as an airfield with parallel runways with several parallel taxiways, the painted taxiway centerline at the runway end is painted straight through the runway end and curved onto the runway. See AC 150/5340-30 for the different RVR in-pavement lighting requirements and recommendations associated with various airfield configurations.

(ii) For taxiways that intersect a runway at any other locations than at the runway end, as shown in Figure A-16, the taxiway centerline marking curves onto the runway and extends parallel to the runway centerline marking for a distance of 200 feet (61 m) beyond the point of tangency with the runway centerline or terminates at the point of contact with the displaced threshold bar, whichever is less. As shown in Figure A-16 and Figure A-17, these lead-on and lead-off taxiway centerlines are 3 feet (1 m) from the runway centerline when measured near-edge to near-edge.

(a) For taxiways that cross a runway, which are either perpendicular to or non-perpendicular to the runway centerline, and are normally used as

crossing taxi routes, the taxiway centerline marking may continue across the runway but is interrupted for all runway markings with some exceptions (see paragraph 4.2.c(2)(i)(b).

(b) For low-visibility taxiing operations, when the RVR is below 1,200 feet (366 m), the taxiway centerline marking continues across all runway markings with the exception of the runway designation marking and, unless required by the SMGCS Plan, the runway threshold marking (longitudinal stripes), aiming point marking, and the touchdown zone markings.

d. Color. The taxiway centerline marking is yellow. See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this marking.

Painting Notice: Over the years, some airport operators have installed other colors to denote various taxiing routes on the movement areas. These surface markings are non-standard. In an attempt to circumvent the yellow color standard, these different colored centerline markings have sometimes been referred to as supplemental markings or some other ambiguous term. Regardless of what they are called, these surface markings are non-standard and require specific approval by the FAA Director of Airport Safety and Standards. Regarding aircraft deicing facilities that are located in a non-movement area, taxiway/taxilane centerlines are painted in accordance with AC 150/5300-14, Design of Aircraft Deicing Facilities.

e. Characteristics.

(1) Width. The taxiway centerline marking width, which is either 6 inches (15 cm) or 12 inches (30 cm), is based on the type of taxiing operation as described below. Uniform width must be maintained for the entire length of the taxiway except under the following conditions.

(i) The taxiway or part of the taxiway is designated as a SMGCS taxi route. Under this designation, the width of the taxiway centerline must be 12 inches (30 cm) wide and, on light-colored pavement, further outlined in black. The taxiway centerline width of any remaining section of the taxiway that is not part of the designated SMGCS taxi route may change abruptly at that point or at the intersection with other taxiway centerline markings, for example, reduced from 12 inches (30 cm) to 6 inches (15 cm).

(ii) A confusing intersection of taxiways is better served by the designation of a preferred taxi route through the confused intersection by painting a wider centerline width. The FAA recommends that airport operators take measures to realign or reconstruct confusing taxiway intersections.

(iii) If deemed necessary by the airport operator to provide pilots a better visual clue of the location of troublesome taxiway exits from the runway, the airport operator may increase 6-inch (15-cm) wide taxiway centerline markings before the aircraft hold side at the runway holding position location to 12-inch (30-cm) wide lead-off taxiway centerline markings on the runway side.

(2) Discontinuity of the Taxiway Centerline Marking Along the Taxiway. The taxiway centerline marking of a taxiway remains continuous except when it intersects (1) a runway holding position marking, (2) an intermediate holding position marking (intersection of taxiways), (3) an ILS/MLS or POFZ holding position marking, or (4) non-movement area boundary marking (paragraph 5.4). Figure A-13 and Figure A-14 illustrate the marking details for most of these conditions.

4.3. Enhanced taxiway centerline marking.

a. Purposes. The enhanced taxiway centerline marking provides supplemental visual cues to alert pilots of an upcoming runway holding position marking (Pattern A) for minimizing the potential for runway incursions. To reinforce situational awareness before entering a runway, this safety enhancement is only used on those taxiways that directly enter a runway. For example, this safety enhancement would not be painted on a runway or used at all Pattern A applications, such as case 1 or case 2 (paragraph 3.2), situations as shown in Figure D-16, or a taxiway that goes through the runway safety area but not onto the runway itself. The same restriction is valid for case 4 Pattern B applications.

14 Code of Federal Regulation (CFR) Part 139 Certificated Airports Runway Incursion Mitigation Requirement (Safety)
The enhanced taxiway centerline marking, as illustrated in Figure D-1, is mandatory and the only acceptable means of compliance for all 14 CFR Part 139 certificated airports. All taxiways leading ONLY to a runway holding position marking are to have the enhanced taxiway centerline marking. This surface painted marking is part of the taxiway centerline marking standard under 14 CFR Section 139.311(a)(2).

b. Location. Taxiway centerlines are enhanced for 150 feet (45.7 m) prior to a Pattern A – runway holding position marking, as shown in Figure D-1, except for the situations described in paragraph 4.3.d. The portion of the taxiway centerline between the runway holding position marking and the runway itself is not enhanced. If the location of taxiway centerline lights and their housings interfere with the painting of the enhanced taxiway centerline, then lights and their housing can be covered up temporarily during the painting process, i.e., lights need not be relocated or housing painted to accommodate this requirement.

c. Color. The enhanced taxiway centerline marking is yellow and must use glass beads. See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this marking. The black border on the outside of the dashes is 3 to 6 inches (7.5 to 15 cm) in width. Never use glass beads on black borders.

d. Characteristics. The standard painted enhanced taxiway centerline marking consists of two parallel lines of yellow dashes one on each side of the existing 6-inch (15-cm) or 12-inch (30-cm) taxiway centerline as shown in Figure D-1 and Figure D-6. For both applications, the first dashes start 6 to 12 inches (15 to 30 cm) from the runway holding position

marking. For Figure D-1 applications, the marking runs for a length of 9 feet (2.7 m) with a 6-inch (15-cm) width and are followed with a gap of 3 feet (0.9 m) between the dashes. For Figure D-6 applications, the first and second set of dashes are 6 to 12 inches (15 to 30 cm) from the runway holding position marking and the surface painted holding position sign. For both cases, the standard painted pattern has a total length of 150 feet (45.7 m). For Figure D-1 applications, the standard pattern consists of 12 sets of 9-foot (2.75-m) dashes plus 3-foot (0.9-m) spaces and ends with a 6-foot (1.8-m) dash for a total length of 150 feet (45.7 m). However, because of the varieties of existing taxiway geometries and the placement of a runway holding position marking, the standard painted pattern is not always painted. The painting patterns for the most common taxiway geometries are described in this section below.

(1) Taxiway Serving Two Closely Spaced Runways. Figure D-16 illustrates how to paint enhanced taxiway centerline markings for a taxiway that connects two closely spaced runways. Each enhancement terminates at the runway edge unless the full 150-foot (46-m) length can be painted. Figure D-16 illustrates situations in which one enhancement is fully painted, one enhancement terminates at the outer edge of the runway edge marking, and the other enhancements terminate at the edge of the runway (Figure D-16 uses an unpainted reference line to terminate the enhancements to Runway 1/19).

(2) Taxiway/Taxiway Intersections and Merging Intersections. Figure D-11 (Note 2), Figure D-12 (Note 1), and Figure D-14 illustrate that if the taxiway centerline to be enhanced intersects another taxiway that is located within 150 feet (45.7 m) of a runway holding position marking and leads to a point other than onto the runway (another enhanced taxiway centerline), the enhancement must terminate 5 feet (1.5 m) prior to the point where the other taxiway centerline crosses the taxiway centerline that is being enhanced. In comparison, on a taxiway, as shown in Figure D-11 (Note 1) and Figure D-13, where the enhancement is 150 feet (45.7 m) or less and merges with a straight or curved taxiway centerline, the enhancement terminates at the last set of full dashes prior to the point of tangency with the other taxiway centerline.

(3) Single, Straight-In, Enhanced Taxiway Centerline Marking Intersecting a Runway Holding Position Marking at Angles of 90 Degrees. Figure D-10 and Figure D-12 (Note 3) show the standard painted patterns, i.e., the enhanced taxiway centerline measures 150 feet (45.7 m) in length. In comparison, Figure D-13 shows a painted pattern for Runway 16/34 in which an enhancement terminates at the last set of full dashes prior to the point of tangency with the other taxiway centerline marking.

(4) Straight-In, Enhanced Taxiway Centerline Markings Intersecting a Runway Holding Position Marking at Angles Other than 90 Degrees. Figure D-3 (details A – D) and Figure D-7 show standard painted patterns. When a straight-in enhancement intersects the runway holding position marking at an angle other than 90 degrees, the first dashes of the enhancement on either side of the taxiway centerline will start and stop at different locations. In this case, use the taxiway centerline as a guide to paint the enhancements as shown in details A – D of Figure D-3. This painting pattern will show both dashes starting 6 to 12 inches (15 to 30 cm) from the first solid bar of the runway holding position marking and ending at the same location. The finished pattern will show for the first set of dashes, one dash longer than 9 feet (2.7 m) and the other dash shorter than 9 feet (2.7 m).

(5) Single Taxiway Centerline Serving Two Runway Holding Position Markings. If a taxiway centerline intersects two runway holding position markings as shown in Figure D-12 (Note 2) and measures less than 150 feet (45.7 m) in length, then the entire taxiway centerline is enhanced only between the two runway holding position markings. In no case will the lacking length of the enhancement be painted between the runway itself and the runway holding position markings. To paint this enhancement, start with the 9-foot (2.75-m) dashes from each runway holding position marking (see paragraph 4.3.d(7)(ii) for painting practice). Next, continue painting the pattern from each starting point until both enhancements meet at the midpoint of the curved taxiway centerline. It is okay if the dashes or the spaces at the midpoint are less than the length specified in the standard. The intent here is to maintain the pattern of long dashes and shorter spaces on each side of the centerline.

(6) Dual Holding Position Markings. If an ILS/MLS or a POFZ (Pattern B) holding position marking is within 150 feet (45.7 m) of a runway holding position marking (Pattern A), the enhanced taxiway centerline remains within the confines of the two holding position markings, i.e., the enhancement does not proceed beyond the ILS/MLS or the POFZ holding position marking. Under this situation, the enhanced taxiway centerline terminates 3 feet (0.9 m) before the ILS/MLS and the POFZ holding position markings.

(7) Curved and Multiple Taxiway Centerlines Converging Prior to or Intersecting a Runway Holding Position Marking. Various geometries exist such as those shown in Figure D-9, Figure D-10, Figure D-11, and Figure D-12. Below are the most common geometries and the recommended painting patterns.

(i) Intersecting and Convergent Taxiway Centerlines. As shown in Figure D-2 and Figure D-3 (Detail B), where two taxiway centerlines intersect or converge before or at the runway holding position marking, the outside dashes continue, with the possible exception of the first set of dashes, to maintain the 9-foot (2.75-m) pattern along the point of convergence. Depending on the geometry, the first inside dashes may be less than 9 feet (2.7 m) but must be aligned with the outside dashes, i.e., the inside dashes stop with and possibly start with the outside dashes. As noted in Figure D-3 (Detail B), it is permissible to omit inside dashes that measure less than 5 feet (1.5 m). Detail B also illustrates that the inside dashes can overlap each other.

(ii) Curved Taxiway Centerlines Intersecting a Runway Holding Position Marking. As shown in Figure D-3 (Detail D), when a taxiway centerline is curved, the dashes on either side of the taxiway centerline would start and stop at different locations when maintaining the 9-foot (2.75-m) length. Therefore, in order to correct this mismatch, apply the following painting practice, which takes all measurements from the taxiway centerline:

(a) Each dash in the first set of dashes along with the taxiway centerline will start at the same distance, 6 to 12 inches (15 to 30 cm) from the first solid bar of the runway holding position marking.

(b) To locate the end point of the first set of dashes, first measure 9 feet (2.7 m) along the taxiway centerline. Next, draw an imaginary line that is

perpendicular to the tangent of the taxiway centerline and mark the ends of the first dashes on each side of the taxiway centerline.

(c) Measure an additional 3 feet (0.9 m) along the curved taxiway centerline. Next, draw an imaginary line perpendicular to the tangent of the curve and mark the starting point for the second set of dashes. The ending point for this set is found by measuring 9 feet (2.7 m) along the center of the curved taxiway centerline. An imaginary line perpendicular to the tangent at this point will mark the end of the second set of dashes.

(d) Repeat the procedure for the remaining curved portion of the taxiway centerline, remembering that the last set of dashes only measures 6 feet (1.8 m).

4.4. Taxiway edge marking.

Where the term "taxiway edge marking" is used throughout this AC, it is understood to apply equally to taxilanes.

a. Purposes. The taxiway edge marking, a dual continuous or dashed marking, is used along a taxi route to (1) alert pilots where the demarcation line exists between usable pavement for taxi operations and unusable pavement and (2) identify the edge(s) of a taxi route located on sizeable paved areas that can be crossed over by the pilot. Two marking schemes for the taxiway edge marking are available to the airport operator to indicate whether the pilot is allowed to cross the taxiway edge. Figure A-15, Figure C-3, and Figure C-4 illustrate these marking variations. For lighting provisions, see AC 150/5340-30.

(1) Continuous Taxiway Edge Marking. The continuous taxiway edge marking is used to delineate the taxiway edge from the shoulder or some other contiguous paved surface that is not intended for use by pilots. Continuous taxiway edge markings are never used in any operational situation that permits a pilot to cross this surface marking, for example, a taxilane on a terminal or cargo apron.

(2) Dashed Taxiway Edge Marking. The dashed taxiway edge marking is used where there is an operational need to define the edge(s) of a taxi route on or contiguous to a sizeable paved area that permits pilots to cross over this surface marking. A common application for this surface marking is a taxi route along the outer edge of a terminal apron. To achieve safety objectives, dashed taxiway edge markings are never used on entrance taxiways or bypass taxiways that directly enter a runway, such as shown in Figure 5-1 and Figure A-19 (see red safety box below, Runway Incursion Mitigation Requirement). Furthermore, airports having dual or more parallel taxiways at a runway end as shown in Figure 5-1 with "paved islands" must use continuous taxiway edge markings around all paved islands (NO TAXI islands). This safety measure is taken to ensure standard wingtip-to-wingtip clearances. Regardless of the taxi route's site, the location for painting the dashed taxi edge marking must be per AC 150/5300-13 using standard taxiway widths after obtaining standard taxiway/taxilane object free area widths for locating the taxiway centerline. In other words, these dashed taxiway edge markings (the stripe pattern) are never used to provide wing tip clearances for other moving or parked airplanes found, for example, operating on aprons. For this separation situation the airport operator may

use the non-movement area boundary marking to indicate adequate clearance (taxiway/taxilane object free area).

b. Requirement. Taxiway edge markings are used when deemed necessary by the airport operator or the FAA.

c. Location. The taxiway edge marking is located such that the outer edge of the continuous line or dashed line defines the edge of the usable pavement.

d. Color. Both taxiway edge marking schemes are yellow. If black borders are necessary, the black borders on the outside of the marking can be 6 inches (15 cm) in width and never use glass beads.

e. Characteristics.

(1) The outermost edge of both marking schemes must be painted along the edge of the usable pavement.

(2) The continuous taxiway edge marking consists of dual, continuous lines with each line being at least 6 inches (15 cm) in width and spaced 6 inches (15 cm) apart (edge to edge) as shown in Figure C-3. This continuous marking must be used to designate NO-TAXI islands as shown in Figure A-19. Although it is preferable for the inner portion of NO-TAXI islands to be unpaved, for example, grass covered, the inner area may be painted green or painted with striated yellow markings per paragraph 1.3.d. Placement of the striated yellow stripes is perpendicular to and abuts the continuous taxiway edge marking. The length, which may be governed by the shape of the NO-TAXI island, should be 5 feet (1.5 m) for TDG-1A and TDG-1B; 15 feet (4.5 m) for TDG-2; 20 feet (6 m) for TDG-3 and TDG-4; and 25 feet (7.6 m) for TDG-5, TDG-6, and TDG-7. Width and separation between striated yellow stripes follow paragraph 1.3.d criteria. One other option to enhance NO-TAXI islands is to apply artificial turf for the portion of the area between the standard taxiway shoulder widths as prescribed by AC 150/5300-13.

(3) The dashed taxiway edge marking consists of dual, dashed yellow lines that are at least 6 inches (15 cm) in width and spaced 6 inches (15 cm) apart (edge to edge) as shown in Figure C-4 or Figure C-5. The dashed lines are 15 feet (4.5 m) in length with 25-foot (7.5-m) gaps as shown in Figure A-15. This marking is never used to designate NO-TAXI islands.

Runway Incursion Mitigation Requirement (Safety)
Recorded runway incursion data associated with multi-taxi entrance designs to a runway that do not use "NO-TAXI islands" between the adjacent taxiway entrances have experienced a higher rate of runway incursions as compared to entrances with NO-TAXI islands. To reduce the possibility of runway incursions, all designs for a direct entrance to a runway that use two or more taxiway entrances must use "NO-TAXI islands" that are outlined with the continuous taxiway edge marking. AC 150/5300-13 prescribes and illustrates only bypass taxiway entrance designs that have NO-TAXI islands as part of the design.

(4) For the case where the taxiway edge marking intersects a holding position marking (Pattern A), then when holding position marking:

(i) is outlined in black, the taxiway edge markings should abut the black outlines on both sides of the runway holding position marking, i.e., the borders for the yellow dashed and yellow solid line.

(ii) is not outlined in black, the taxiway edge markings should abut the yellow holding position marking on both sides, i.e., the yellow dashed and yellow solid line.

4.5. Surface painted holding position signs.

a. Purposes. This surface painted sign provides supplemental visual cues that alert pilots and vehicle drivers of an upcoming holding position location and the associated runway designator(s) as another method to minimize the potential for a runway incursion and, for certain airport geometries, wrong runway takeoffs. Several applications of this surface painted sign for taxiways are shown in Figure D-5 (non-centered), Figure D-6 (centered) and Figure D-15 (stacked). The surface painted holding position sign is used only on those taxiways (not runways) with a Pattern A holding position marking that enter a runway. Taxiways that do not lead directly onto the runway, such as a taxiway that crosses through an approach area, are not to have this surface painted sign. In regards to Pattern B, certain taxi/runway geometries, for example Figure A-17, under specific landing operations do occur in which this surface painted sign is necessary to protect both the runway entrance environment and the ILS/MLS or the POFZ critical area. Figure A-17 shows the POFZ critical area overlapping the holding bay at the entrance to the runway.

14 Code of Federal Regulation (CFR) Part 139 Certificated Airports
Runway Incursion Mitigation
(Safety)

The surface painted holding position sign (SPHPS), as illustrated in Figure D-5 or Figure D-6 for existing taxiway widths, is mandatory and the only means of compliance for all 14 CFR Part 139 certificated airports regardless of the number of runways at the airport. The intent of this requirement is to eliminate the various practices among 14 CFR Part 139 certificated airports in which pilots would (1) see the surface painted holding position sign at all taxiway entrances to a runway, (2) only see the marking on extra wide taxiway entrances over 200 feet (61 m) in width, or (3) see none at all at single runway airports. In turn, this all-inclusive application will reduce human confusion among pilots and drivers that may contribute to runway incursions.

This surface painted sign is mandatory on the left side of the taxiway centerline for TDGs 3-7 and centered over the taxiway centerline for TDG-1A, TDG-1B, and TDG-2 even if a vertical runway holding position sign exists. For TDGs 3-7, the surface painted sign for the right side of the taxiway centerline, which is highly recommended for taxiway entrances serving airplane operations that require two person crews, may be eliminated when a taxiway centerline is closer than 45 feet (13.7 m) from the edge of the taxiway and a mandatory vertical runway holding position sign is in clear view (either left or right of the taxiway centerline).

b. Location. The location (and number) of the SPHPS is determined by the width of the taxiway entrance and the number of taxiway centerlines that intersect the same holding position marking. Although the design of all taxiway entrances to a runway should have been based on a single taxiway design group, i.e., all taxiway entrances have the same standard width, some existing runways have varied taxiway widths serving more than one taxiway design group. In such cases, the taxiway design group for that taxiway entrance will determine the location (and number) of the surface painted marking. For example, a runway with a runway design code of C-III-5000 has one taxiway entrance built to TDG-2 standards and others built to TDG-3 standards. For the TDG-2 entrance, a single, centered surface painted marking as shown in Figure D-6 is painted while the TDG-3 taxiway entrances are painted differently.

(1) The SPHPS must not be painted on a runway, including runways that are temporarily used by ATCT as a taxiway.

(2) In all cases, the SPHPS is never painted onto the taxiway shoulders.

(3) In reference to the holding position marking (Pattern A), the surface painted holding position sign is always painted prior to and runs parallel to the holding position marking at a distance of 2 to 4 feet (0.6 to 1.2 m) as shown in Figure D-5, Figure D-6, and Figure D-7. The location takes into account the direction of taxiing and should allow sufficient clearance for in-pavement runway guard lights and/or stop bars.

(4) When a single taxiway centerline intersects the holding position marking (Pattern A, the surface painted holding position sign is located as follows:

(i) For taxiway widths that are greater than 35 feet (10.5 m) (TDG-3 - TDG-7), one or two surface markings are placed 3 to 10 feet (0.9 to 3.1 m) from the center of the taxiway centerline. With a few exceptions, one surface marking must be painted on the left side of the taxiway centerline. The left side rather than the right side is used because not all aircraft that may use this entrance require two-person crews. The surface painted sign for the right side of the taxiway centerline, which is highly recommended for taxiway entrances serving airplane operations that require two-person crews, may be eliminated when a taxiway centerline is closer than 45 feet (13.7 m) from the edge of the taxiway and a mandatory vertical runway holding position sign is in clear view (from either left or right of the taxiway centerline.) Any airport with a taxiway entrance to a runway with insufficient lead-on length (see safety box under Condition 2 of paragraph 4.5.b(5) for definition) to the runway holding position marking, such as Figure D-11, must have two surface painted holding position signs, one on each side of the taxiway centerline marking. Because of the variety in taxiway geometries, such as shown in Figure D-9, Figure D-10, Figure D-11, Figure D-12, and Figure D-14, the taxiway centerline may or may not be perpendicular to the holding position marking. If the taxiway centerline is perpendicular, then placement of the surface painted holding position sign is in accordance with Figure D-5. If the taxiway centerline is not perpendicular, then placement is in accordance with Figure D-7.

(ii) For taxiways widths of 35 feet (10.5 m) or less (TDG-1A, TDG-1B, and TDG-2), one surface marking is centered directly over the taxiway center. If the taxiway centerline is perpendicular to the holding position marking (Pattern A), then placement of the surface painted holding position sign is as shown in Figure D-6. If the taxiway centerline is not perpendicular, then placement is still centered over the taxiway centerline, but oriented to run parallel to the holding position marking. That is, its placement would appear in like fashion when two such markings are painted as shown in Figure D-7.

(5) When two or more taxiway centerlines intersect or converge within 15 feet (4.5 m) of the holding position marking (Pattern A), there might not be enough space for two or more surface painted holding position signs. Figure D-3, Figure D-12, and Figure D-16 are examples of layouts where it is not possible to paint all the required surface painted holding position signs for each converging taxiway centerline. In these cases, a surface painted holding position sign may be omitted on one side of the taxiway centerline as shown in Figure D-9 and Figure D-12 for TDGs 3-7 standard taxiway widths. In the case of TDG-1A, TDG-1B, and TDG-2 standard taxiway widths, a single surface painted holding position sign must be centered over the two converging taxiways where separate surface markings would have overlapped each other. These and other types of geometries will require individual site assessment by the airport operator to determine the number of surface painted holding position signs that are required by this advisory circular and fit properly into the available space. In terms of proper spacing between two taxiway centerlines, a surface painted holding position sign should be approximately equidistant from both taxiway centerlines at a distance of no less than 3 feet (0.9 m) or more than 10 feet (3.1 m) from either taxiway centerline as measured from the center of the taxiway centerlines to the nearest border of the surface painted holding position sign. For difficult taxiway geometries, the airport operator should consult their FAA Regional Airports Division Office or the Airports District Office (ADO) before painting any markings. For such

requests, the airport operator should provide information about the rate of usage by each taxiway centerline, aircraft types, and the available space for painting.

Wrong-Runway Takeoff Mitigation
(Safety)

If an airport has a taxiway entrance that simultaneously serves two or more runways, the surface painted holding position sign must show all runway designators plus directional arrows. The directional arrows must approximate the orientation of the runways.

The surface painted holding position sign is part of the standard signage requirements under 14 CFR Section 139.311(b)(1)(ii).

Runway Incursion Mitigation
Extra-Wide Taxiway Entrances
(Safety)

Condition 1.

Any airport with a taxiway entrance to a runway having a width greater than 200 feet (61 m) as measured along its runway holding position marking requires the following surface markings. First, a surface painted holding position sign must be painted on the left side of the taxiway centerline (or centered over the taxiway centerline for TDG-1A, TDG-1B, and TDG-2 standard taxiway widths). Second, depending on how excessive the width, a "repetitive pattern" of additional surface painted holding position signs must be painted in accordance with Table 4-1 below. This second requirement is in direct response to documented runway incursions associated with extra-wide taxiway entrances to a runway. Note the spacing requirement is based on the Airplane Design Group component of the Runway Design Code, not the Taxiway Design Group.

The repetitive pattern of Table 4-1 relates the spacing of the additional markings to the viewing angles of pilots and to the painting of future parallel taxiway entrances according to AC 150/5300-13. In other words, when the airport operator decides to paint additional parallel taxiway entrances, the criterion in Table 4-1 would already have in place the required surface painted holding position sign within the proper distance of the newly painted taxiway centerlines (or centered over the taxiway centerline for TDG-1A, TDG-1B, and TDG-2).

When the airport operator paints additional parallel taxiway entrances, then the repetitive pattern is completed by painting a NO-TAXI island as shown in Figure A-19

Runway Incursion Mitigation
Extra-Wide Taxiway Entrances
(Safety)

at each midpoint between parallel taxiway centerlines. See paragraph 4.4.e Safety Box for the marking scheme to paint NO-TAXI islands.

Table 4-1. Placement of repetitive surface painted holding position signs and NO-TAXI islands on taxiway entrances of over 200 feet (61 m) in width

Airplane Design Group (ADG) Category[1]	Distance between adjacent surface painted holding position signs[2] as measured from the same outer edge[3] Feet (meters)	Midpoint distance for a NO-TAXI island between parallel taxiway centerlines[4] as measured from either taxiway centerline Feet (meters)
ADG I	69 (21)	34.5 (10.5)
ADG II	105 (32)	52.5 (16)
ADG III	152 (46.5)	76 (23.25)
ADG IV	215 (65.5)	107.5 (32.75)
ADG V	267 (81)	133.5 (40.5)
ADG VI	324 (99)	162 (49.5)

Note 1: The terms Airplane Design Group and Taxiway Design Group are defined in AC 150/5300-13.

Note 2: Each entry equals the taxiway centerline to parallel taxiway centerline value based on ADG listed in AC 150/5300-13.

Note 3: The listed value assumes that the existing surface painted holding position sign is used as the starting point to measure and paint additional surface markings either on the left side of the taxiway centerline (Figure D-5) or directly centered over the taxiway centerline (Figure D-6). For taxiways with dual surface markings, such as shown in Figure D-5, the measurement should still be from the left-side surface marking. If there is no left-side surface marking, use the center of the taxiway centerline and add 3 to 10 feet (0.9 to 3.1 m) to the listed value in Table 4-1. This numeric range is the dimension letter B used in Figure D-5.

Note 4: Each entry is half of the taxiway centerline to parallel taxiway centerline value based on ADG listed in AC 150/5300-13.

Condition 2.

Any ADG III–VI runway with a taxiway entrance to a runway with insufficient lead-on length to the runway holding position marking must have two surface painted holding position signs, one on each side of the taxiway centerline marking.

The term "insufficient lead-on-length" is defined as follows:

(1) For the case of a perpendicular taxiway centerline intersecting the holding position marking, such as shown in Figure D-5, Figure D-12 curve #3, and Figure D-14, the design airplane for that runway is unable to line up its entire

Runway Incursion Mitigation
Extra-Wide Taxiway Entrances
(Safety)

fuselage perpendicular to the runway holding position marking.

(2) For the case of a non-perpendicular taxiway centerline intersecting the holding position marking, such as shown in Figure D-7 and Figure D-9, the design airplane for that runway is unable to line up its entire fuselage on a straight section of the entrance taxiway centerline while holding at the runway holding position marking.

Three quick, visual indications of this undesirable design condition are (1) taxiway centerlines, such as shown in Figure D-9, that only curve into the runway holding position marking; (2) holding position markings, such as shown in Figure D-14, that are painted in or near the region where taxiway fillets are constructed; and (3) an enhanced taxiway centerline that measures far less than 150 feet (45.7 m) in length.

Figure D-9, Figure D-10, Figure D-11, and Figure D-12 provide some examples on how to paint left-of-centerline and right-of-centerline surface painted holding position signs.

The surface painted holding position sign is part of the standard signage requirements under 14 CFR Part 139.311(b)(1)(ii).

c. Color. The surface painted holding position sign has a red background with a white inscription and, on light-colored pavements, is outlined in black. Although this marking supplements the mandatory runway holding position sign, the black outline that surrounds the white alphanumeric inscription on the signs is not required for the surface painted holding position sign.

d. Characteristics.

(1) The standard height of the inscription and its location are as follows:

(i) For taxiway widths that are greater than 35 feet (10.5 m) (TDGs 3-7), the inscription is 12 feet (3.7 m), but may be reduced in accordance with the criteria in Figure D-5.

(ii) For taxiways widths of 35 feet (10.5 m) or less (TDG-1A, TDG-1B, and TDG-2), the inscription is in accordance with the criteria in Figure D-6.

Solutions for Difficult Placements
Stacked Surface Painted Holding Position Signs
(Painting)

For taxiway entrances or a taxiway entrance with a complex geometry that requires a lengthy inscription (a single surface marking) for two or more runways and that will not fit properly between the existing taxiway centerline and the taxiway edge, the airport operator should reduce the inscription height. Under this solution, the lowest allowable height for the inscription for TDGs 3-7 standard taxiway widths is 6 feet (1.8 m) and for TDG-1A, TDG-1B, and TDG-2 standard taxiway widths is 3 feet (0.9 m). This painting solution may be necessary for smaller standard taxiway widths whose entrance taxiways support two runway ends. If this solution fails, the single marking may then be broken into two separate markings, one marking per runway, but stacked one above the other as shown in Figure D-15. Under this solution, the airport operator should fit the stacked markings such that (1) the height of the inscription is increased toward the standard height and (2) the separation between the stacked inscriptions is 2 to 4 feet (0.6 to 1.2 m). For taxiways less than or equal to 35’ wide, the stacked surface painted holding position signs are located centered on the taxiway in accordance with criteria in Figure D-6. See Figure D-15 for the recommended order of appearance for stacked surface painted holding position signs.

Note: All other unaffected runway holding positions that do not require a reduced inscription height must use the standard inscription height. The intent of this note is to maintain uniformity in visual cues across the United States.

(2) The inscription must be identical to the runway holding position sign by using the same numbers, letters, and arrows. The appearance of the letters, numbers, and arrows must be per Appendix B.

(3) The background is rectangular and extends horizontally and vertically beyond the extremities of the inscription 7.5 inches (19 cm) for TDG-1A, TDG-1B, and TDG-2 standard taxiway widths and 15 inches (38 cm) for TDGs 3-7 standard taxiway widths.

(4) The surface painted holding position sign is at least 2 feet (0.6 m) from the edge of the inside taxiway edge marking or from the edge of the paved taxiway when there are no taxiway edge markings. See Figure D-4.

4.6. Surface painted taxiway direction signs.

a. Purpose. The surface painted taxiway direction sign is used with an arrow to provide directional guidance at an intersection.

b. Requirement. This marking is required where it is not possible to provide a taxiway direction sign in accordance with AC 150/5340-18. Optionally, it may be installed where operational experience has indicated that its presence at a troublesome taxiway intersection can assist flight crews in better ground navigation. For signage provisions, see AC 150/5340-18.

c. Location. The edge of the surface painted taxiway direction sign (excluding the border if used) is 3 feet (0.9 m) from the edge of the taxiway centerline and is located on the side of the taxiway centerline that the aircraft travels as shown in Figure A-19. That is, markings that indicate left turns are located on the left-hand side of the taxiway centerline while markings indicating right turns are located on the right-hand side of the taxiway centerline.

(1) The surface painted taxiway direction sign is not painted on runways, including runways that are operationally used as a taxiway, or painted between the runway holding position marking (Pattern A) and the runway.

(2) For crisscrossing taxiways, such as two taxiways crisscrossing at 90 degrees to each other, a surface painted taxiway direction sign is combined with arrows to indicate the different travelling directions at the intersection. Under this application, the single marking is located on the left side of the taxiway centerline.

(i) When it is not practicable to install a taxiway direction sign along the side of the taxiway, paint a surface painted taxiway direction sign and locate it at the same distance from the intersection per AC 150/5300-13 standards for fixed/moveable objects.

(ii) When a surface painted taxiway direction sign supplements a taxiway direction sign installed along the side of the taxiway, the surface painted direction sign may be located at or within the distances per AC 150/5300-13 standards for fixed/moveable objects, and the point of divergence of the painted taxiway centerlines.

(3) A surface painted taxiway direction sign is not co-located with a surface painted holding position sign.

(4) The surface painted taxiway direction sign is not painted on runways, including runways that are operationally used as a taxiway.

d. Color. The surface painted taxiway direction sign has a yellow background with a black inscription that includes an arrow(s). See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this marking. On light-colored pavements, a 6-inch (15-cm) black border completely surrounds its perimeter.

e. Characteristics.

(1) The black inscription is 12 feet (3.7 m) in height. However, the height may be reduced if necessary to the minimum height of 9 feet (2.7 m).

(2) Each black inscription must be accompanied by an arrow oriented to show the approximate direction of a turn.

(3) The black inscription with the arrow(s) must conform in appearance to the letters, numbers, and symbols in Appendix B.

(4) The yellow background is rectangular and extends a minimum of 15 inches (38 cm) horizontally and vertically beyond the extremities of the black inscription, which includes the arrow head(s).

(5) A 6-inch (15-cm) wide vertical black stripe separates two black inscriptions when more than one inscription is included on the same side of the taxiway centerline.

(6) See paragraph 4.7.e(4) when collocating a surface painted taxiway direction sign with a surface painted taxiway location sign.

4.7. Surface painted taxiway location signs.

a. Purposes. The surface painted taxiway location sign identifies the taxiway upon which the aircraft is located. This marking is used to supplement other signs located along the taxiway system.

b. Requirement. This marking is required when deemed necessary by the airport operator or FAA. Optionally, it may be installed where operational experience has indicated that its presence can assist flight crews in better ground navigation. For signage provisions, see AC 150/5340-18.

c. Location. The surface painted taxiway location sign is located normally on the right side of the taxiway centerline in the direction of travel as shown in Figure A-19. The edge (excluding the border if used) of the surface painted taxiway location sign should be 3 feet (0.9 m) from the edge of the taxiway centerline.

(1) When adequate pavement width exists, a surface painted taxiway location sign may be located on the left side of the taxiway centerline if it is co-located to the left of a surface painted holding position sign (paragraph 4.5). In this case, the two surface painted signs will mimic the mandatory holding position signs. Under this application, if the co-located surface painted taxiway location sign and the mandatory holding position sign serve two converging taxiways, then the surface painted taxiway location sign should be located to the left of the surface painted holding position sign (in the direction of taxiing).

(2) The surface painted taxiway location sign is not painted on runways, including runways that are operationally used as a taxiway, or painted between the runway holding position marking (Pattern A) and the runway.

d. Color. The surface painted taxiway location sign has a black background with a yellow inscription and a yellow border around its perimeter for all pavement surfaces. See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this marking.

e. Characteristics.

(1) The yellow inscription is 12 feet (3.7 m) in height. However, the height may be reduced if necessary to the minimum height of 9 feet (2.7 m).

(2) The yellow inscription never contains an arrow and must conform in appearance to the letters, numbers, and symbols in Appendix B.

(3) The background is rectangular and extends a minimum of 15 inches (38 cm), which includes the 6-inch (15-cm) yellow border, horizontally and vertically beyond the extremities of the yellow inscription.

(4) When a surface painted taxiway location sign is collocated with a surface painted taxiway direction sign on any pavement surface, paint the inscriptions for both markings of equal height.

4.8. Surface painted gate destination signs.

a. Purpose. The surface painted gate destination sign is used to assist pilots in locating their assigned terminal gate. The marking is especially useful for low-visibility operations.

b. Requirement. This marking is optional.

c. Location. The surface painted gate destination sign may be installed in non-movement areas or movement areas that are in the proximity of terminal building(s) per the examples in Figure A-20 and Figure A-21. The markings are located adjacent to taxiway centerlines on the same side in which a turn will be made while traveling toward the assigned gate.

d. Color. The surface painted gate destination sign has a solid yellow background with a black inscription. On light-colored pavements, a 6-inch (15-cm) black border may be used.

e. Characteristics.

(1) For surface painted gate destination signs containing only a single row of several gate designations as shown in Figure A-20, the black inscriptions must have a maximum height of 4 feet (1.2 m).

(2) For surface painted gate destination signs containing more than one row of gate designations, shown as an option in Figure A-21, the inscriptions must have a minimum height of 3 feet (0.9 m). There is no maximum height size for a surface painted gate destination sign containing more than one row of inscriptions.

(3) The background of the marking is rectangular and extends a minimum of 15 inches (38 cm) horizontally and vertically beyond the extremities of the inscriptions.

(4) The black inscription must conform in appearance to the letters, numbers, and other symbols in Appendix B.

(5) A range of gates that are sequential should be indicated with a single dash. For example, a series of gates A1 through A4 are indicated as “A1 - A4”.

(6) A range of gates that are non-sequential should be separated by commas. For example, the gates B1, B3, and B6 are indicated as "B1, B3, B6".

4.9. Surface painted apron entrance point signs.

a. Purpose. The surface painted apron entrance point sign is used to assist pilots in locating their position along the edges of a large, continuous apron serving the terminal gates. The marking is especially useful for identifying both the entrances and exits in and along the terminal complex. To facilitate shorter, less confusing verbal communication and movement of ground traffic, the surface painted apron entrance point sign is sometimes referred to as the "ramp spot" at some airports.

b. Requirement. This marking is optional.

c. Location. The surface painted apron entrance point sign may be painted in non-movement areas or movement areas that are in the proximity of an apron leading to the concourses or terminal buildings as shown in Figure A-22. The marking, located 7 feet (2.1 m) from taxiway centerline(s), is on the same side of the centerline to which a turn will be made to travel toward the assigned gate.

d. Color. The surface painted apron entrance point sign has a yellow background with a black inscription. The color of the border depends on the pavement color. Concrete or light-colored pavement should use a black border, while dark pavements should use a white border.

e. Characteristics.

(1) The surface painted apron entrance point sign consists of three 9-foot (2.7-m) diameter circles each located 7 feet (2.1 m) from the associated taxiway/apron centerline. As shown in Figure A-22, two circles are located on either side of the entrance taxiway centerline(s) that continues toward the gate and ends with the third circle.

(2) For taxiways that do not turn but continue forward, only the third circle is painted. For complex taxiways where two converging taxiway centerlines cross the non-movement boundary marking in very close proximity to each other, the airport operator may paint a single marking near the non-movement boundary marking that is between the two converging taxiway centerlines. That is, the single marking is not overlapping the taxiway centerlines. For a single taxiway centerline that diverges into two separate taxiway centerlines just prior to the non-movement boundary marking, paint a single marking on the taxiway centerline prior to its splitting into different taxiway centerlines.

(3) Each circle is comprised of an inner 8-foot (2.7-m) diameter yellow circle with a 6-inch (15-cm) outer ring that is black in color for concrete and light-colored pavements and is white in color for asphalt pavements.

(4) The inscription is either numeric or alpha-numeric. For the situation that consists of three circles, the inscription for gate designation within each of the three circles should match.

(5) The black inscription inside each circle should only be a number, black in color and 4 feet (1.2 m) in height.

(6) The appearance of the inscription numbers must conform to the scale of letters, numbers, and other symbols in Appendix B.

4.10. Taxiway shoulder markings.

a. Purpose. Aprons, holding bays, and taxiways are sometimes provided with paved shoulders or stabilization per AC 150/5300-13 to prevent ground erosion attributed to jet blast or water runoff or to minimize engine damage caused by foreign object debris. Although these shoulders are not intended for use by aircraft, conditions may exist along a taxi route that confuse cause pilots and cause them to use the shoulders. For example, a particular taxiway curve with an extra-wide paved shoulder may confuse pilots as to which side of the painted taxiway edge marking stripe is intended for their use. Where such conditions exist, the airport operator should paint taxiway shoulder markings to indicate the non-usable (deceptive) area to pilots. Figure A-23 illustrates this surface marking.

b. Requirement. This marking is optional.

c. Location. The taxiway shoulder marking is painted using a perpendicular reference line draw from the taxiway centerline. The start and stop points, and separation gaps, for painting the marking are described below.

(1) Referring to Figure A-23 on straight sections, the taxiway shoulder markings will be placed perpendicular at each point of intersection with the defined edge of paved taxiway or the taxiway edge marking with additional markings being uniformly placed between the two start and finish markings. The spacing of the markings, centerline-to-centerline, will not exceed 100 feet (30.5 m) between two adjacent markings as shown in Figure A-23.

(2) Referring to Figure A-23 on curved sections, the taxiway shoulder markings will be uniformly spaced along the curve. The first and last markings are placed perpendicular at the point of curvature and point of tangency of the curve or, in the case of a runway/taxiway intersection, at the point of intersection of the runway and taxiway edges. The spacing of the markings, centerline-to-centerline, will not exceed 50 feet (15 m) between two adjacent markings measured at the largest gap of the radially-spaced markings. Two cases exist for the largest gap of the radially-spaced markings.

(i) Case 1. For a taxiway that intersects a paved area as shown in Figure A-23, both curved shoulders are referred to as “inboard” shoulders. Under this case use a 50-foot (15-m) centerline-to-centerline separation (maximum separation) as measured along the inner edge of the curved shoulder that abuts the paved taxiway. Notice that in case 1 both curved shoulders are categorized as inboard shoulders.

(ii) Case 2. For a taxiway that makes a turn prior to connecting another paved area, as shown in Figure A-10, then one curved shoulder is referred to as an “inboard” shoulder and the other as an “outboard” shoulder. Placement of the taxiway shoulder marking along the inboard shoulder is measured as described above. For the outboard shoulder

use the same maximum 50-foot (15-m) centerline-to-centerline placement of the taxiway shoulder marking but as measured along the outer edge of the curved shoulder that abuts the ground.

d. Color. The taxiway shoulder marking is yellow. For NO-TAXI islands with a paved interior, it is acceptable to paint the paved interior green in color instead of painting yellow taxiway shoulder markings. If this option is used, it is acceptable to paint both the interior area and the shoulder area green.

e. Characteristics. The area is marked with 3-foot (1-m) wide yellow stripes that start with the edge of the paved taxiway or the edge of the taxiway edge marking (paint over the black border if present) and extended to within 5 feet (1.5 m) of the edge of the paved/stabilized shoulder area or 25 feet (7.5 m) in length, whichever length is less.

4.11. Geographic position markings.

a. Purpose. The geographic position marking (GPM), as shown in Figure A-24, is used repeatedly along a designated taxi route to serve as an indicator of a location (a spot) so that pilots can confirm holding points or report their location while taxiing during periods of low-visibility operations. The referred to low-visibility operations are those taxiing operations prior to takeoff or after landing that occur when the runway visual range (RVR) is below 1,200 feet (366 m). Operationally, these sequentially numbered holding points differ from a reporting point. For example, one of the GPM (the spot) may be used only as a reporting point when ATCT is sequencing airplanes along the Surface Movement Guidance and Control System (SMGCS) route—when the first airplane reports to ATCT it is passing spot #3, ATCT would then clear the next airplane up to the next open spot. **Note:** See AC 120-57, Surface Movement Guidance and Control System, and AC 150/5340-18 for signage and lighting provisions.

b. Requirement. This marking is required as noted in the airport's SMGCS plan.

c. Location. The repeated marking is located along a low-visibility taxi route identified by the airport's SMGCS Plan. Each marking is positioned to the left of the taxiway centerline in the direction of taxi.

(1) All geographic position markings used operationally by the airport traffic control tower to designate a specific hold point along the low-visibility taxi route are co-located with the intermediate holding position marking (Pattern C) for taxiway/taxiway intersections as shown in Figure A-24. For a taxi route designated for use in visibilities below 600 RVR, the geographic position marking must be collocated with the intermediate holding position marking as well as a clearance bar consisting of three yellow lights. When the GPM is not used operationally for hold points, i.e., the spot is always used as a reporting point for sequencing operations, the painting of an intermediate holding position marking and the installation of the clearance bar are optional.

(2) The geographic position marking is never located at a runway holding position marking (Pattern A) location that immediately enters the runway used for the departure. However, the GPM may be located at a runway holding position for other runway(s) that the designated low-visibility taxi route happens to cross prior to arriving at the departure runway.

(3) A taxiway/taxiway intermediate holding position marking should be used with the geographic position marking, except for a GPM that is located at a runway holding position for the runway that will not be used for takeoff.

(4) The airport operator, in coordination with the FAA Regional Airports Division Office or the Airports District Office, will determine where the geographic position markings are deemed necessary. Generally, the geographic position markings are sequentially numbered holding points along a designated taxi route. To offer airport operators greater flexibility in developing a labeling scheme benefitting ATCT, the inscription scheme may, if approved by the FAA, take into account the specific taxiway intersections. For example, a geographic position marking that is located near Taxiway B2 may be labeled "2B" while another geographic position marking associated with Taxiway E4 is labeled "4E."

d. Color. The geographic position marking, as shown in Figure A-24, is a 7-foot (2-m) diameter pink circle with a black inscription surrounded by two 6-inch (15-cm) wide rings, one white and one black. When the geographic position marking is painted on concrete or other light-colored pavements, the white ring is inside the black outer ring. When the geographic position marking is installed on asphalt or other dark-colored pavements, the white ring becomes the outer ring and the black ring becomes the inner ring. See paragraph 1.4 and Table 1-1 for required and recommended techniques to enhance this marking.

e. Characteristics. The GPM is designated with a black inscription that may be a single number or a number-plus-letter combination. Since the basic marking reappears along the designated low-visibility SMGCS taxi route, each inscription must correspond to the sequential position identified by the SMGCS Plan. The sequential process for inscriptions is as follows.

(1) The number used for the inscription must correspond to its sequential position along the SMGCS taxi route, i.e., 1, 2, 3, etc.

(2) When a number plus a letter combination is used for the inscription, the letter indicates the taxiway's letter designation on which the marking is located. For example, the inscription "2B" implies the second marking along Taxiway B. Additionally, the number always precedes the letter for all inscriptions.

(3) If a GPM is located on a taxiway with an alphanumeric designation, only the letter portion of the taxiway designation is used for all the inscriptions. For example, if the fourth location on the SMGCS taxi route is located on Taxiway A7, the inscription for this location would read "4A".

(4) The inscription inside the GPM is centered within the circle.

(5) The inscription has a height of 4 feet (1.2 m).

(6) The numbers and letters used in the inscription are scaled to those in Appendix B.

4.12. Ramp control markings.

a. Purpose. The ramp control marking is used to facilitate the local ramp tower or the FAA airport traffic control tower in the movement of aircraft and vehicles to designated areas of ramps, aprons, and other paved areas between non-movement areas and the movement area. In terms of controller workload, the surface marking simplifies verbal communications between controllers, pilots, and vehicle drivers during this transition process.

b. Requirement. This marking is optional.

c. Location. The ramp control marking is predominantly located on terminal aprons and cargo ramps within the non-movement area but may be painted within the movement area.

d. Color. The ramp control marking has a black inscription on a yellow background with a black border when painted on light-colored pavements. See Table 1-1 for general guidelines for determining light-colored pavements. The black inscription, determined by the airport operator, may be numeric, letters, or alphanumeric with or without special characters such as an arrow. Flexibility is acknowledged for the black inscription as a means for the airport operator to address the varied operational applications conducted on diverse apron and ramp layouts. The black inscription is centered within the surface marking with a height of at least 4 feet (1.2 m). The numbers, letters, and other characters used in the inscription are scaled to those in Appendix B.

e. Characteristics. Two recommended shapes for ramp markings are as follows. **Note:** Existing ramp marking schemes that differ from the two recommended shapes may remain until repainting is necessary for a major section or to replace the existing marking scheme to one of the recommended shapes.

(1) Circular-shaped. Circular ramp markings—illustrated in Figure 4-1, Figure 4-2, and Figure 4-3—should have a diameter of at least 9 feet (2.7 m), which excludes the black border. The diameter of the circular marking must be increased so the width and height of the black inscription is at least 1 foot (30 cm) from the edges of the yellow circumference. Place the marking directly over the taxiway centerline or so the outer edge of the circular marking, excluding the black border, is within 7 feet (2.1 m) of the taxiway centerline.

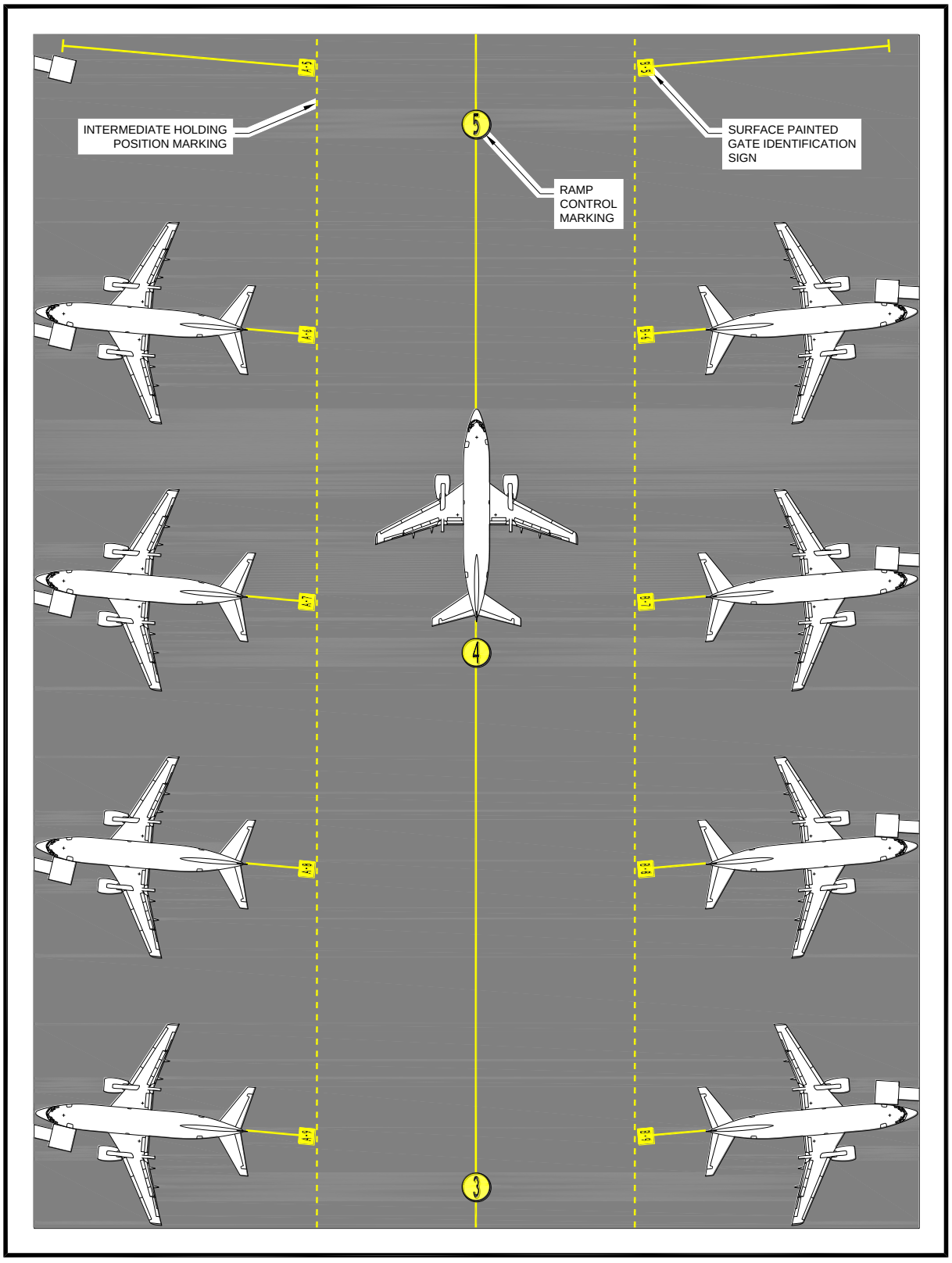


Figure 4-1. Sequential circular-shaped Ramp Control Markings 3, 4, and 5 between two terminals

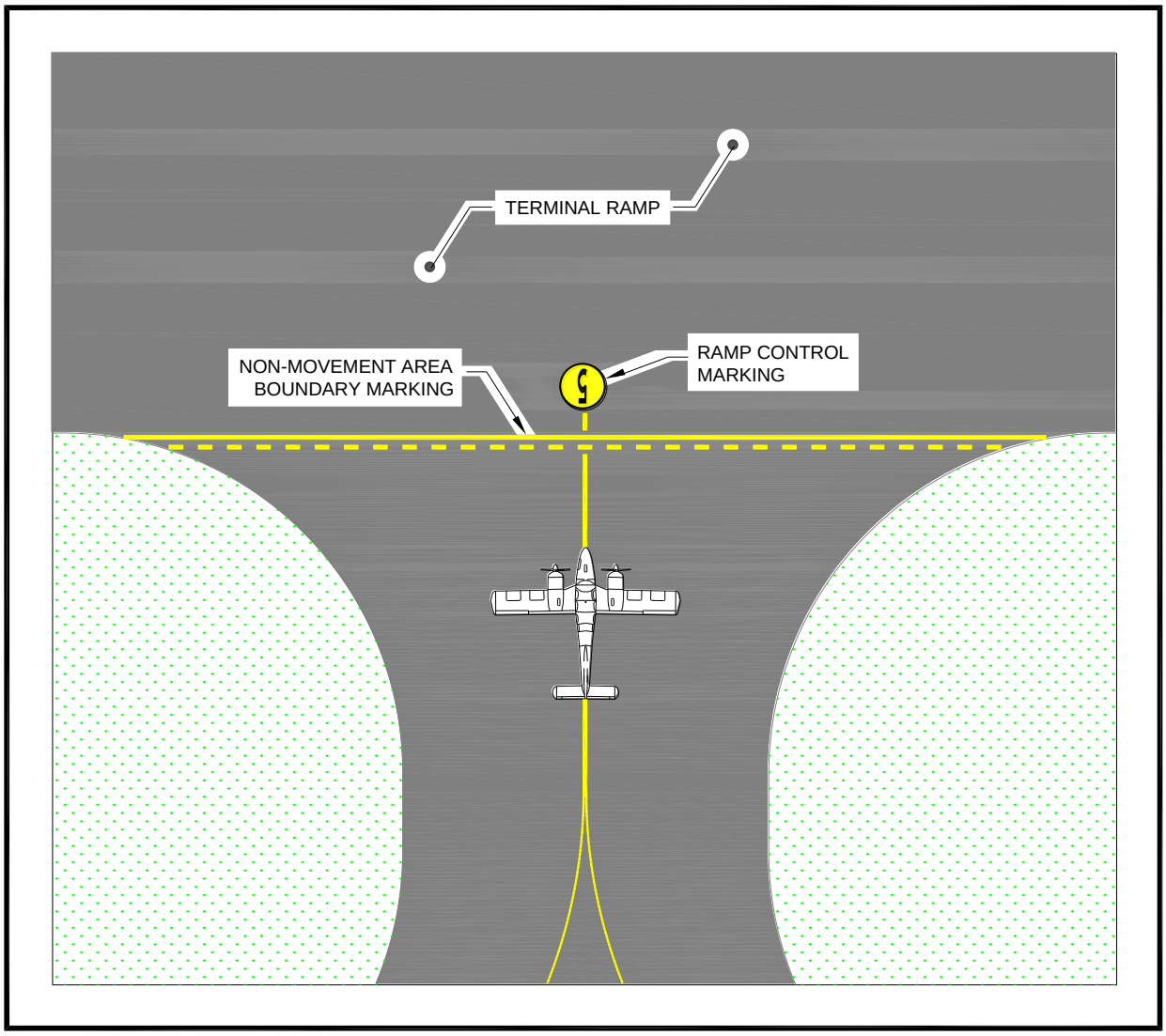


Figure 4-2. Circular-shaped Ramp Control Marking 16 on elongated terminal apron

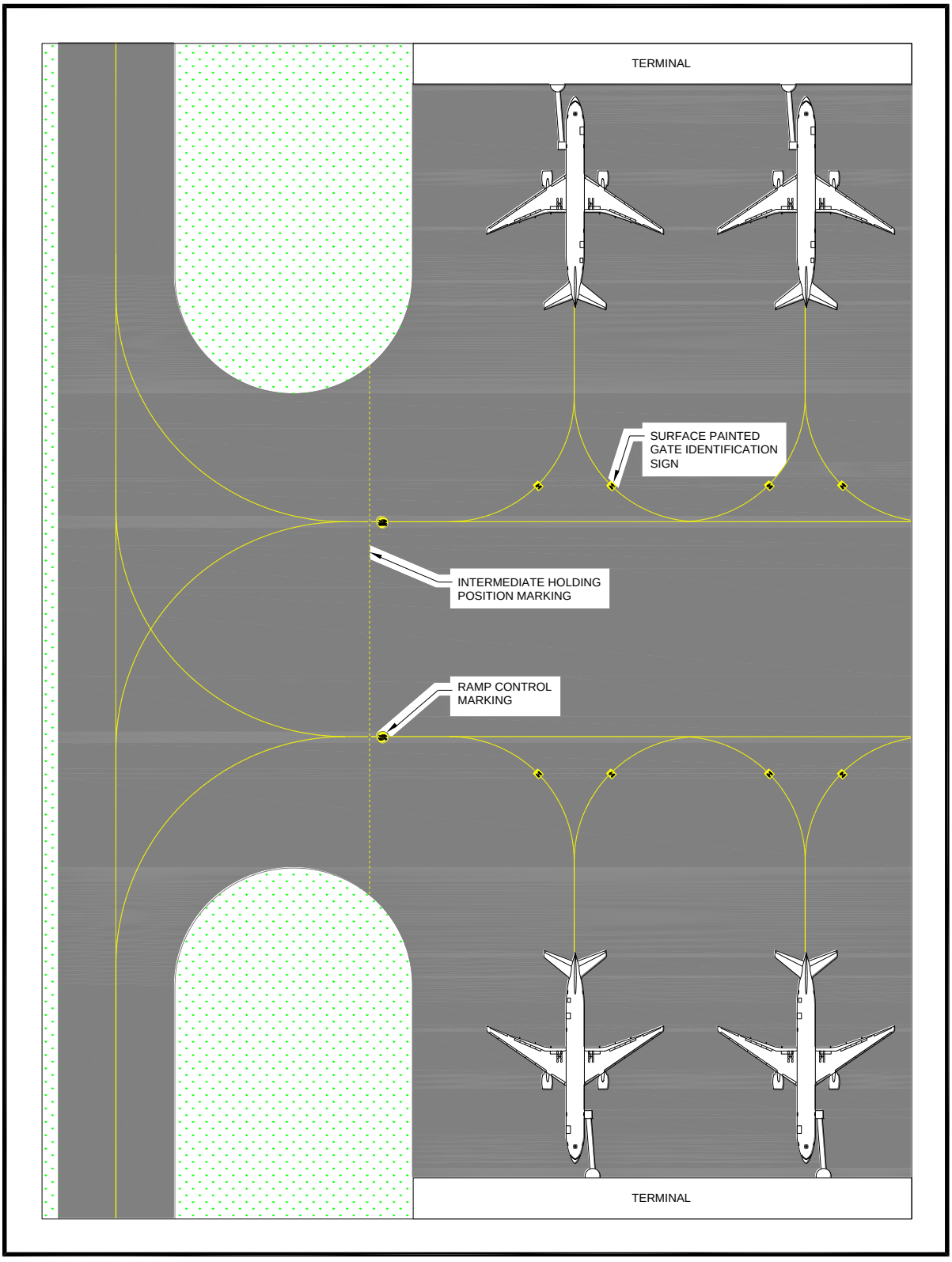


Figure 4-3. Circular-shaped Ramp Control Markings 9S and 9N between terminals

(2) Triangular-shaped. Triangular-shaped ramp markings, as illustrated in Figure 4-4 and defined in Figure 4-5, offer pilots and drivers the additional function of reinforcing a specific direction of travel. Triangular-shaped ramp markings are equiangular triangles of at least 9 feet (3 m) in height. The base and height of the triangular marking must be increased so that the width and height of the black inscription is at least 1 foot (30 cm) from the edges of the yellow triangle. Place the marking directly over the taxiway centerline.

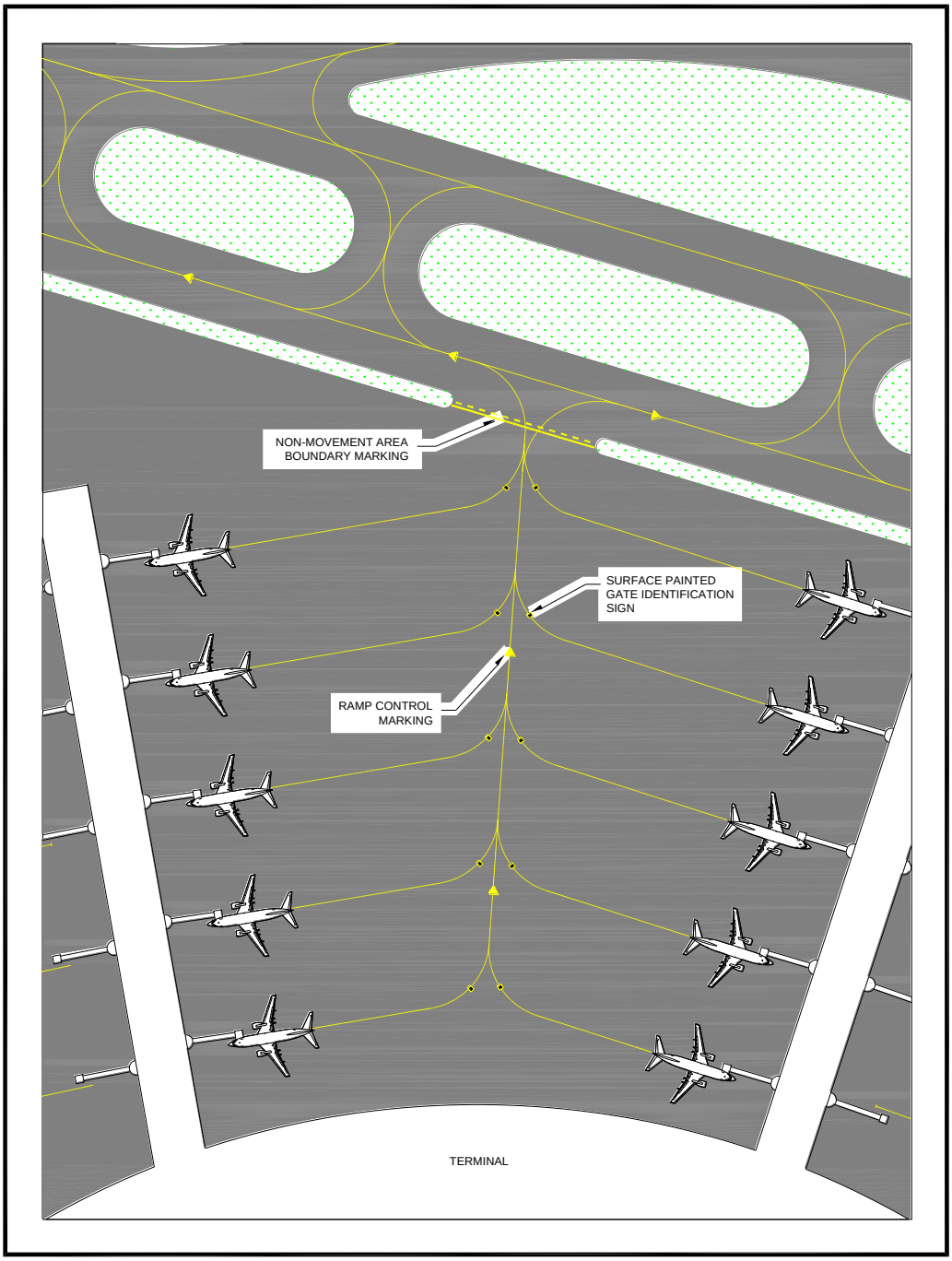
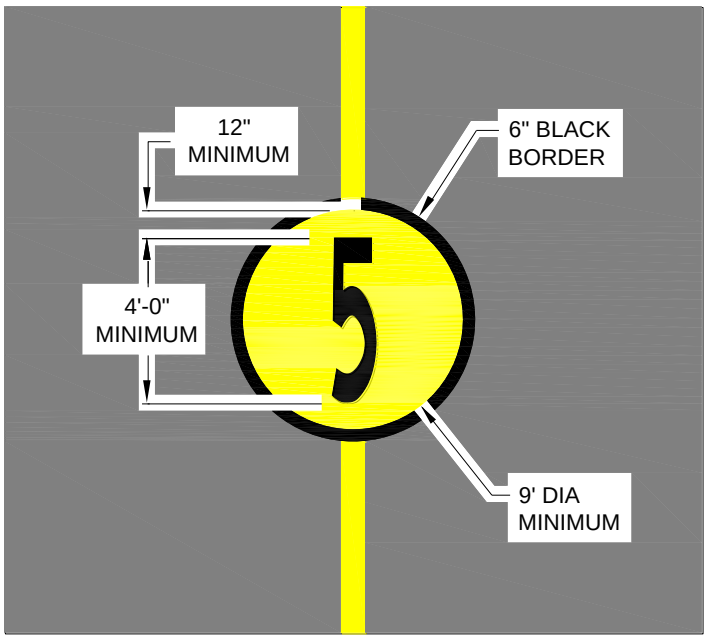
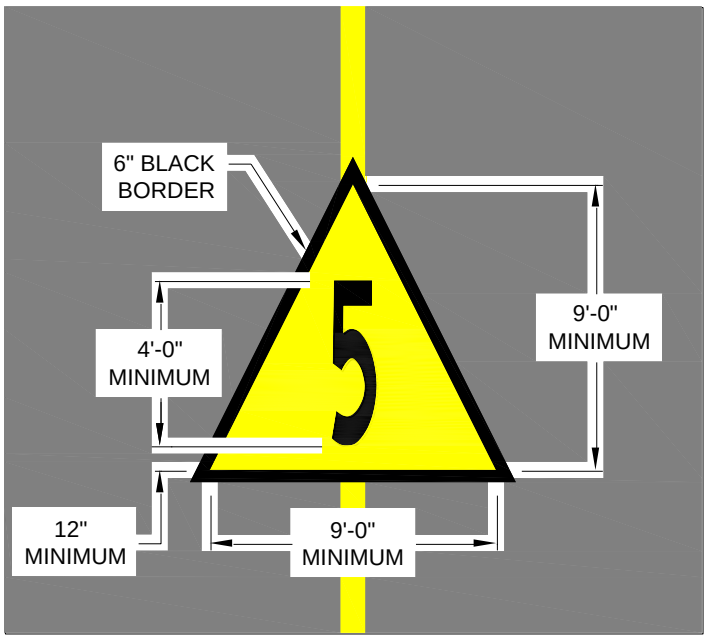


Figure 4-4. Triangular-shaped ramp control marking between terminals



(a) Circular Shaped Ramp Control Marking Details



(b) Triangular Shaped Ramp Control Marking Details

Figure 4-5. Circular and triangular-shaped ramp control marking dimensions

Chapter 5. Other Surface Markings.

5.1. Application.

The surface markings in this section are used, as appropriate, on airports.

5.2. Vehicle roadway markings.

a. Purpose. The three distinct vehicle roadway markings contained in this chapter are used to delineate roadways located on or that cross paved areas used by aircraft (aircraft maneuvering areas) so that collisions and other mishaps are averted. Markings for roadways not located on aircraft maneuvering areas, such as airport service roads, should conform, whenever possible, to the U.S. Department of Transportation's Manual on Uniform Traffic Control Devices. Do not use surface markings intended for aircraft, such as holding position markings or non-movement area boundary markings for roadways used exclusively by vehicles. Such markings may mislead pilots into identifying the roadway as a taxiway. For roadway signage provisions for either case, see AC 150/5340-18.

b. Requirement. These markings are required as necessary to control vehicular traffic.

c. Location. Vehicle roadways are delineated on aircraft maneuvering areas where there is a need to define a pathway for vehicle operations. A minimum separation of 2 feet (0.6 m) must be maintained between the roadway edge marking described below and the non-movement area boundary marking (see paragraph 5.4). All vehicle roadway markings are interrupted when crossing any taxiway and runway markings.

d. Color. Vehicle roadway markings are white.

e. Characteristics.

(1) Vehicle roadway markings consist of (a) roadway edge lines to delineate each edge of the roadway, (b) a dashed line to separate lanes within the edges of the roadway, and, where appropriate, (c) a roadway stop line (bar). The roadway edge lines, which are either solid lines or zipper-style, and the dashed lines are all 6 inches (15 cm) wide, except that zipper-style edges are 12 inches (30 cm) wide and 4 feet (1.2 m) long. See Figure A-15 for details of the zipper-style marking. The dashed line for lane separation is 15 feet (4.5 m) in length and spaced 25 feet (7.5 m) apart. The roadway stop line (bar) is 2 feet (0.6 m) wide and extends across its appropriate lane. See Figure A-25 for illustrations and details.

(2) In lieu of the solid lines for roadway edge lines, zipper-style markings may be used to delineate the edges of the vehicle roadway wherever the airport's SMGCS working group or the airport operator determines the roadway edges need enhanced delineation.

(3) Every roadway lane that feeds vehicle traffic onto or across a taxi route must have a solid roadway stop line (bar). The placement of the stop line (bar) is in accordance with the criteria for taxiway centerline to fixed/movable object per AC 150/5300-13 for the largest airplane design group serving the airport. This placement generally ensures adequate

vehicle clearance from taxiing aircraft. However, the airport operators should evaluate if the effects of jet blasts by turning aircraft operations on vehicle traffic require a larger setback.

5.3. Very High Frequency Omnidirectional Range (VOR) receiver checkpoint marking.

a. Purpose. The VOR receiver checkpoint marking is used by pilots to check their aircraft instruments with navigational aid signals. It consists of a painted circle with a painted directional arrow that is aligned toward the azimuth of the VOR facility. The location of the marking indicates a point on the airport where sufficient signal strength from a VOR facility exists so a pilot can check the aircraft VOR equipment against the radial azimuth indicated by the painted directional arrow. For the accompanying signage provisions, see AC 150/5340-18.

b. Requirement. This marking is required as directed by FAA Flight Inspection Services.

c. Location. FAA Flight Inspection personnel determine the location for the VOR receiver checkpoint marking(s) and issue information for checkpoint descriptions in flight publications. In general, the VOR receiver checkpoint marking preferably is located on an airport apron but could be on a taxiway; it is never on a runway. The location(s) should also allow easy access to align the aircraft with the marking without unduly obstructing other airport traffic. VOR receiver checkpoint markings should not be established at distances less than one-half mile (0.8 km) from the facility, nor on unpaved areas.

d. Color. The VOR receiver checkpoint marking is a painted circle of the size and colors shown in Figure A-26.

e. Characteristics. The VOR receiver checkpoint marking is a painted circle with an arrow that is accompanied with an associated information sign.

(1) The VOR receiver checkpoint is a circle 10 feet (3.1 m) in diameter with a yellow arrow aligned toward the azimuth of the VOR facility.

(2) The arrow should extend to the full width of the inner circle.

(3) The black interior of the circle is surrounded by a 6-inch (15-cm) wide yellow ring contiguous to a 6-inch (15-cm) wide white outer ring per Figure A-26.

(4) When installed on concrete or other light-colored pavements, the interior of the circle is painted black.

5.4. Non-movement area boundary marking.

a. Purpose. The non-movement area boundary marking is used to delineate the movement areas under direct control by the airport traffic control tower from the non-movement areas that are not under their control. Secondary purpose: The primary users of this marking are airport operators with an airport traffic control tower. However, some airport operators without an airport traffic control tower have effectively used this surface marking on terminals and other aprons to separate vehicle traffic, equipment traffic, etc. from the areas where aircraft taxi, such

as, when aircraft enter/exit an aircraft parking area located off the terminal. No part of a parked aircraft may overhang this marking. If aircraft taxi parallel to this marking, paint a taxiway or taxilane centerline marking such that the taxiway/taxilane object free area criteria are met.

b. Requirement. This marking is used when there is a need to delineate the movement areas under direct control by the airport traffic control tower from the non-movement areas that are not under their control, and only where aircraft may cross the marking. Airports without an airport traffic control tower may use the surface marking to help delineate aircraft traffic routes, aircraft parking limits, etc.

c. Location. A non-movement area boundary marking is located on the boundary between the movement and non-movement area as shown in Figure A-15. Prior to its implementation, a letter of agreement should be formalized between the airport operator and airport traffic control tower that specifies the location(s) of the boundaries. To provide adequate clearance for the wings of taxiing aircraft, the marking should never coincide with the edge of a taxiway. In this regard, the non-movement area boundary marking is set back in accordance with the taxiway or taxilane centerline to fixed/movable object criteria (taxiway/taxilane object free area) of AC 150/5300-13. However, the airport operator should evaluate if the effects of jet blasts by turning aircraft operations on equipment, personnel, or vehicle traffic require a larger setback. Taxilane instead of taxiway clearance criteria are usually used because this marking is painted in nearly all cases on terminal aprons, cargo areas, and aircraft parking areas where aircraft taxi at lower speeds.

Mitigation of Wrong Runway Takeoffs (Safety)
Precaution should be taken not to paint a non-movement area boundary marking on the outer edges of an apron that is transitioning into a taxiway that leads directly to a runway. Under certain runway/taxiway geometries, such as shown in Figure 5-1, placement of this surface marking where dual parallel taxiways support a runway have resulted in pilots taking off on a parallel taxiway. The concern of such usage is that pilots who expect a nearby runway holding position marking after leaving an apron will confuse these two markings because of their visual similarities, i.e., single dash/single line versus dual dashes/dual lines. It is recommended that the non-movement boundary marking not be located on or just prior to a taxiway that leads directly to a runway.

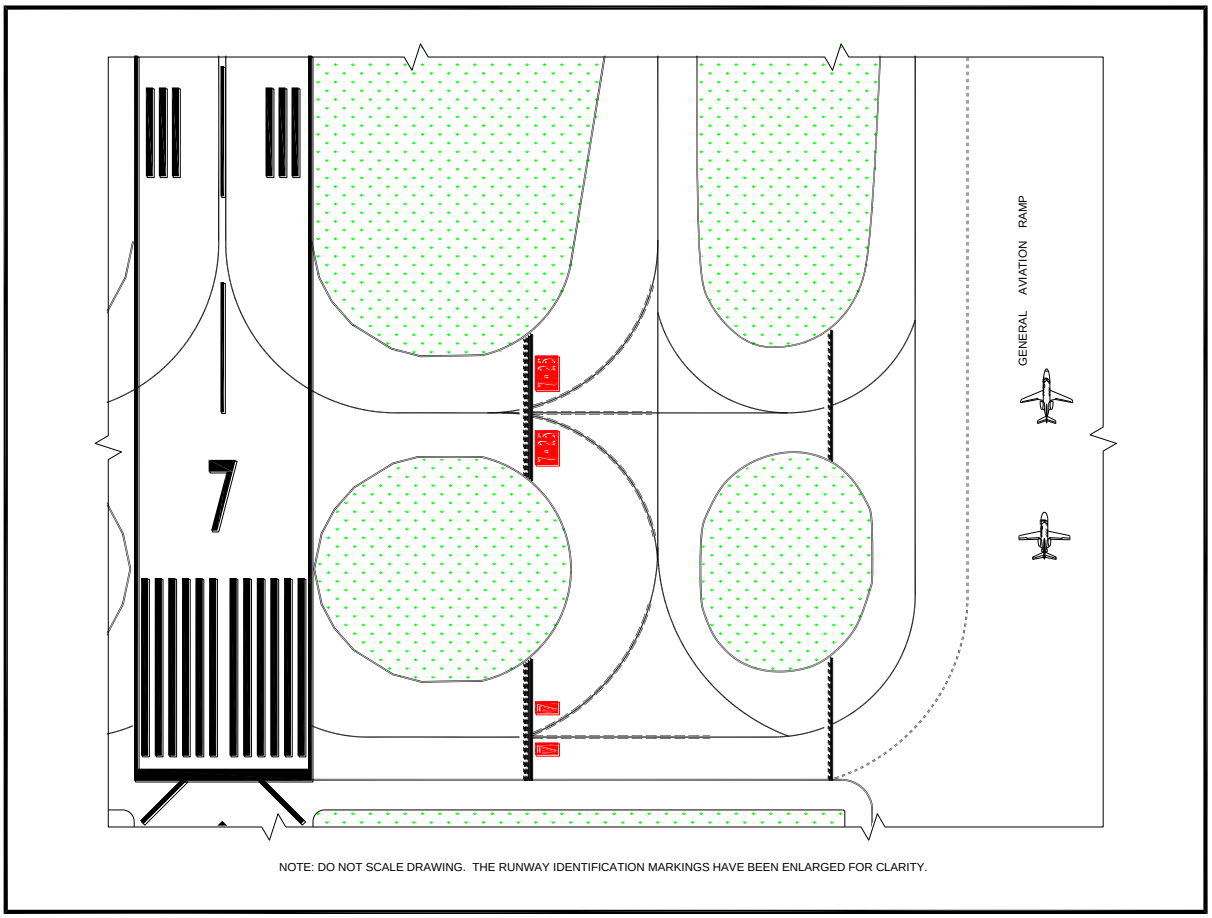


Figure 5-1. Precautionary placement of the non-movement boundary marking

d. Color. The non-movement area boundary marking is yellow and will be outlined in black on light-colored pavements.

e. Characteristics.

(1) The non-movement area boundary marking consists of two yellow lines, one solid and one dashed as shown in Figure A-15. The solid line is located on the side of the non-movement area while the dashed line is located on the side of the movement area.

(2) Each line is 6 inches (15 cm) in width with 6-inch (15-cm) spacing between lines. In the event of circumstances where pilots may have difficulty discerning the edge of a movement area, the width of the lines and spaces may be doubled to 12 inches (30 cm). In both applications, the dashes are 3 feet (0.9 m) in length with 3-foot (0.9-m) spacing between dashes.

(3) If a taxiway centerline intersects a non-movement area boundary marking, then the taxiway centerline is interrupted so that it is 6 to 12 inches (15 to 30 cm) from both sides of the non-movement area boundary marking.

(4) If the non-movement area boundary marking that includes a black border intersects a taxiway edge marking, then the taxiway edge marking is interrupted such that the taxiway edge marking abuts the black border of the non-movement area boundary marking.

(5) If the non-movement area boundary marking that does not include a black border intersects a taxiway edge marking, then the taxiway edge marking is interrupted such that a 6-inch gap is left between the taxiway edge marking and the non-movement area boundary marking.

5.5. Markings for thresholds temporarily relocated during construction.

See AC 150/5370-2, Operational Safety on Airports During Construction, for provisions for marking and lighting a threshold temporarily relocated during construction.

5.6. Marking and lighting of permanently closed runways and taxiways.

Permanently closed paved areas are indicated by the use of an "X". Figure A-27 provides the detail criteria for the "X" marking.

a. For runways and taxiways that are permanently closed, the lighting circuits are disconnected. For closed runways, all markings for runway thresholds, runway designations, touchdown aiming points, and touchdown zones are obliterated.

b. For closed runways, only solid yellow "X" markings are painted (never striated "X" markings) at each end of the runway and at 1,000-foot (305-m) intervals.

c. For a closed runway that intersects an active runway, a solid yellow "X" marking should be placed on the closed runway near the sides of the open intersecting runway. In most cases, two "X" markings are required, i.e., one "X" per each side of the open intersecting runway.

d. For closed taxiways, a yellow "X" marking is placed at each entrance of the closed taxiway.

e. In terms of pattern selection from Figure A-27, the larger alternate pattern is preferable over the smaller pattern for closed runways because this pattern is seen more readily from aircraft on final approach. For closed taxiways, the smaller pattern is preferable over the larger alternative pattern unless taxiing pilots have difficulty seeing the marking and are entering the closed taxiway or have reported near landings on the closed taxiway.

5.7. Temporarily closed runways and taxiways.

The following procedures are to be followed when it is necessary to temporarily close a runway or a taxiway. See AC 150/5370-2 for requirements and guidelines.

a. For temporarily closed runways, the airport operator has two options when it is necessary to provide a visual indication that a runway is temporarily closed.

(1) Option 1 (preferred). The airport operator uses a raised-lighted "X" on each runway end to indicate the runway is temporarily closed. See AC 150/ 5370-2, Operational Safety on Airports During Construction, for guidance on the use of this visual aid.

(2) Option 2. The airport operator places an "X" only at each end of the runway over the runway designation markings or, when required by construction activity, just off the runway end. The "X" is yellow in color and conforms to the dimensions specified in Figure A-27. Since the "X" is used temporarily, they are usually made of some easily removable material, such as plywood or fabric, rather than painted on the pavement surface. Any materials used for a temporary "X" should provide a solid appearance, for example, not flap in the wind, say by using a ground anchor device. Anchoring devices should be designed to minimize damage to pavement, and any damage should be repaired before the runway is opened to aircraft traffic. Since the "X" will usually be placed over white runway markings, their visibility can be enhanced by a 6-inch (15-cm) black border.

b. For temporarily closed taxiways, the airport operator has two options when it is necessary to provide a visual indication that a taxiway is temporarily closed.

(1) Option 1. Usually this type of closure is treated as a hazardous area so the guidance in paragraph 5.13 applies.

(2) Option 2. As an alternative, the airport operator may install the same yellow "X" shown in Figure A-27 for those entrances leading into the temporarily closed taxiway.

c. If the runway or taxiway will be closed during the nighttime, the runway and taxiway lights will normally be disconnected so they cannot be illuminated unless such illumination is needed to perform maintenance operations on or adjacent to the runway, e.g., snow removal.

General Comment
Note: The airport operator is responsible for determining (1) the need for a visual indication that a runway or taxiway is temporarily closed and (2) the safest place to put the "X" or "X"s or other indicators per paragraph 5.13. In making these determinations, the airport operator should consider such things as the reason for the closure, duration of the closure, airfield configuration, and the existence and hours of operation of the airport traffic control tower and construction crews.

5.8. Converting a runway to a taxiway.

The following actions are necessary to convert a runway permanently to a taxiway. Operationally, once this conversion is invoked, aircraft are not permitted to land or take off from the taxiway.

a. All runway markings found on the runway are obliterated or replaced with the appropriate taxiway markings. For example, the runway landing designation numbers are obliterated, and the white runway centerline is converted to a yellow taxiway centerline.

b. All runway related signage and lighting fixtures found on or along the runway must be removed and/or replaced with the appropriate taxiway signage and lighting to indicate the existence of the converted taxiway. For example, runway edge lights are converted to blue edge lights, and runway centerline lighting fixtures are converted to green. (It may be possible to do both actions by changing the lens color.) See AC 150/5345-46, Specification for Runway and Taxiway Light Fixtures, for information about taxiway edge lights; AC 150/5345-39, Specification for L-853 Runway and Taxiway Retroreflective Markers, for information about Runway and Taxiway Retroreflective Markers; and AC 150/5340-30 for information about taxiway centerline lighting requirements.

c. All markings associated with the converted runway but not painted on the runway, such as the runway holding position markings found on entrance taxiways, are obliterated and replaced with the appropriate taxiway markings. Additionally, runway related signage and lighting fixtures found off the runway must be removed and/or replaced with the appropriate taxiway signage and lighting to indicate the existence of the converted taxiway.

d. In terms of documentation, airport operators must update their Airport Layout Plan as well as other appropriate documents to indicate the presence of the new taxiway and the permanent closure of the runway. Both the Airport/Facility Directory (A/FD) and the Airport Master Record (FAA Form 5010) need to indicate the conversion to a permanent taxiway.

General Comment
Note: The "X" closure marking is never used on this type of conversion since the converted pavement is intended to be an active, new taxiway.

5.9. Intermittent use of a taxiway as a runway.

The intermittent use of a taxiway as a runway is a type of conversion where the converted taxiway is either used only as a runway or used as a runway for a specified time of the day or night. In both of these applications, the airport operator must properly re-mark affected pavements (including provisions for signage and lighting). One required restriction for any conversions is that the converted pavement cannot be marked simultaneously with a yellow taxiway centerline and a white runway designation number. Other re-marking actions are listed below. The FAA recommends a Safety Management System risk assessment to determine if other necessary actions need to be implemented.

General Comment
Note: For airports subject to National Environmental Policy Act (NEPA) requirements, any proposal to use a taxiway as a runway should include a review of the potential environmental consequences of such an action. The airport operator should contact the FAA Airports Regional Office or Airports District Office for NEPA guidance.

a. Pavement used as a runway during the day should at a minimum be painted with the visual runway markings identified in Table 2-1, that is, the white landing designation

number(s) and a white centerline. Furthermore, converted pavement used as a runway at night that is to be lighted should have runway lighting installed per AC 150/5340-30.

b. If the pavement is to be used ONLY as a taxiway at night, blue edge lights should be installed per AC 150/5340-30.

c. In terms of documentation, airport operators must update their Airport Layout Plan as well as other appropriate documents to indicate the presence of the new runway. If the runway is to be used ONLY as a taxiway at night and has blue edge lighting, this runway must be listed as unlighted along with an appropriate annotation in both the Airport/Facility Directory (A/FD) and the Airport Master Record (FAA Form 5010) indicating the runway is closed to nighttime operations and that the blue lights are provided for taxiing aircraft.

d. Since the pavement is now considered a runway, any taxiways intersecting the designated runway must have appropriate runway holding position markings (including provisions for signage and lighting) painted per this AC including criteria from AC 150/5340-18, and AC 150/5340-30.

5.10. Closed or abandoned airports.

When all runways are closed temporarily, the airport beacon is turned off and the runways are marked per paragraph 5.7. When an airport is abandoned and all runways are closed permanently, the runways are marked per paragraph 5.6, the airport beacon is disconnected, and an "X" is placed in the segmented circle or at a central location if no segmented circle exists. For additional details, see AC 150/5370-2.

5.11. Heliport markings.

Information on markings for heliports is in AC 150/5390-2, Heliport Design.

5.12. Marking for arresting gear.

Information on marking for arresting gear is in AC 150/5220-9, Aircraft Arresting Systems on Civil Airports.

5.13. Hazardous construction areas.

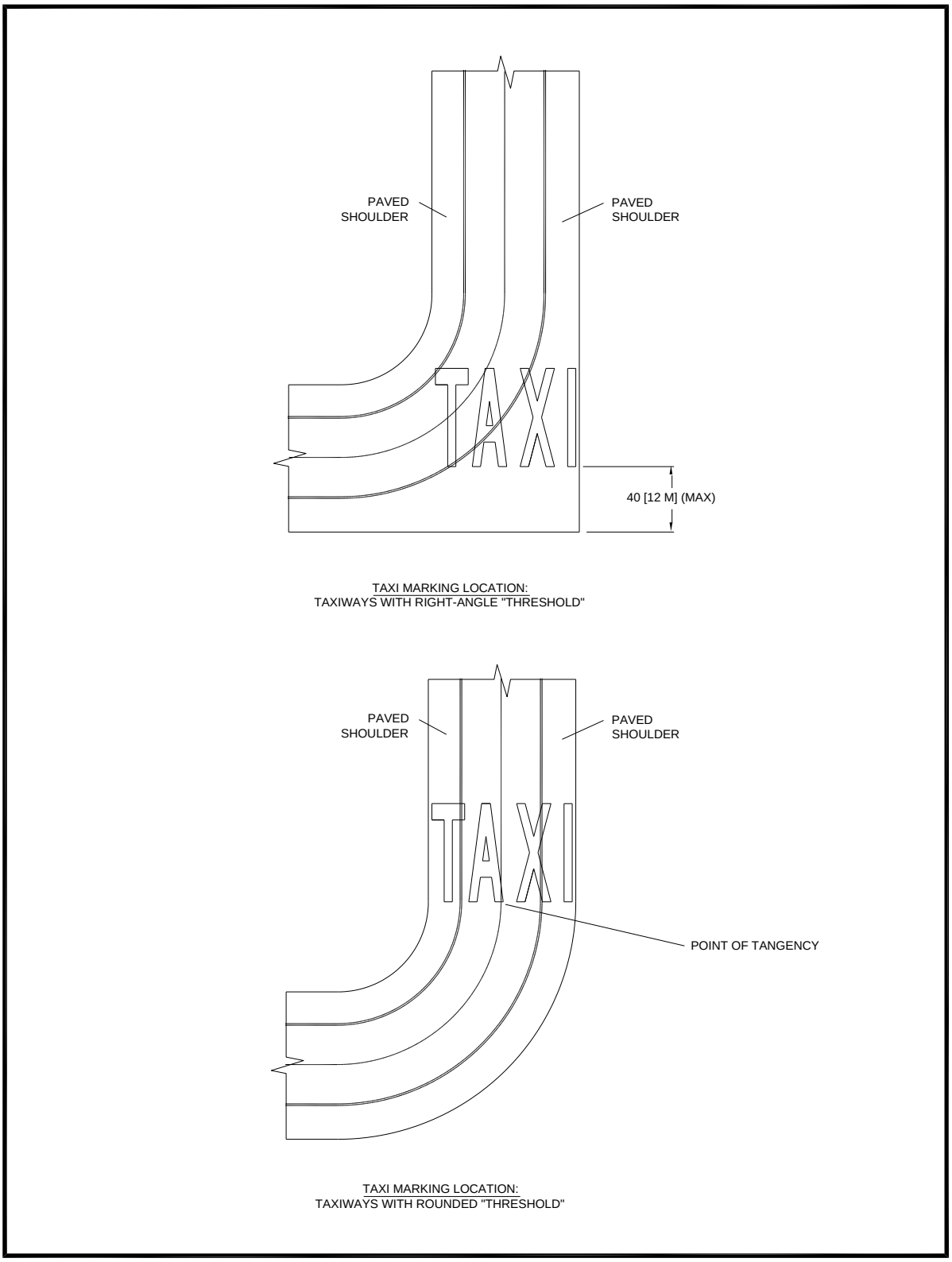
Marking of hazardous areas due to construction, in which no part of an aircraft may enter, are marked in accordance with AC 150/5370-2.

5.14. Aircraft deicing facility markings.

Information on markings for aircraft deicing facilities is in AC 150/5300-14, Design of Aircraft Deicing Facilities.

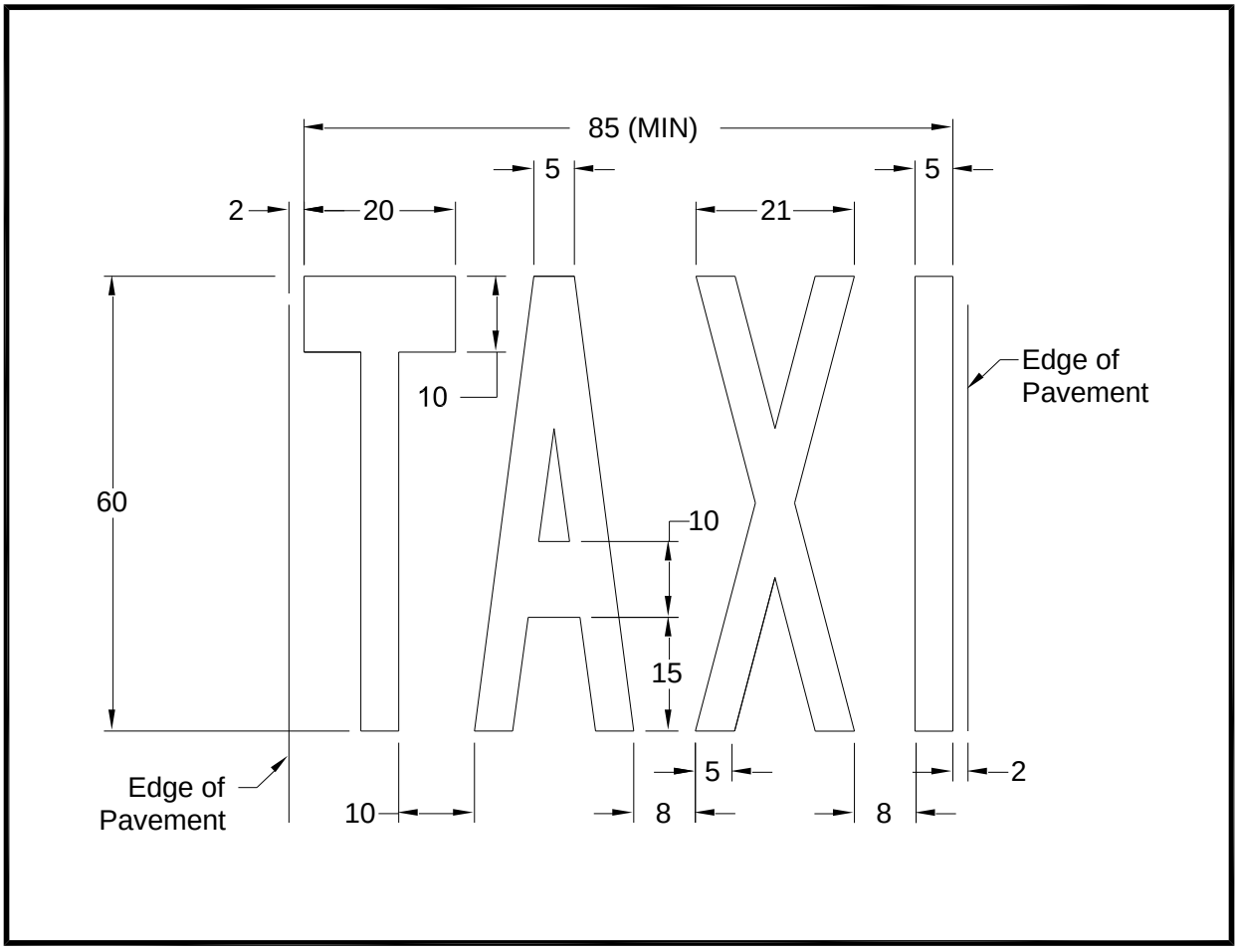
5.15. Interim surface markings for taxiways mistaken as runways.

This advisory circular recognizes the use of the non-standard surface marking "TAXI" as an interim measure only for those taxiways that have repeated landing incidents. **Note:** For new construction, the outer edge of an entrance taxiway must be curved. See AC 150/5300-13. Figure 5-2 and Figure 5-3 provide location and characteristics for this application. In practice "TAXI" extends across the entire pavement including any paved shoulder as shown in the figures. The color is yellow with a 12 inch (30.5 cm) wide black border along the sides of each letter and a 4-foot (1.2-m) black border on the tops and bottoms of the letters. Figure 5-4 illustrates the combined application with aviation grade artificial turf. See FAA Engineering Brief No. 72A, Positive Identification Of Runways For Landing, which provides guidance for identifying situations where a taxiway could be mistaken for a runway and provides other mitigation strategies for dealing with this problem.



Note: For new construction, the outer edge of an entrance taxiway must be curved. See AC 150/5300-13.

Figure 5-2. TAXI marking location facing runway approach end



Note: These are minimum dimensions (in feet). If the existing taxiway plus paved shoulder is not wide enough to accommodate these markings, then provide a paved pad or wider shoulder in the area where the marking is to be installed.

Figure 5-3. TAXI marking dimensions

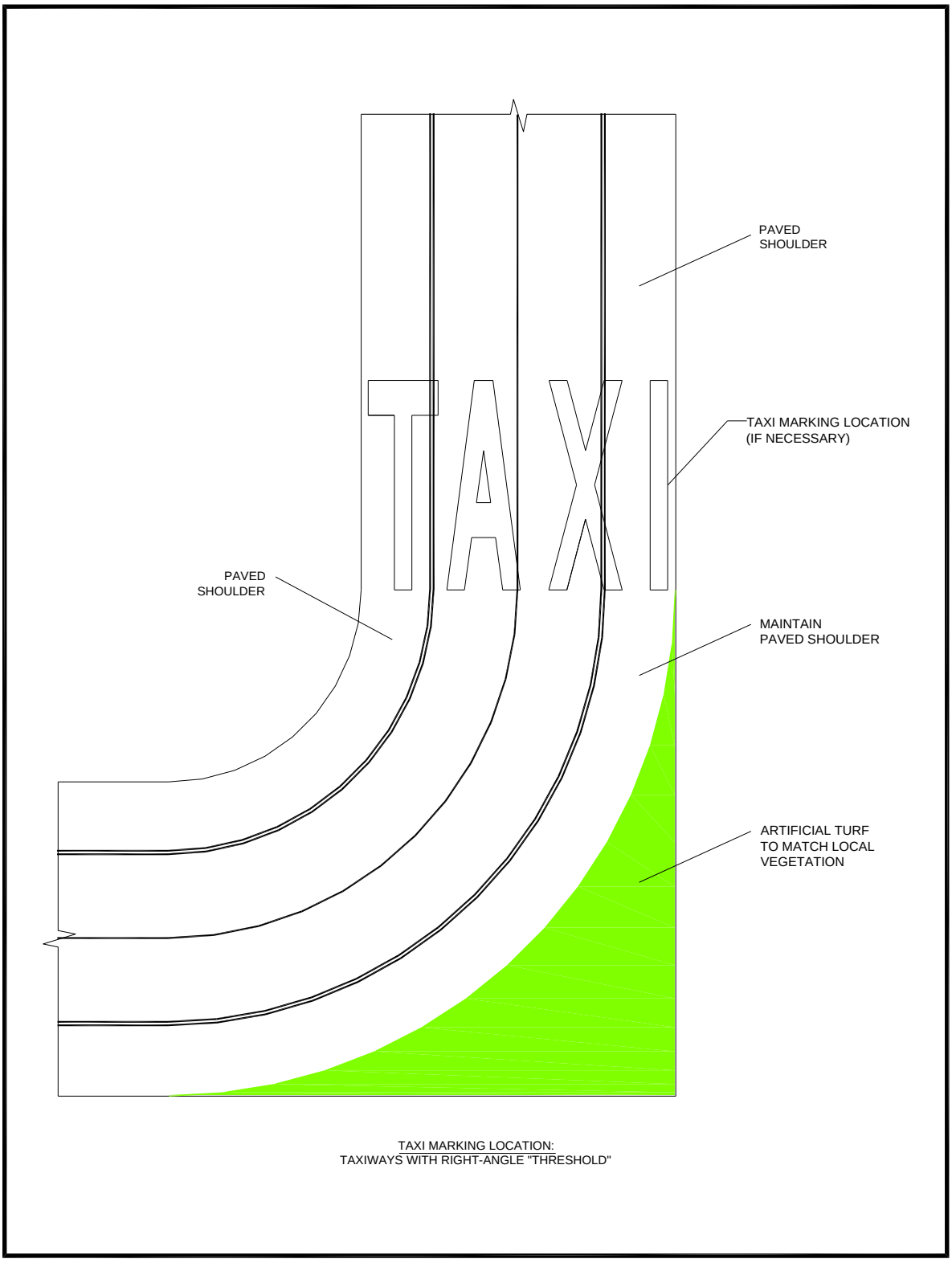
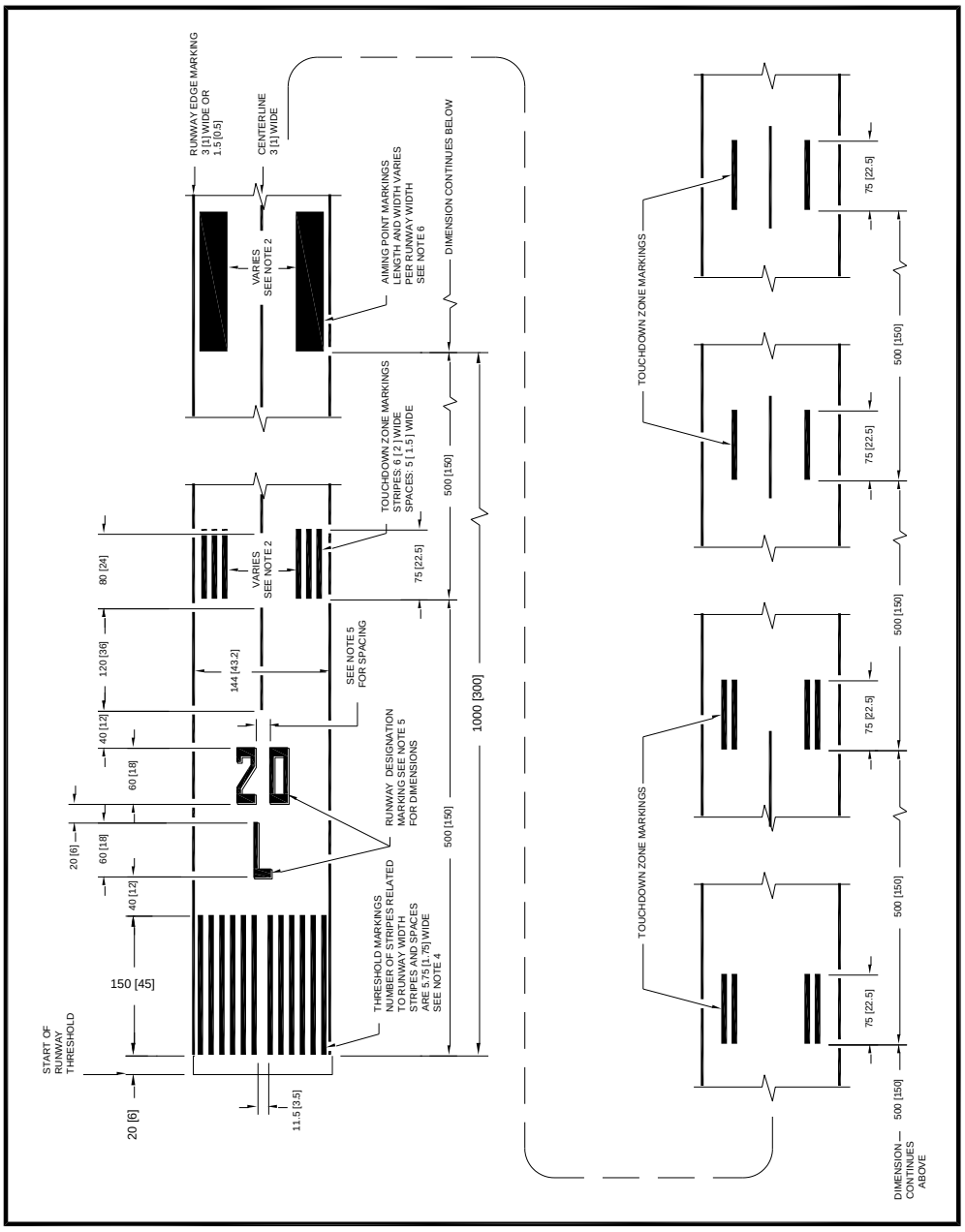


Figure 5-4. Aviation grade artificial turf installation

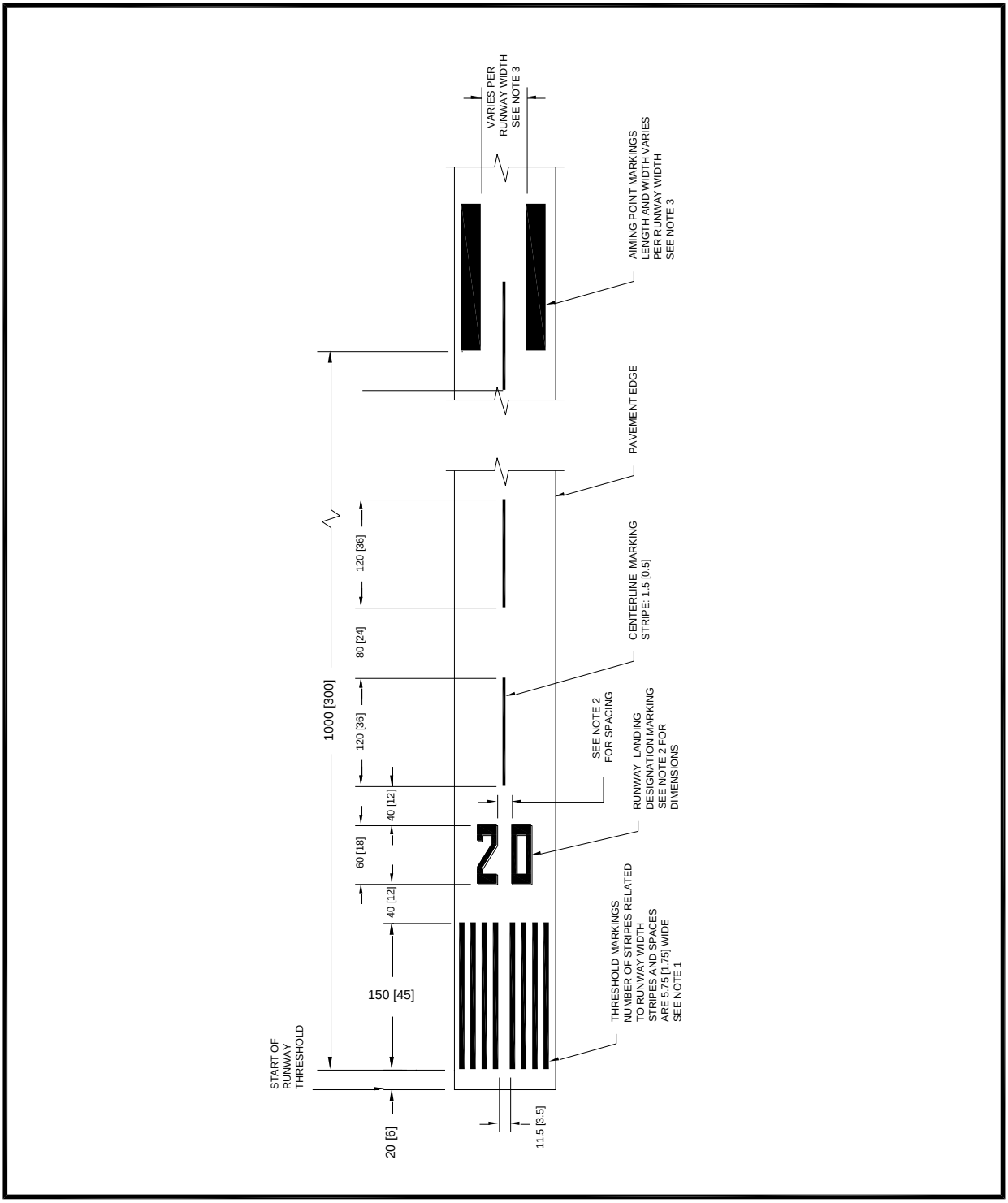
Appendix A. Pavement Markings



Notes:

1. Dimensions are expressed in feet (meters).
2. Dimension varies with runway width. See paragraph 2.6.
3. The touchdown zone marking scheme maintains a 900 ft (275m) "no marking zone" from the midpoint of the runway. That is, those pairs of surface markings that extend within 900 ft (275m) of the runway midpoint are eliminated.
4. See paragraph 2.5.
5. See Figure A-6.
6. See paragraph 2.6.

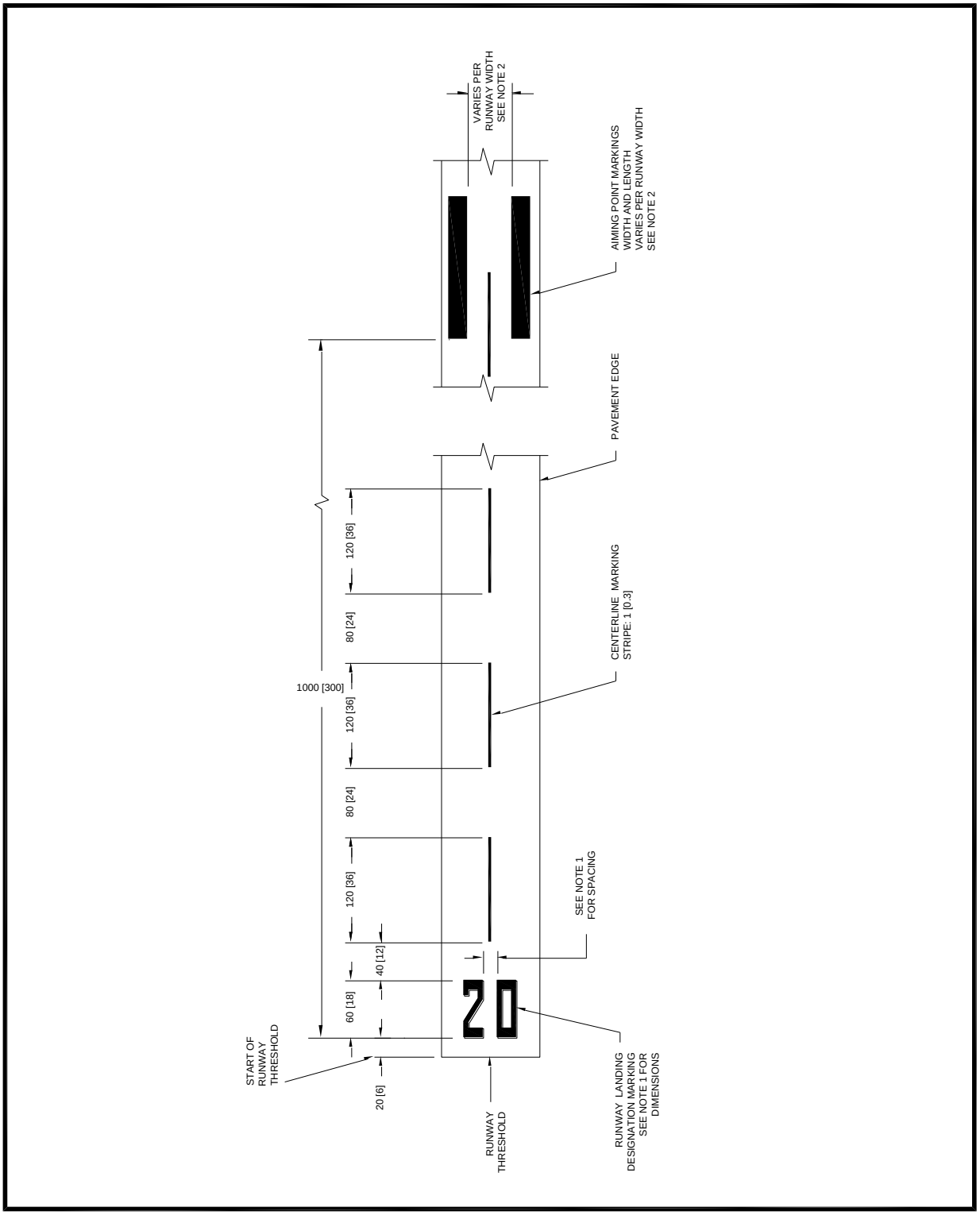
Figure A-1. Precision runway markings



Notes: Dimensions are expressed in feet (meters).

1. See paragraph 2.5 and Table 2-2.
2. See Figure A-6.
3. See paragraph 2.6. See Table 2-1 for when required.

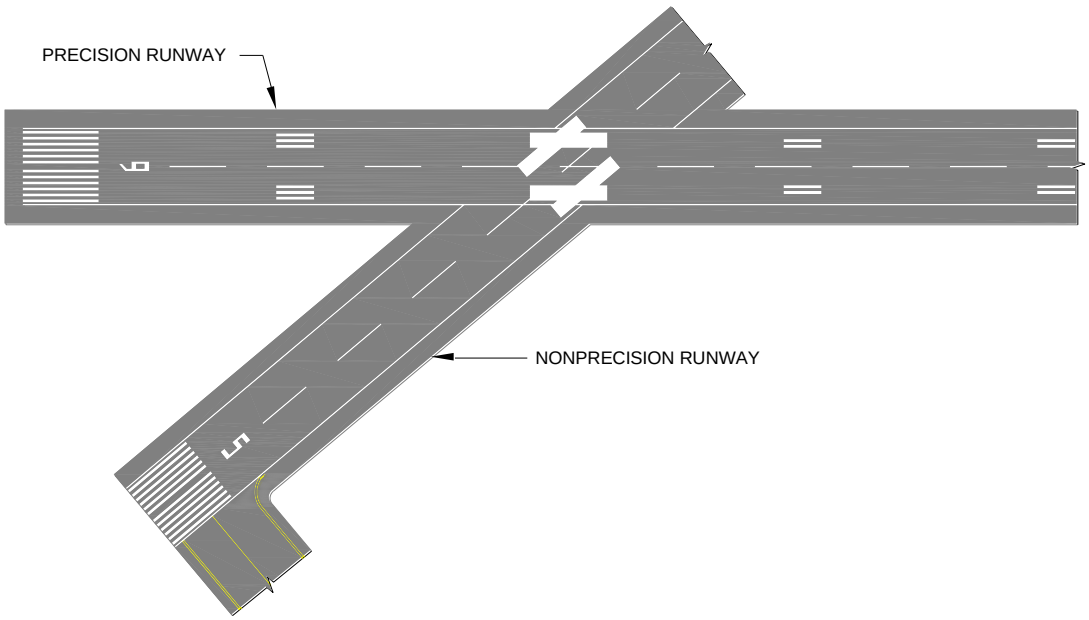
Figure A-2. Non-precision runway



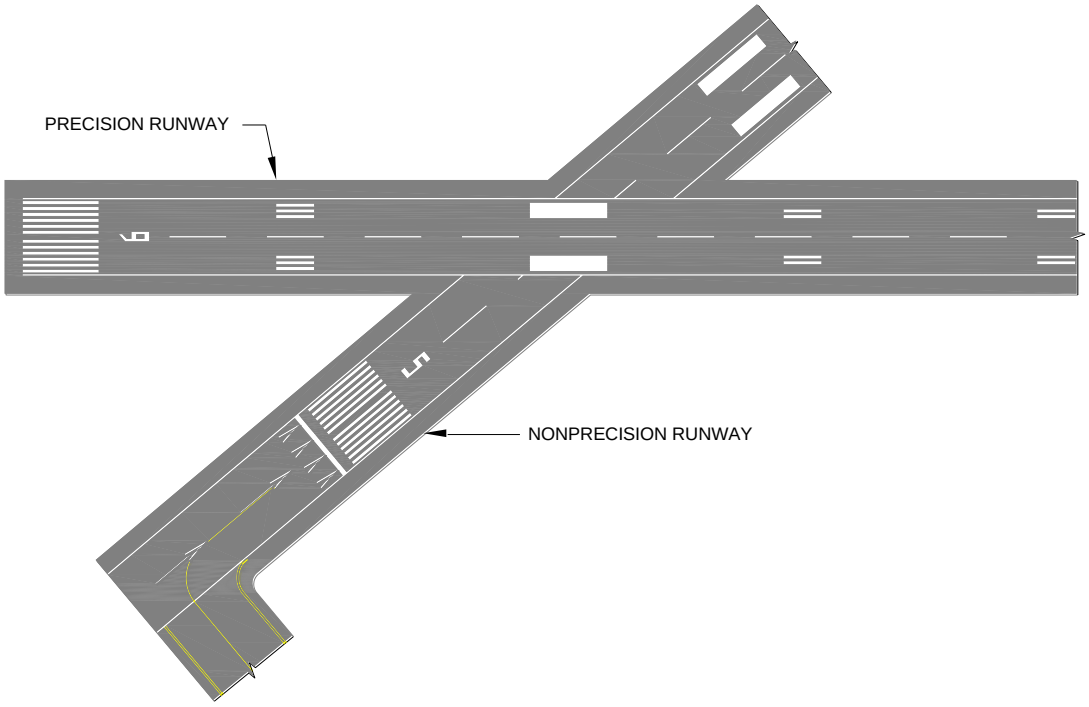
Notes: Dimensions are expressed in feet (meters).

1. See Figure A-6.
2. See paragraph 2.6.

Figure A-3. Visual runway markings



EXAMPLE OF CONFLICTING RUNWAY MARKINGS



ONE SOLUTION:
THRESHOLD AND AIMING POINT OF THE LOWER PRECEDENCE RUNWAY DISPLACED TO MAINTAIN THE REQUIRED DISTANCE FROM THE AIMING MARKING TO THE THRESHOLD

Note: In lieu of displaced threshold, the airport operator may place a remark on FAA Form 5010 which provides the distance that exists between the threshold and the aiming point marking.

Figure A-4. Example of conflicting markings on crossing runways

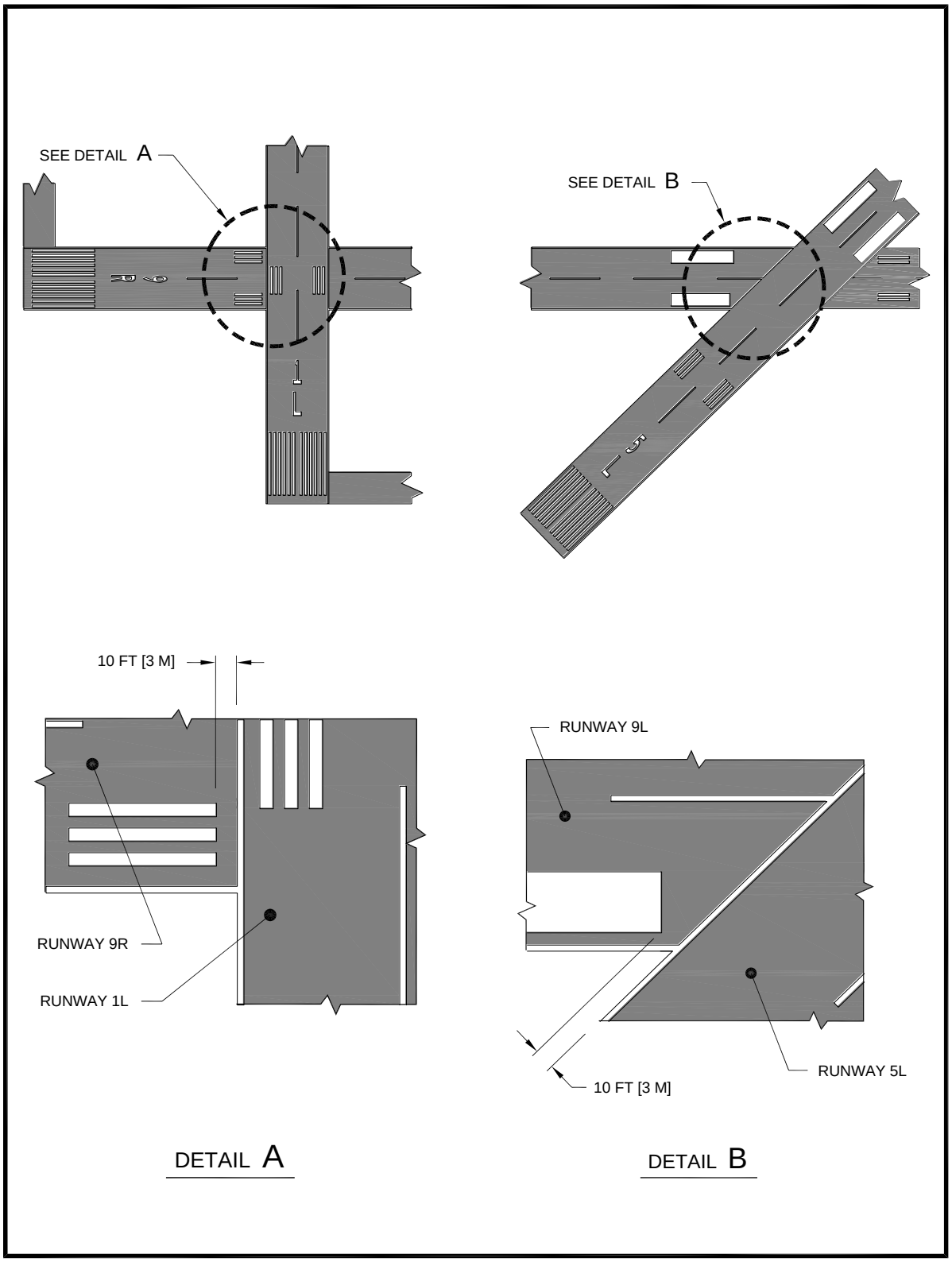
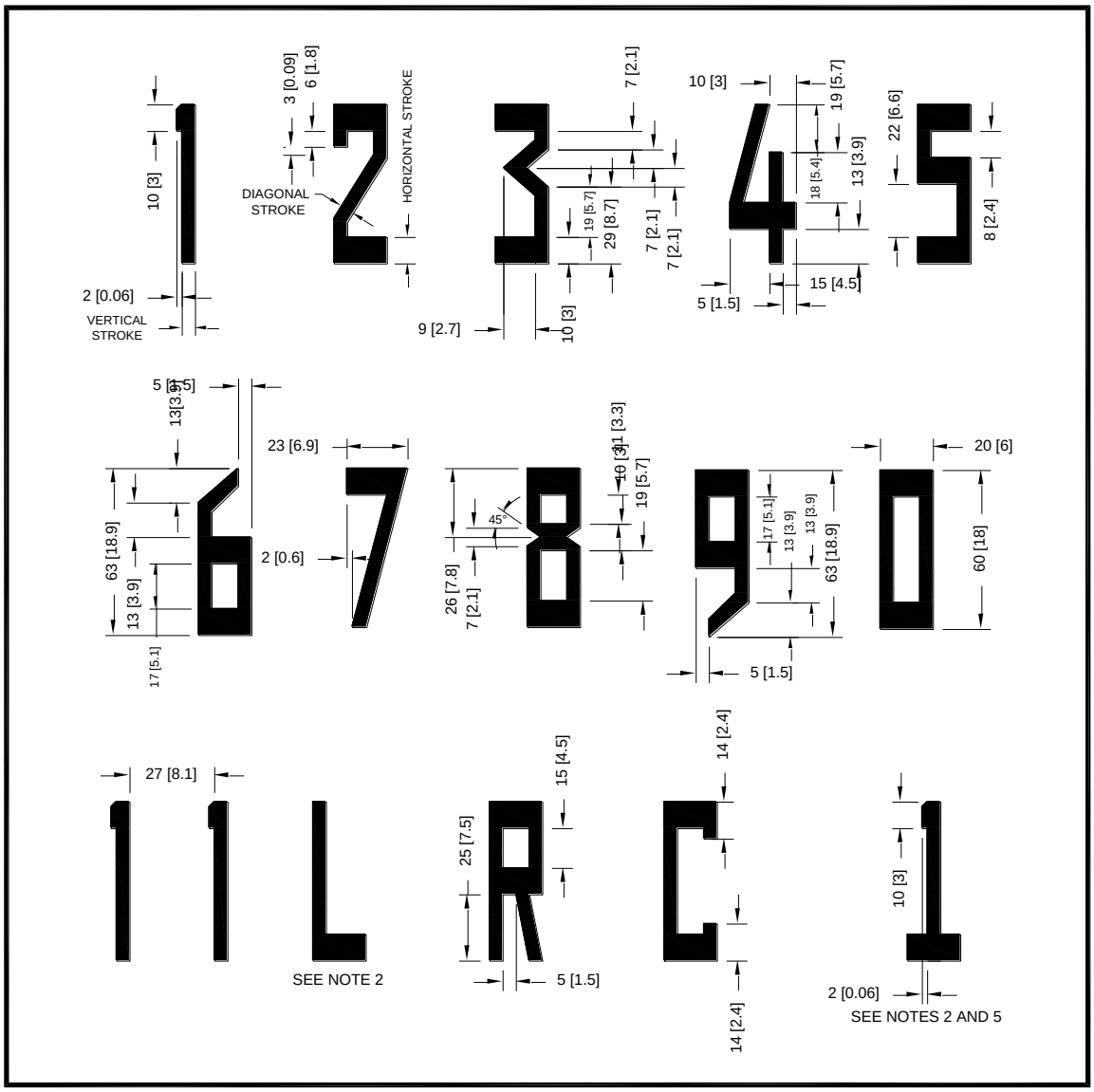


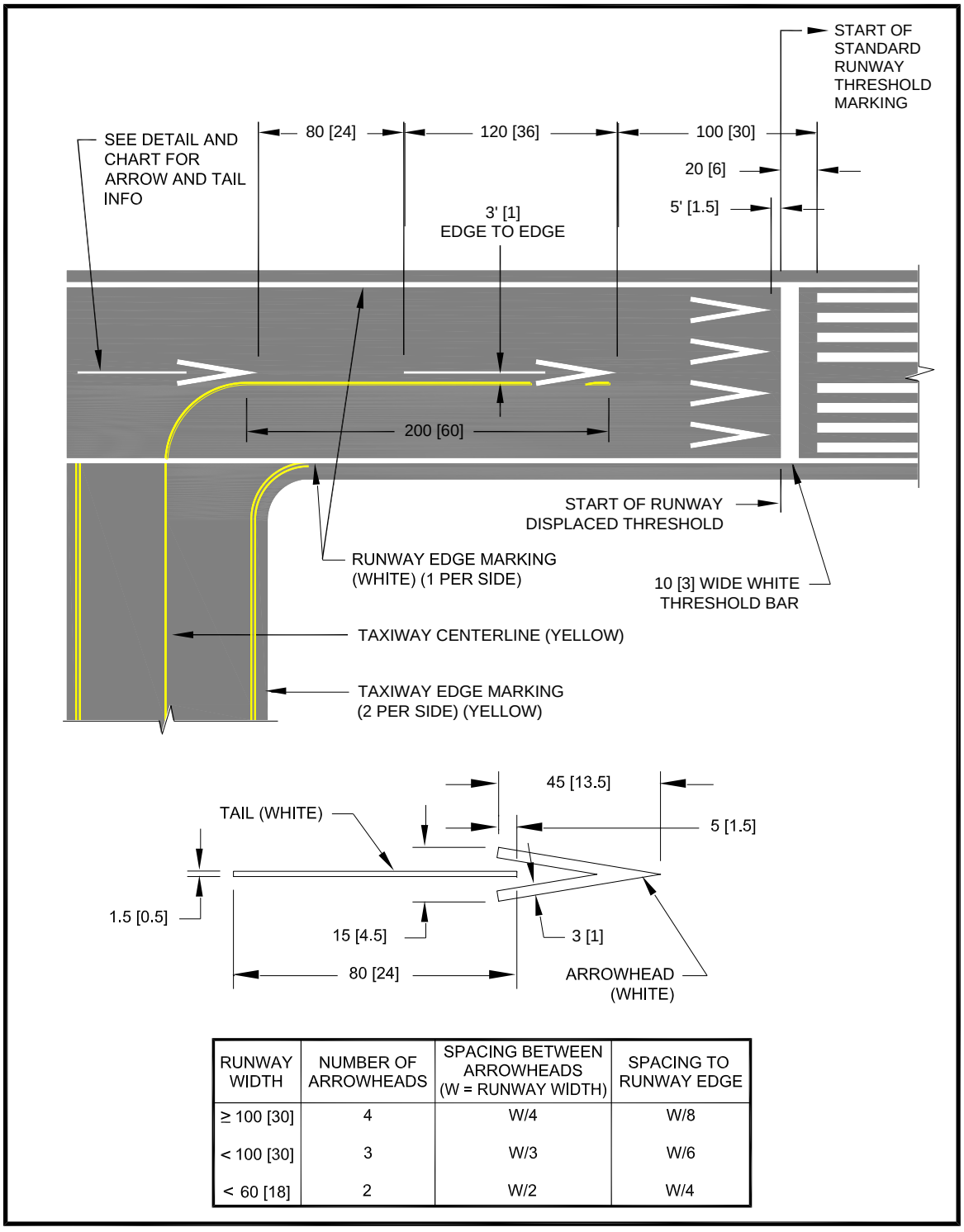
Figure A-5. Details of markings for intersecting runways



Notes:

1. Dimensions are expressed in feet (meters).
2. All characters have these characteristics (unless otherwise specified):
   - 60 [18] high
   - 20 [6] wide
   - vertical stroke of 5 [1.5]
   - horizontal stroke of 10 [30]
   - diagonal stroke of 5 [1.5]
3. All numerals except the number eleven as shown are horizontally spaced 15 [4.5] apart.
4. Single digits must not be preceded by a zero.
5. The numeral "1", when used alone, contains a horizontal stroke, as shown, to differentiate it from the runway centerline marking.
6. Single designations are centered on the runway pavement centerline. For double designations, the center of the outer edges of the two numerals is centered on the runway pavement centerline.
7. Where the runway designation consists of a number and a letter, the number and letter are located on the runway centerline in a stacked arrangement as shown in Figure A-1.

Figure A-6. Runway designation numerals and letters

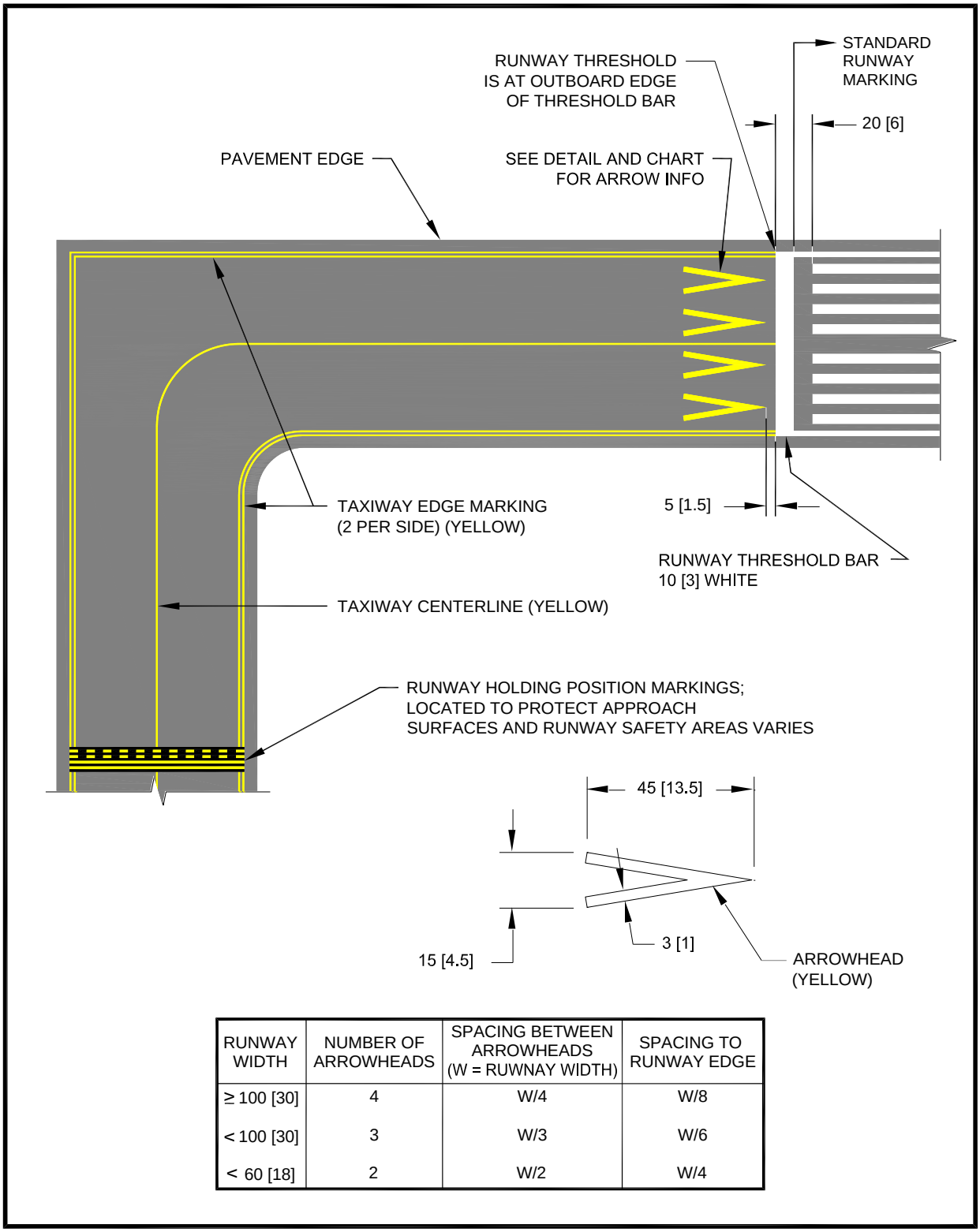


RUNWAY WIDTH	NUMBER OF ARROWHEADS	SPACING BETWEEN ARROWHEADS (W = RUNWAY WIDTH)	SPACING TO RUNWAY EDGE
≥ 100 [30]	4	W/4	W/8
< 100 [30]	3	W/3	W/6
< 60 [18]	2	W/2	W/4

Notes:

1. Dimensions are expressed in feet (meters).
2. Runway edge markings, when used on the runway, extend into the displaced area.
3. Runway markings (except holding position markings) including those in the displaced threshold are white.

Figure A-7. Displaced threshold markings

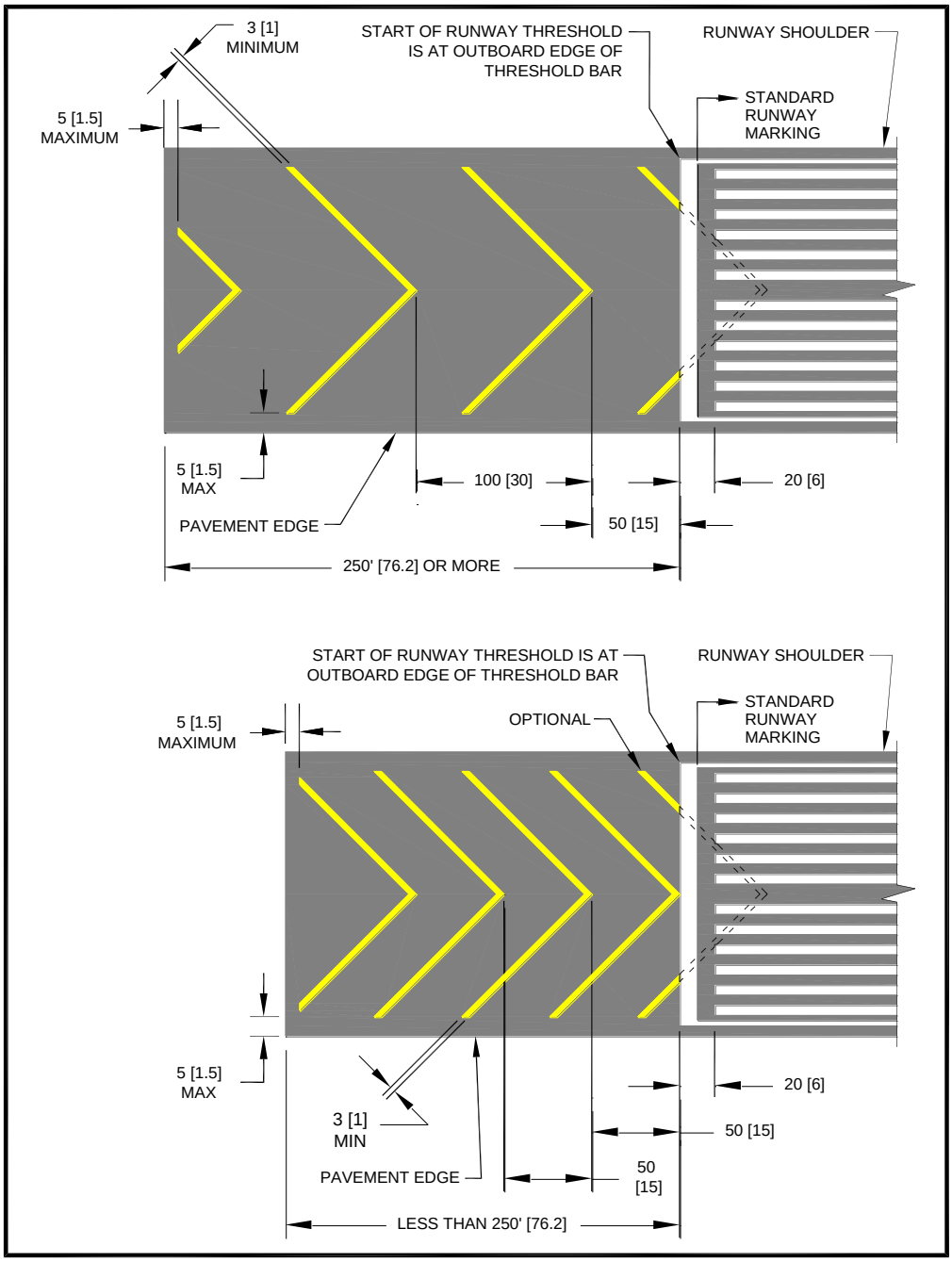


RUNWAY WIDTH	NUMBER OF ARROWHEADS	SPACING BETWEEN ARROWHEADS (W = RUWNAY WIDTH)	SPACING TO RUNWAY EDGE
≥ 100 [30]	4	W/4	W/8
< 100 [30]	3	W/3	W/6
< 60 [18]	2	W/2	W/4

Notes:

1. Dimensions are expressed in feet (meters).

Figure A-8. Marking for aligned taxiway with runway without a displaced threshold



Notes:

1. Dimensions are expressed in feet (meters).
2. The widths of the stopways and blast pads are not the same. Stopways equal runway width. Blast pads equal runway width plus runway shoulders. See AC 150/5300-13.
3. 50 ft (15m) spacing may be used when length of area is less than 250 ft (7.5m) in which case the first full chevron starts at the index point (intersection of runway centerline and runway threshold).
4. Chevrons are painted yellow and at an angle of 45° to the runway centerline.
5. Chevron spacing may be doubled if length of area exceeds 1000 ft (300m).
6. For stopways of less than 250 feet in length, only full chevrons are required with the option to paint partial chevrons.

Figure A-9. Markings for blast pads and stopways

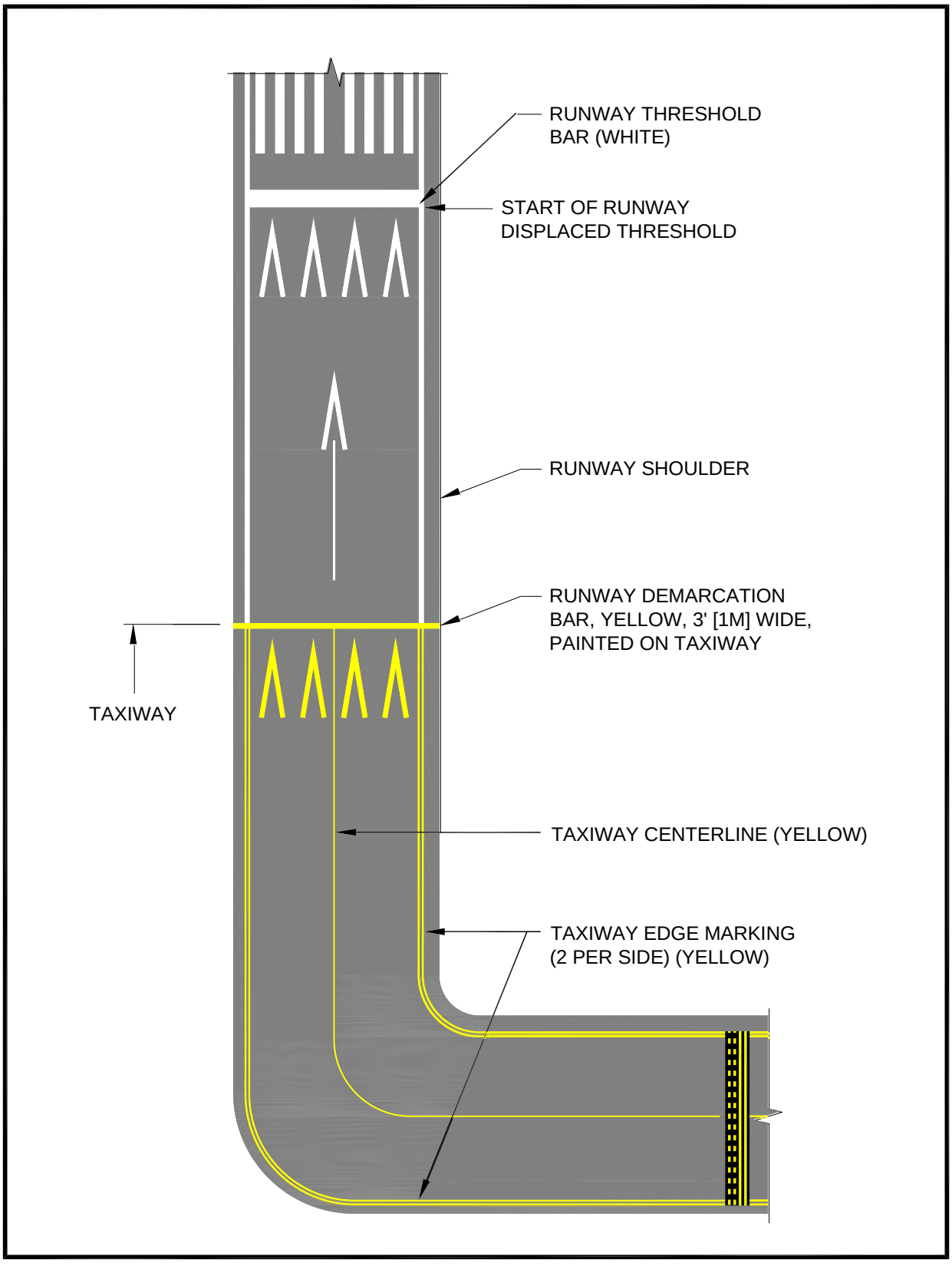
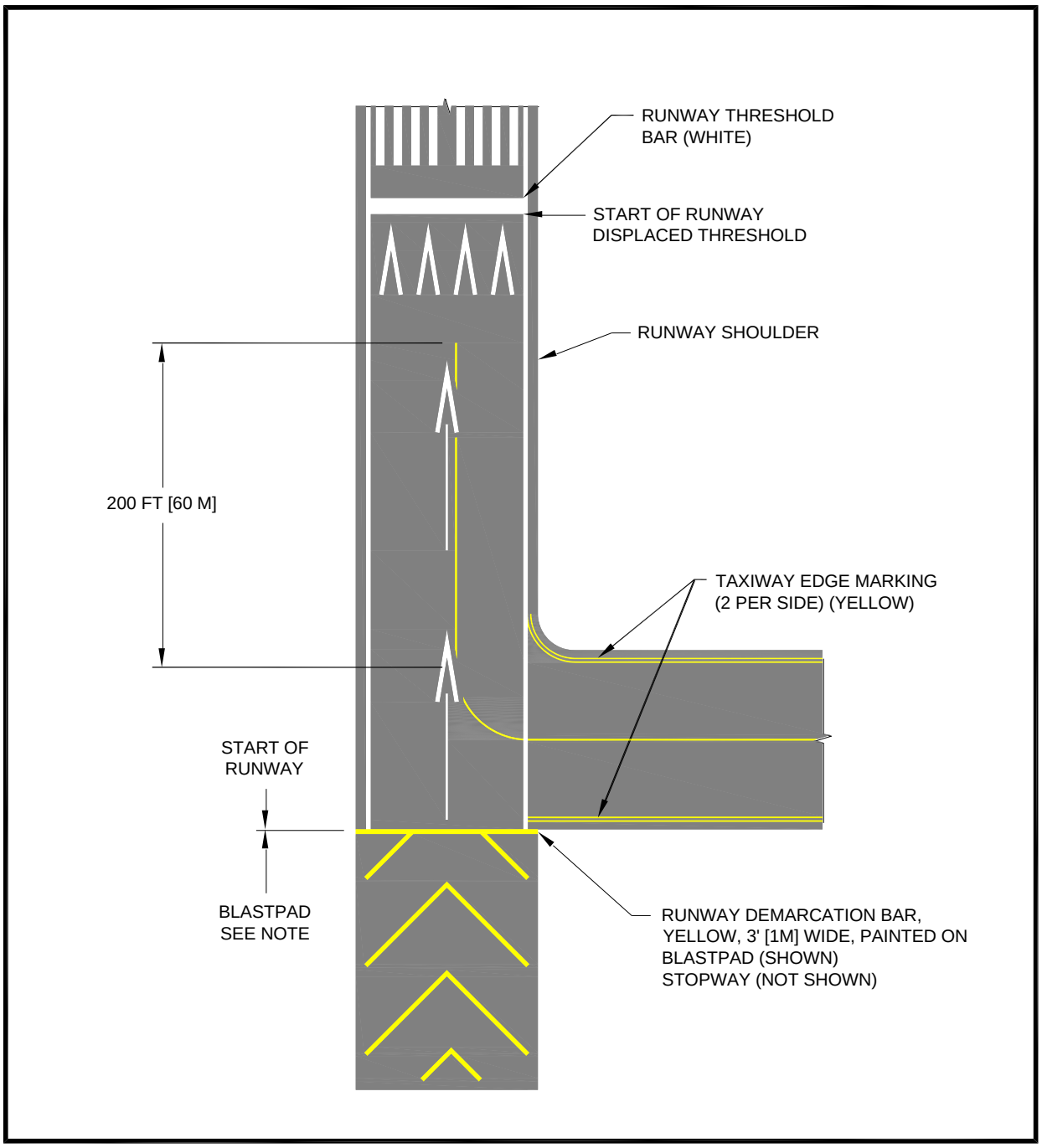


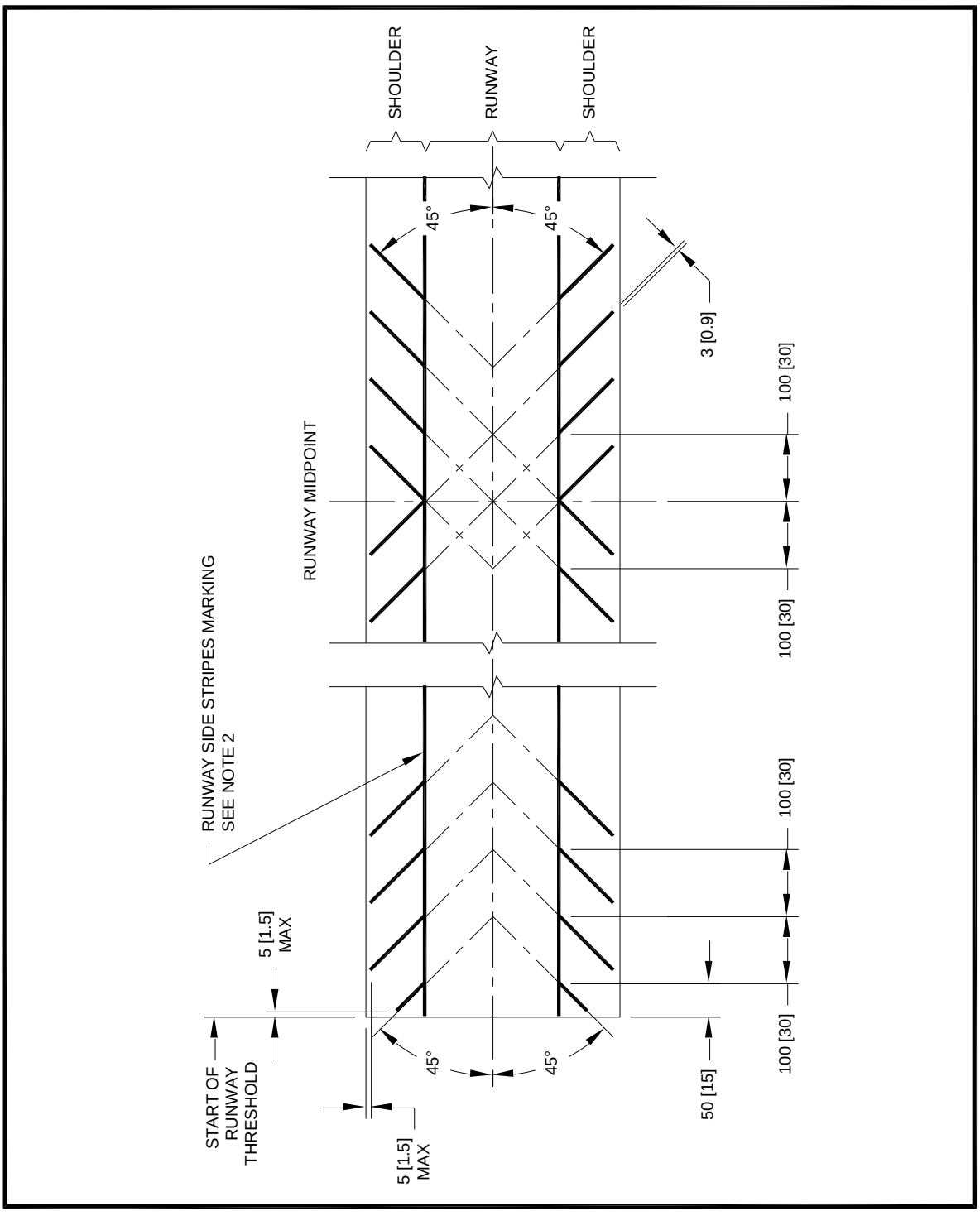
Figure A-10. Markings for aligned taxiway preceding a displaced threshold



Notes:

1. Stopway width equals runway width.
2. Blastpad width equals runway width plus runway shoulders.

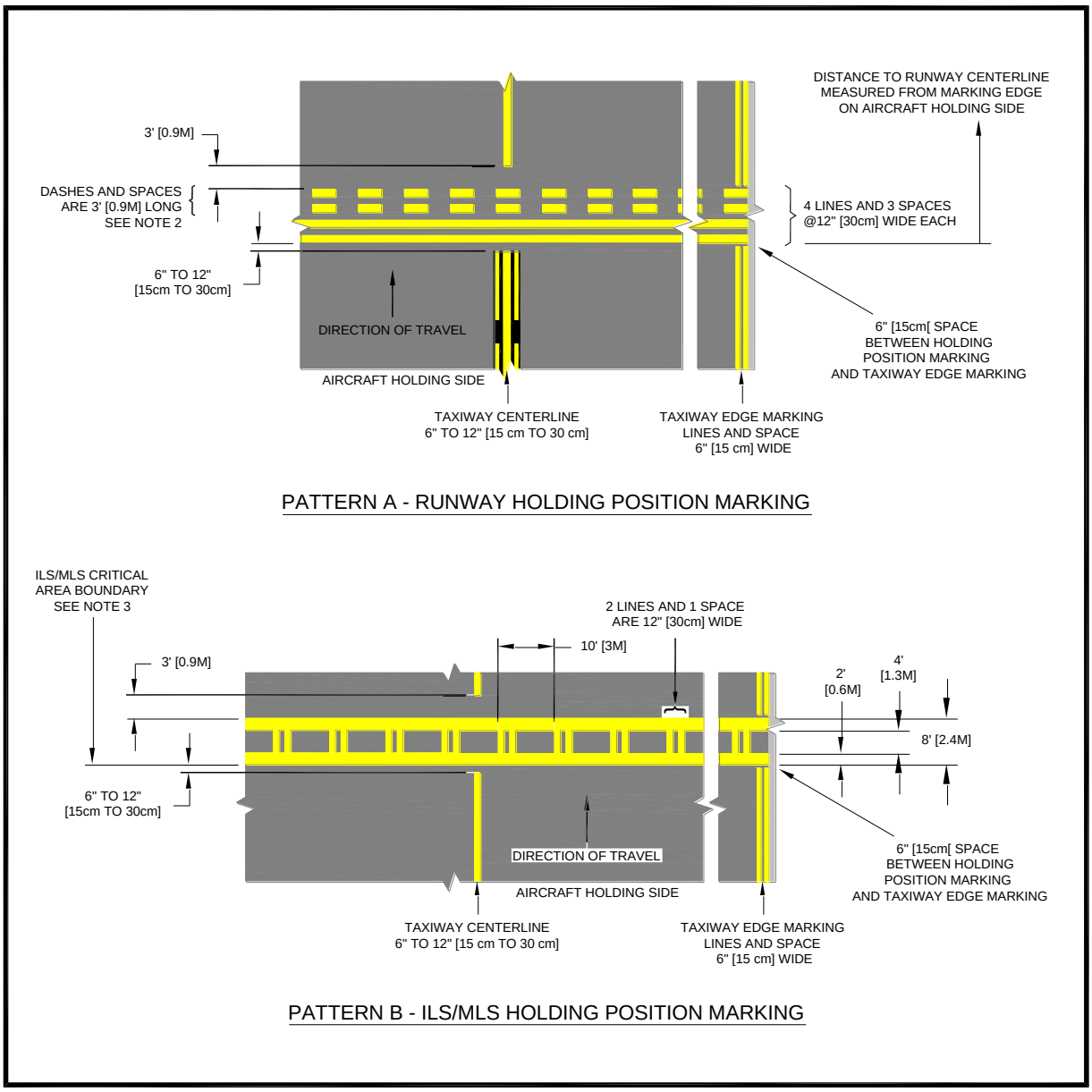
Figure A-11. Markings for blast pad preceding a displaced threshold



Notes:

1. Dimensions are expressed in feet (meters).
2. Runway shoulder markings are used only in conjunction with runway edge markings.
3. Runway shoulder markings are painted yellow.

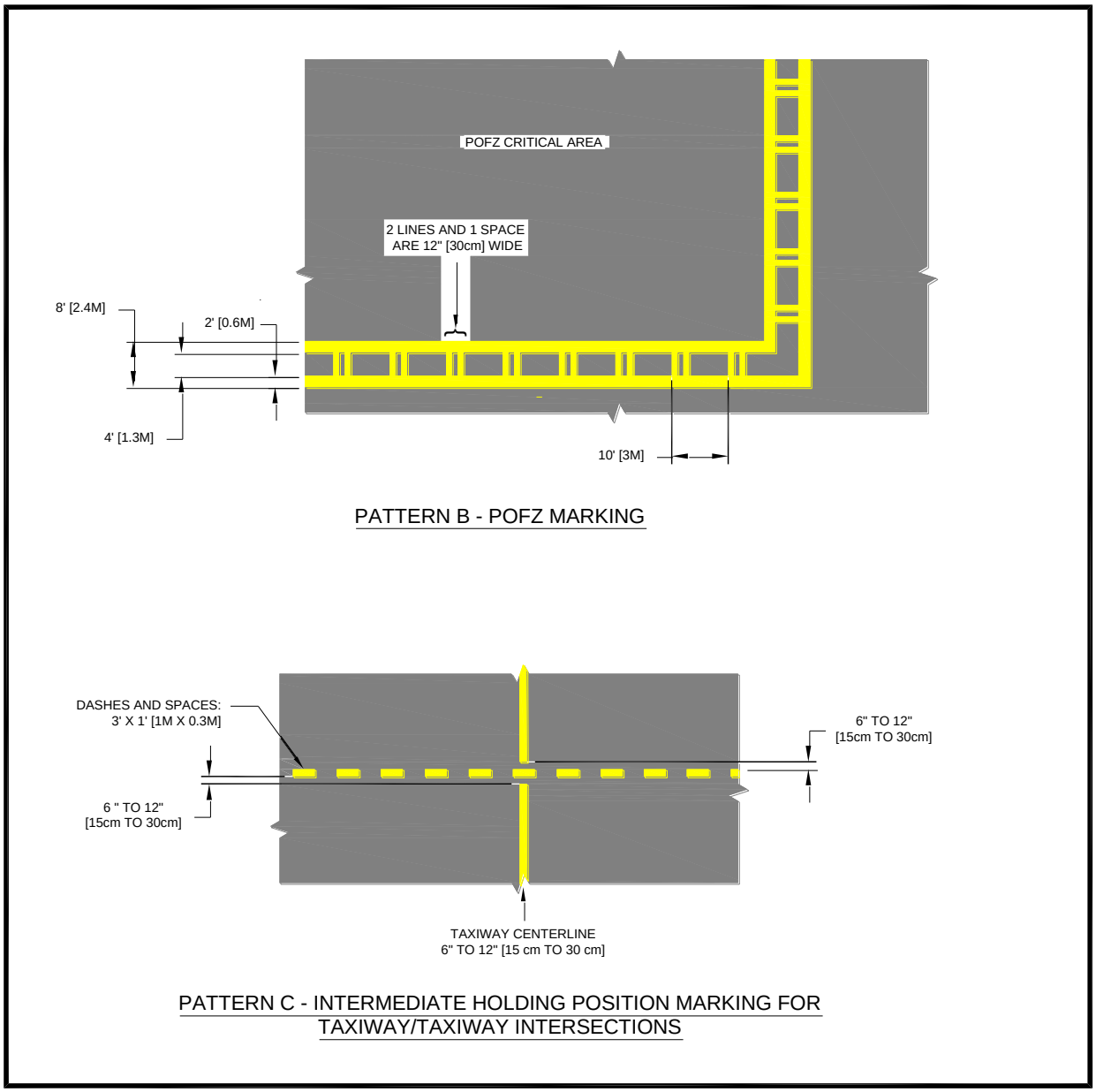
Figure A-12. Runway shoulder markings



Notes:

1. Unless otherwise notes, all lines are yellow.
2. See paragraph 3.3 for reductions.
3. See paragraph 3.4 for reductions.
4. Dimensions shown do not account for outline marking in black paint when on light-colored pavement. See paragraph 1.4 and Appendix C.
5. See Table 1-1 for general guidelines for black borders on light-colored pavements.

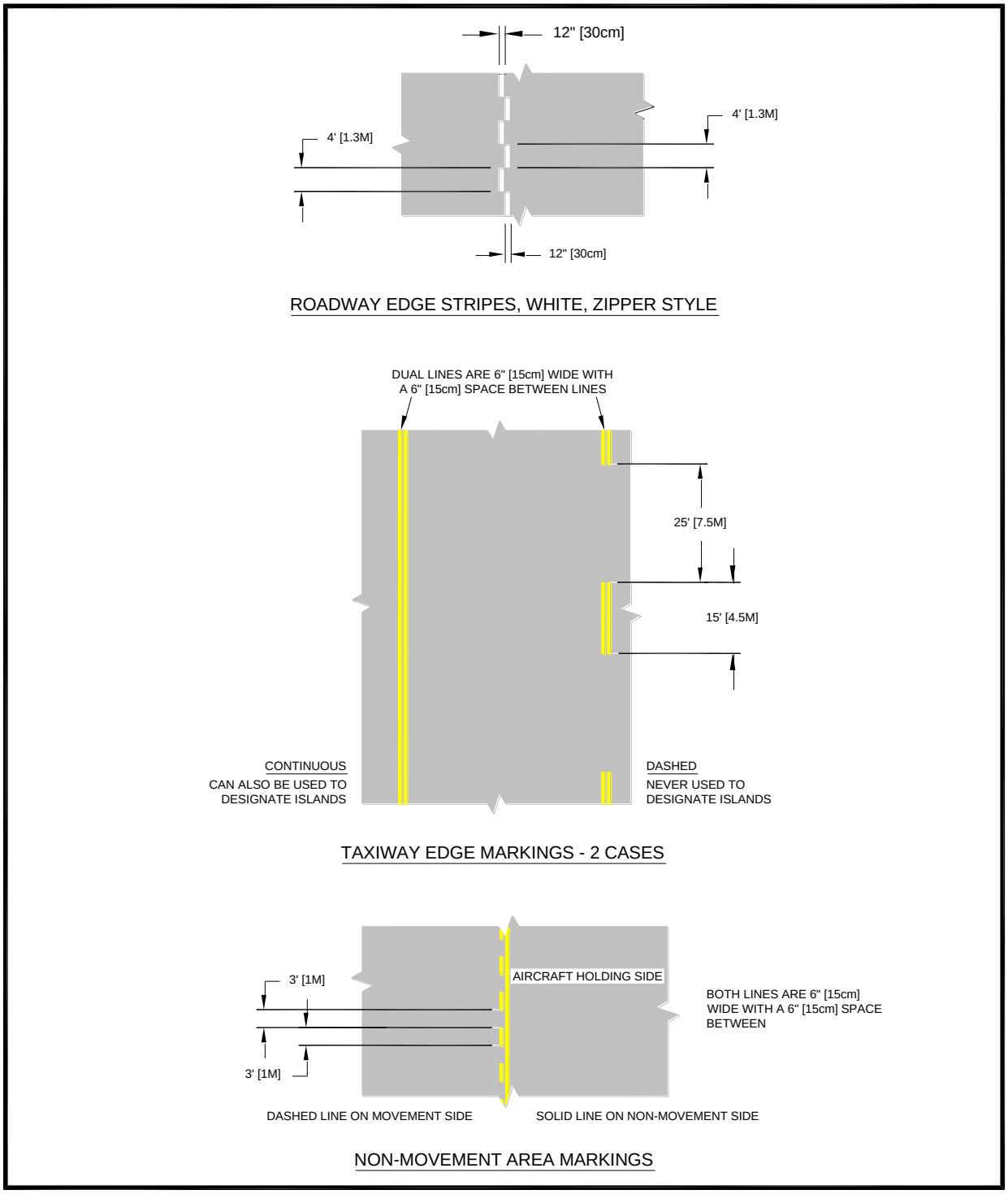
Figure A-13. Holding position marking details



Notes:

1. Unless otherwise noted all lines are yellow.
2. Dimensions shown do not account for outline marking in black paint when on light-colored pavement. See paragraph 1.4 and Appendix C.
3. See Table 1-1 for general guidelines for black borders on light-colored pavements.

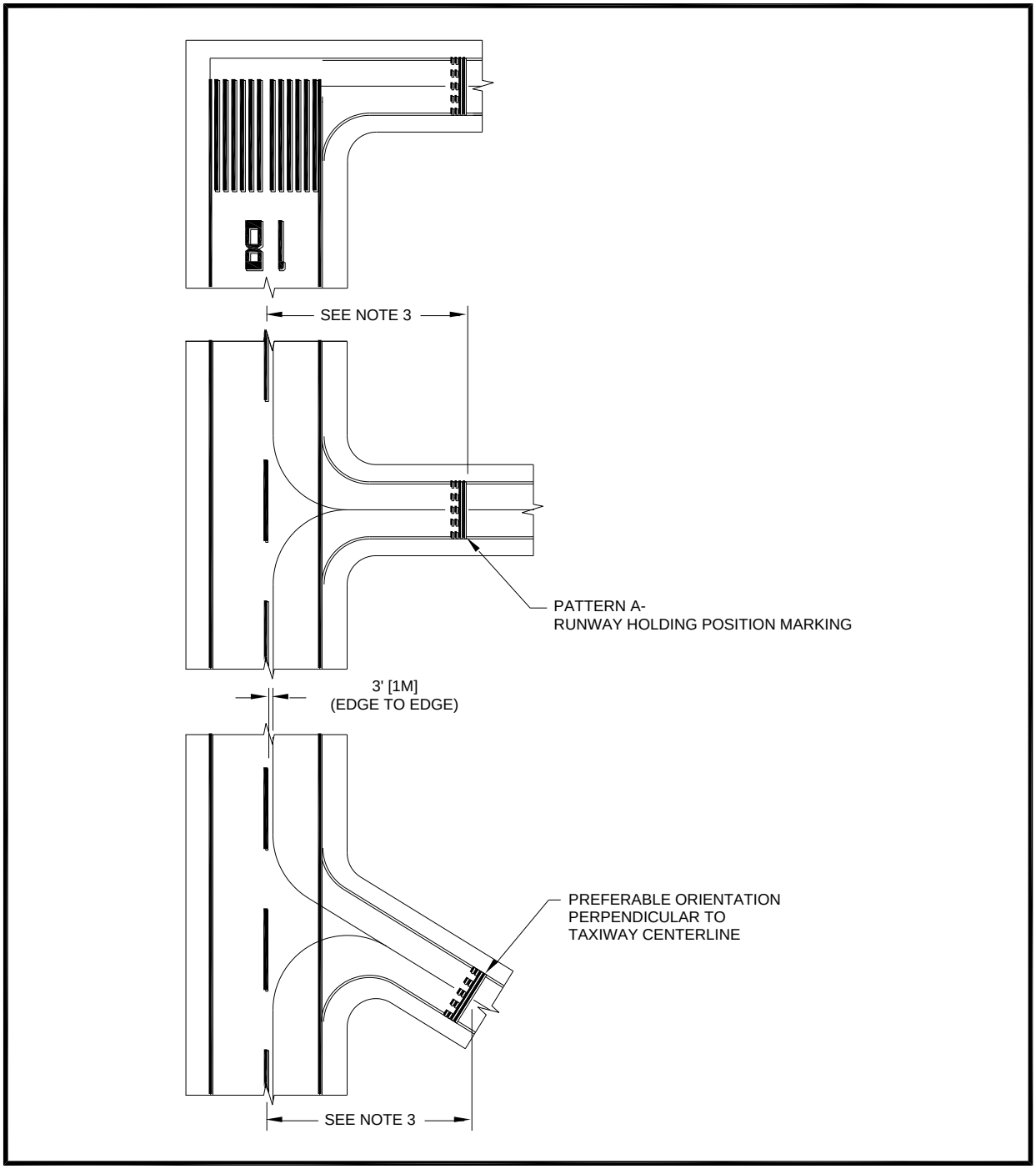
Figure A-14. Holding position marking details



Notes:

1. Unless otherwise noted all lines are yellow.
2. Dimensions shown do not account for black outline of enhanced taxiway marking. See paragraph 1.4 and Appendix C.

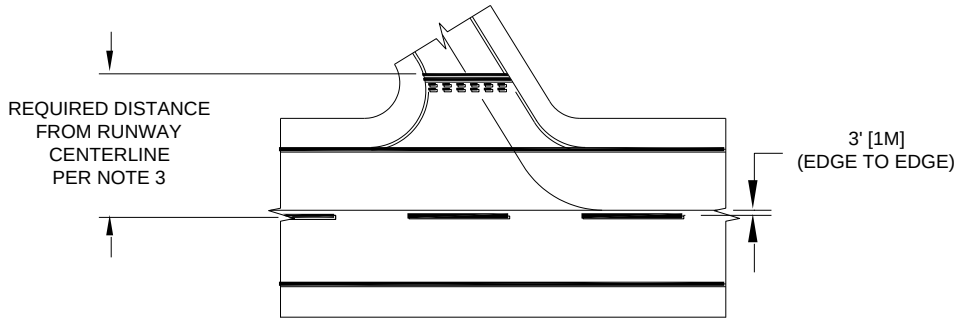
Figure A-15. Taxiway markings



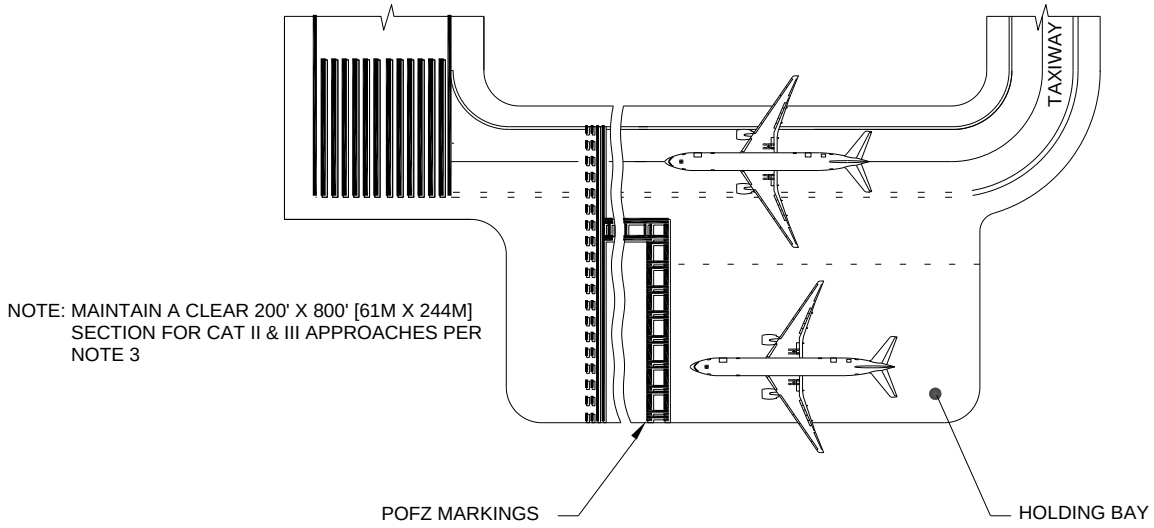
Notes:

1. Refer to Figure A-1, Figure A-13 and Figure A-14 for dimensions off the runway and taxiway markings identified in this figure.
2. Refer to AC 150/5340-18 for sign requirements at holding position markings.
3. Refer to AC 150/5300-13.

Figure A-16. Taxiway markings



EXAMPLE OF PATTERN A HOLDING POSITION MARKINGS NOT AT RIGHT ANGLE TO TAXIWAY CENTERLINE. THE PREFERABLE ORIENTATION (SEE NOTE 4) IS TO BE PERPENDICULAR TO THE TAXIWAY CENTERLINE. HOWEVER, WHEN THE ANGLE IS VERY ACUTE, AND PART OF THE AIRCRAFT IS IN THE RUNWAY SAFETY AREA, USE THIS METHOD.

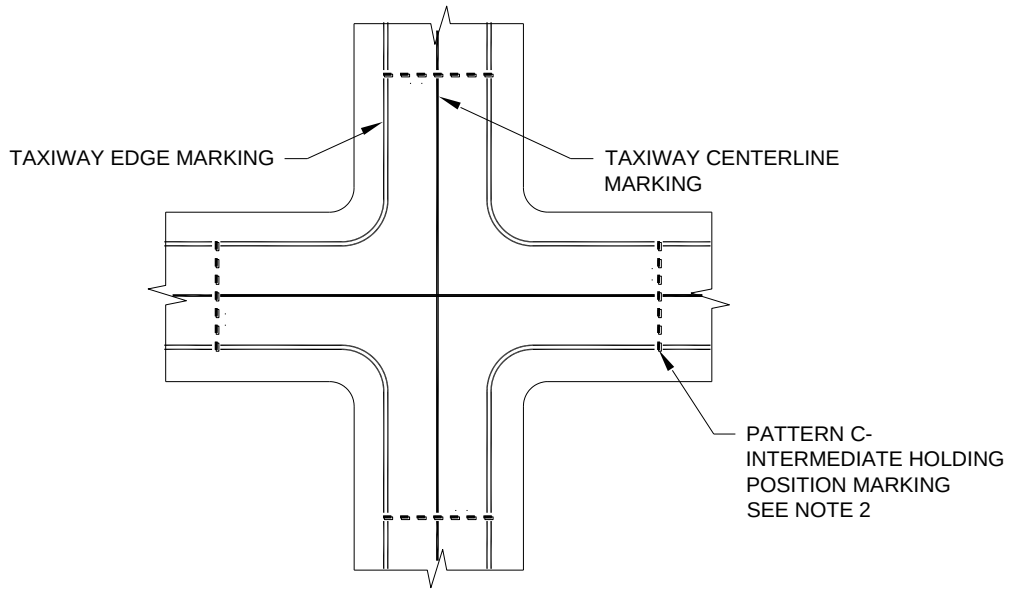


EXAMPLE WHERE PATTERN B POFZ HOLDING POSITION MARKINGS EXTENDING ACROSS HOLDING BAY

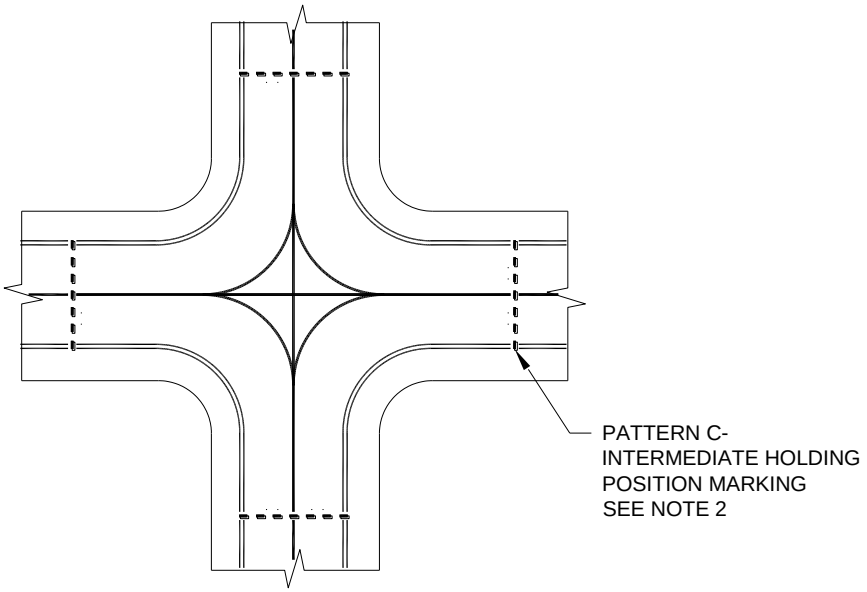
Notes:

1. Refer to Figure A-1, Figure A-13 and Figure A-14 for dimensions off the runway and taxiway markings identified in this figure.
2. Refer to AC 150/5340-18 for sign requirements at holding position markings.
3. Refer to AC 150/5300-13.
4. Refer to Figure A-14.

Figure A-17. Taxiway markings



TAXIWAY CENTERLINE MARKING AT INTERSECTION HAVING LESS THAN STANDARD FILLETS AND REQUIRING JUDGMENTAL OVERSTEERING



TAXIWAY CENTERLINE MARKING AT INTERSECTION HAVING STANDARD FILLETS PERMITTING COCKPIT-OVER-CENTERLINE STEERING (RECOMMENDED)

Notes:

1. Refer to Figure A-12 and Figure A-13 for dimensions of the taxiway marking identified in this figure.
2. Refer to Figure A-13.

Figure A-18. Methods for taxiway centerline marking

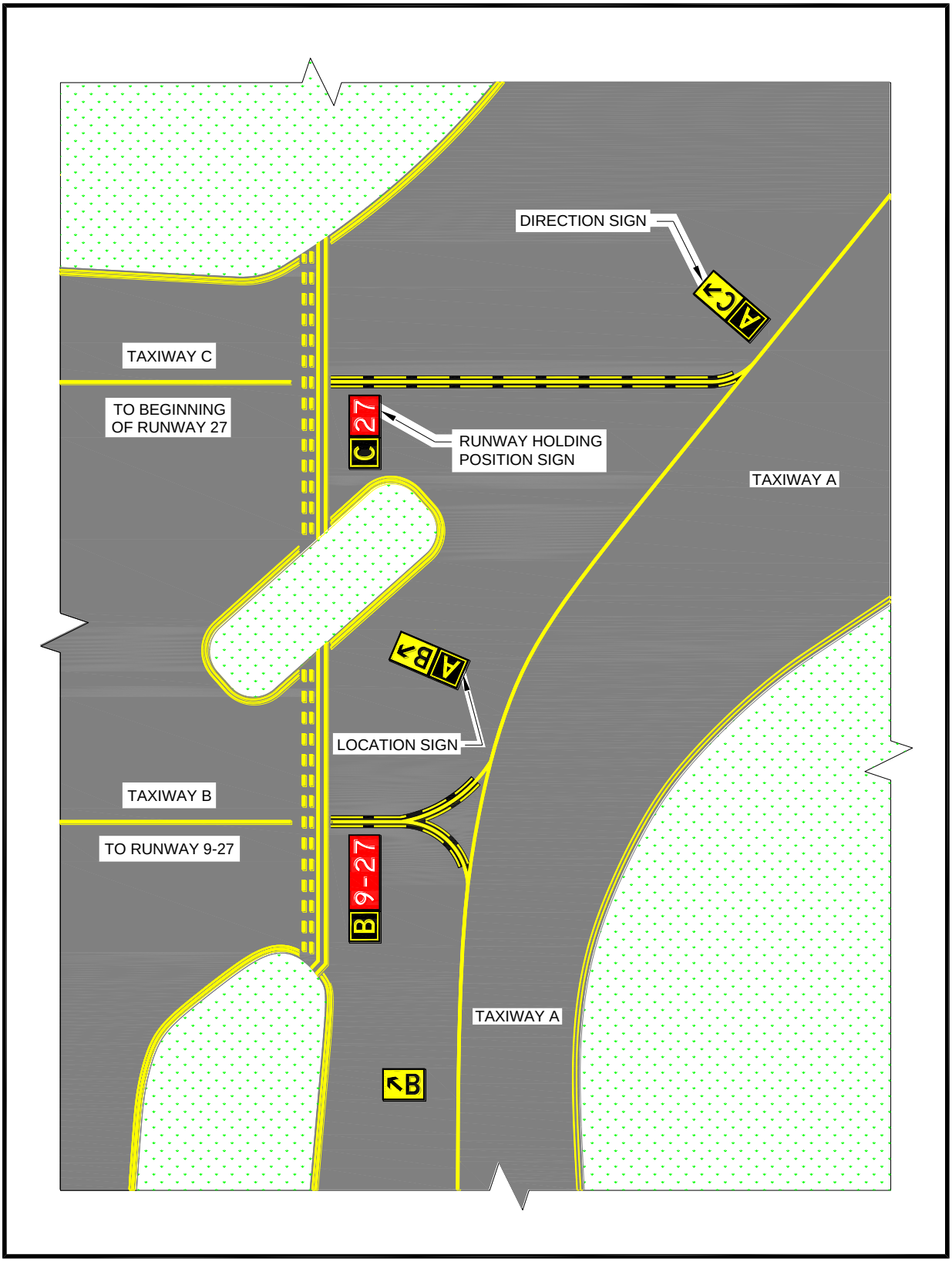


Figure A-19. Surface painted signs

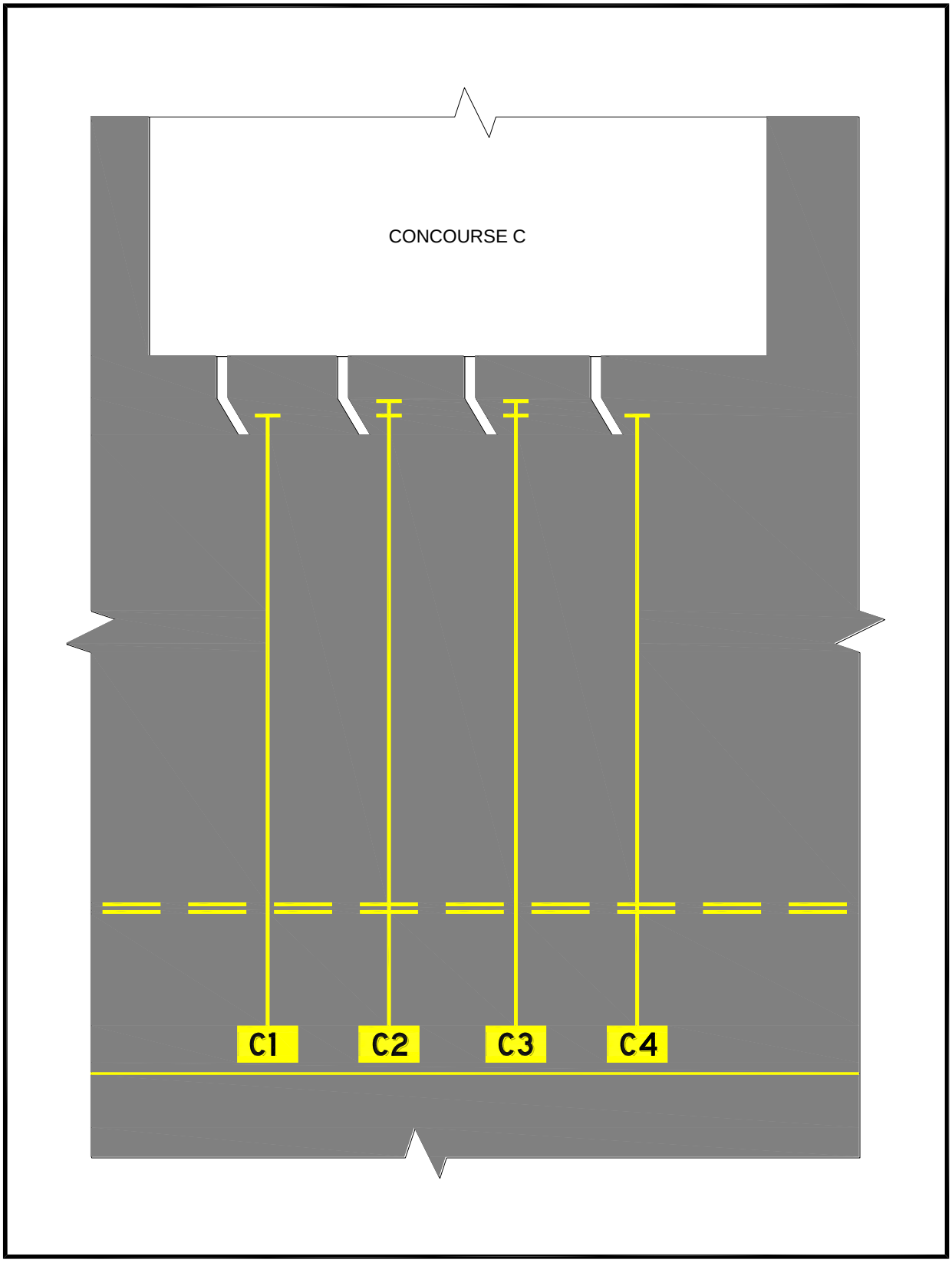


Figure A-20. Surface painted gate identification signs

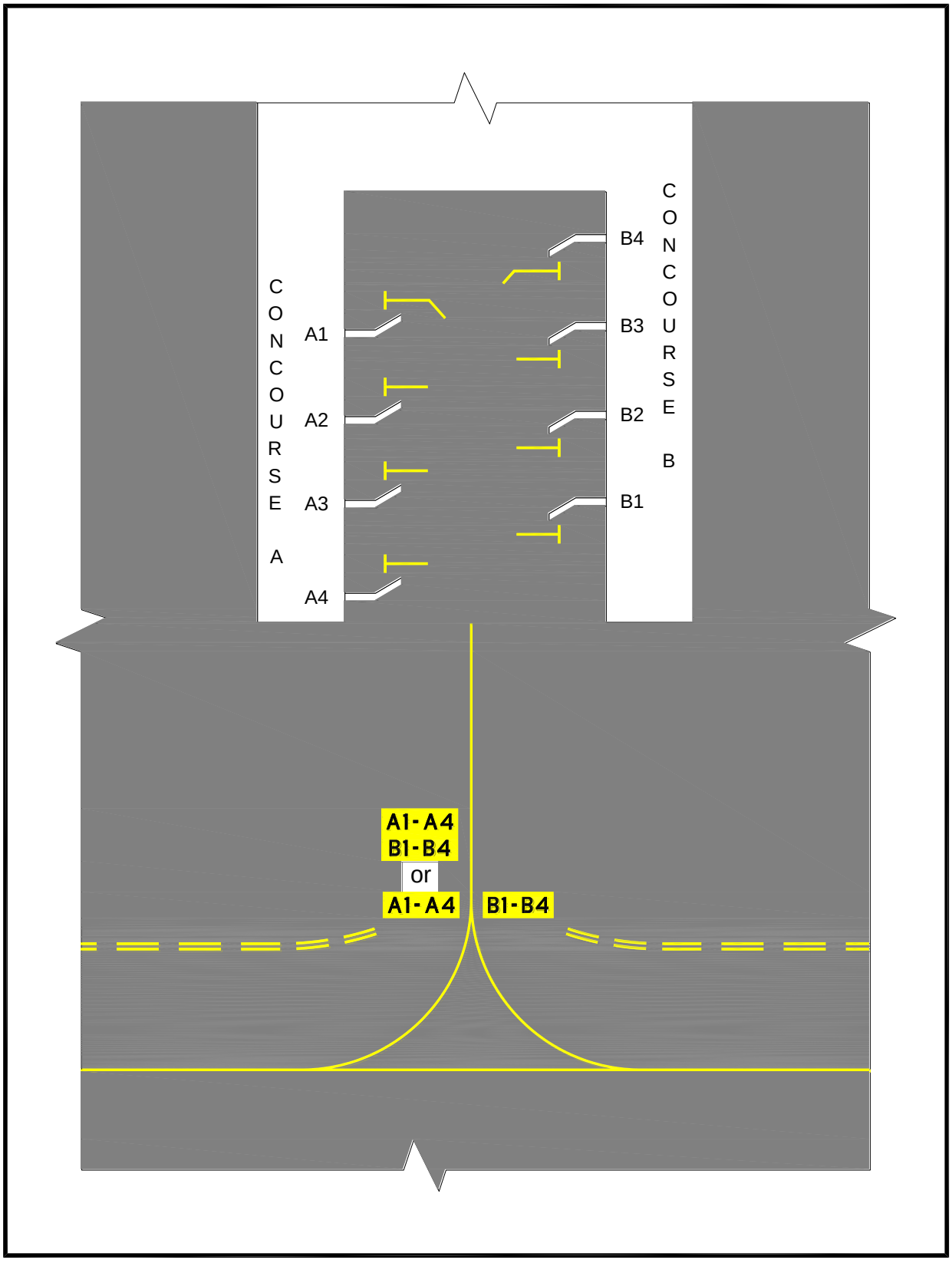
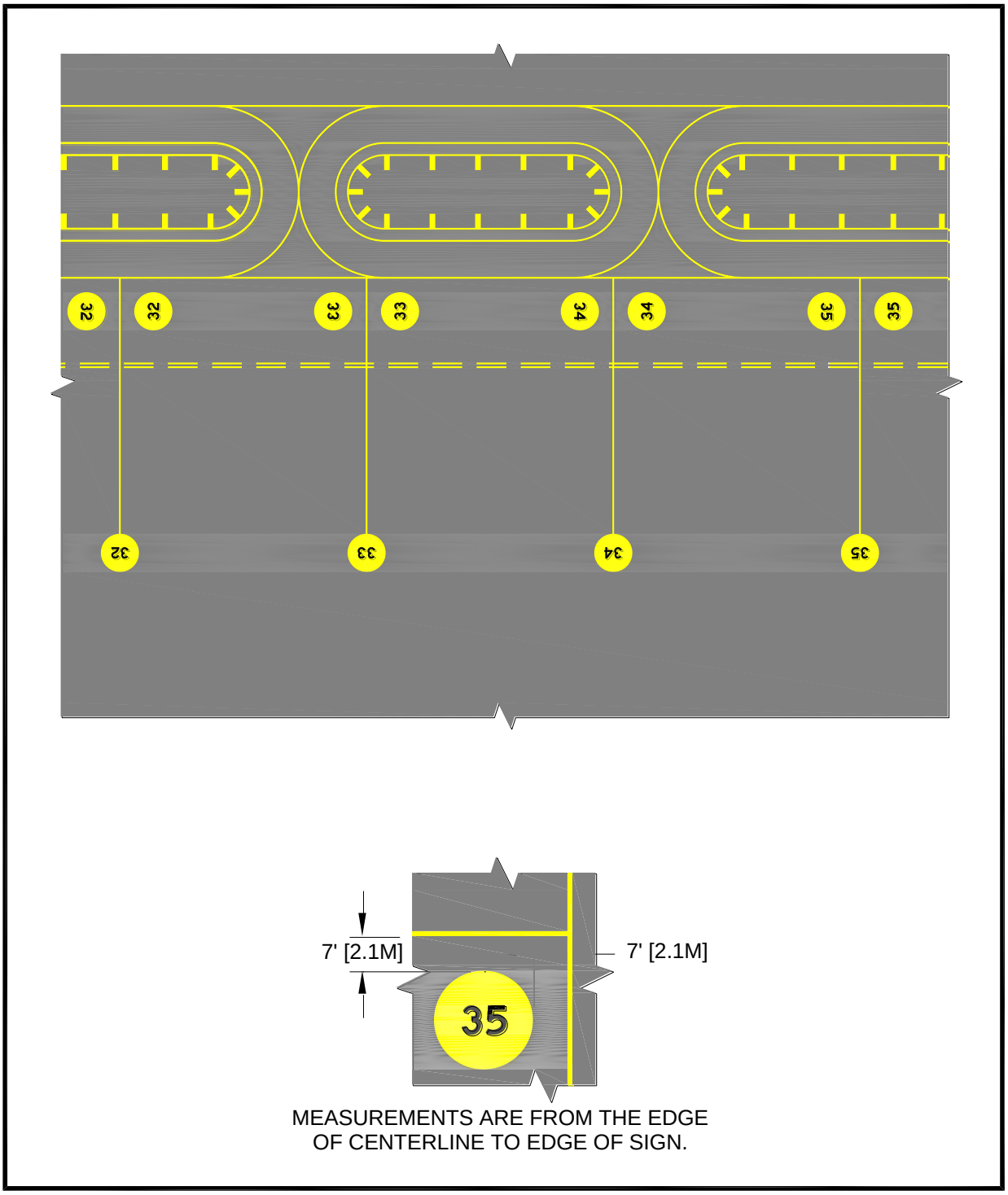
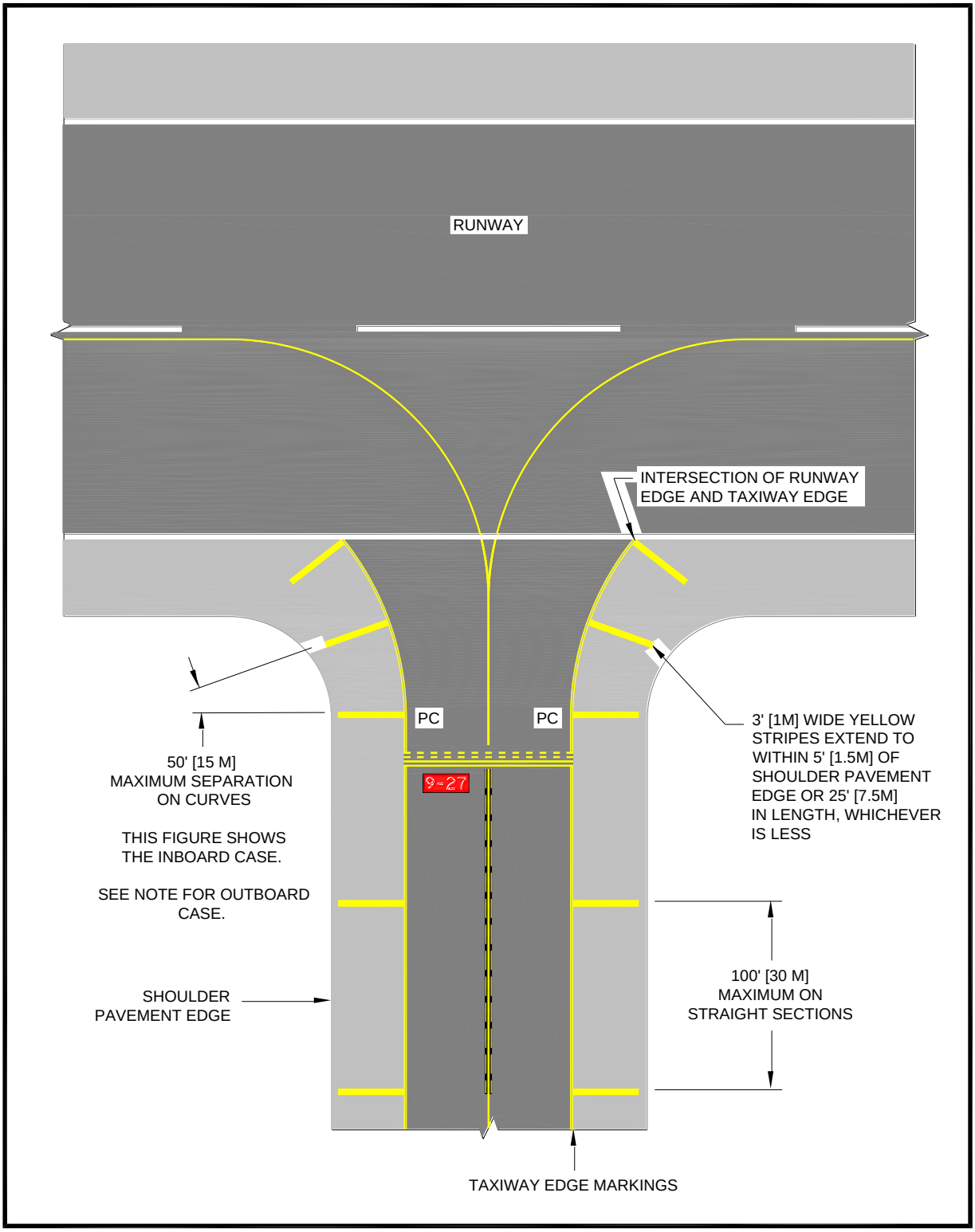


Figure A-21. Multiple gate signs



Note: Centerline at apron entrance point locations may be marked with a radius marking rather than with a "T" configuration, as shown.

Figure A-22. Surface painted apron entrance point signs



Notes: 1. See paragraph 4.10.c(2).
2. PC –Point of Curvature

Figure A-23. Taxiway shoulder markings

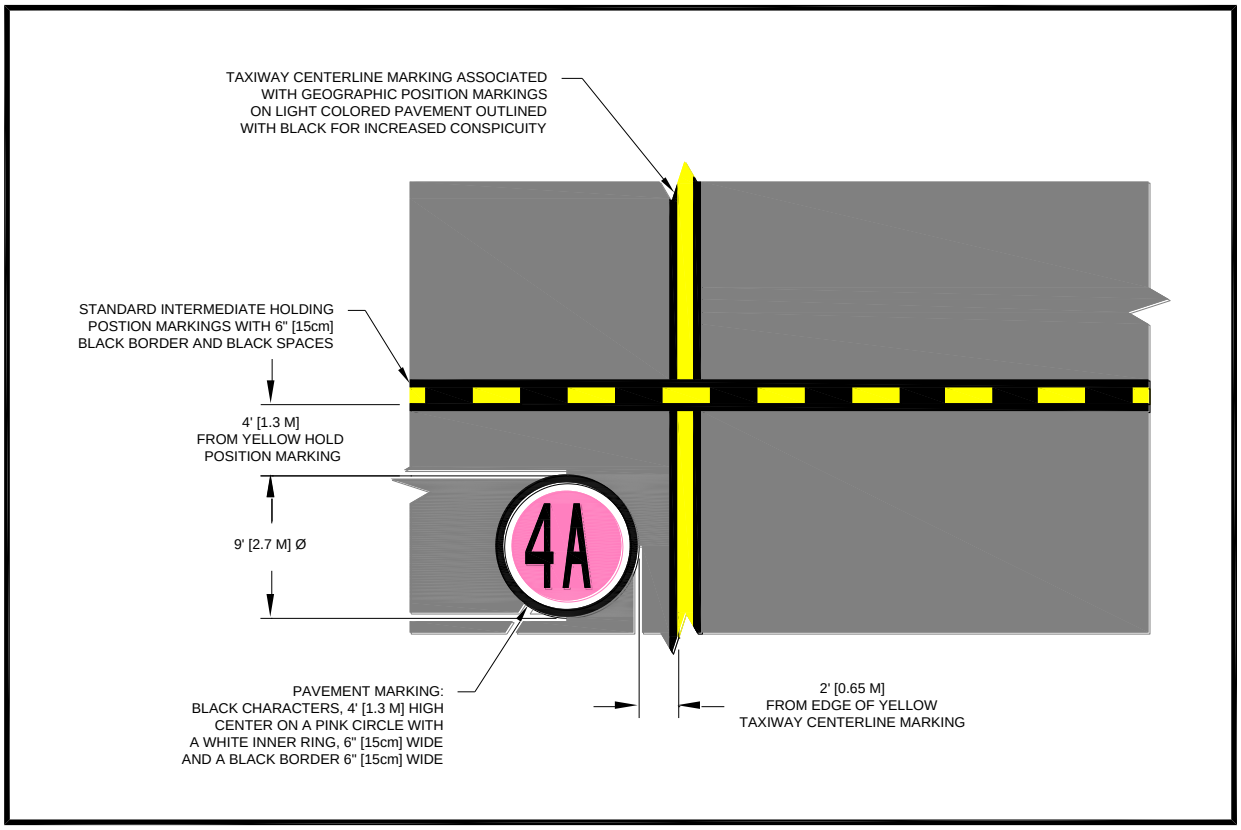
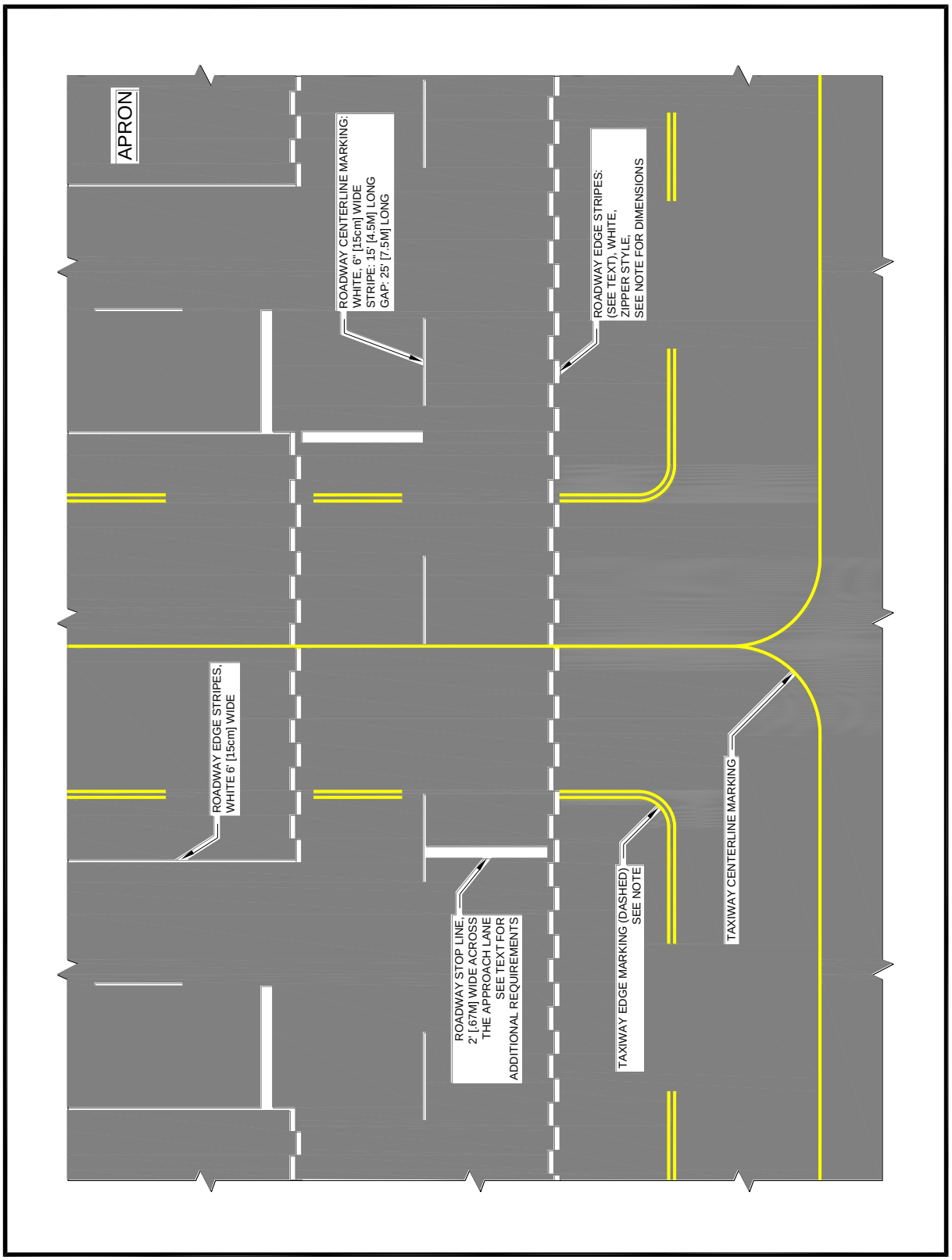
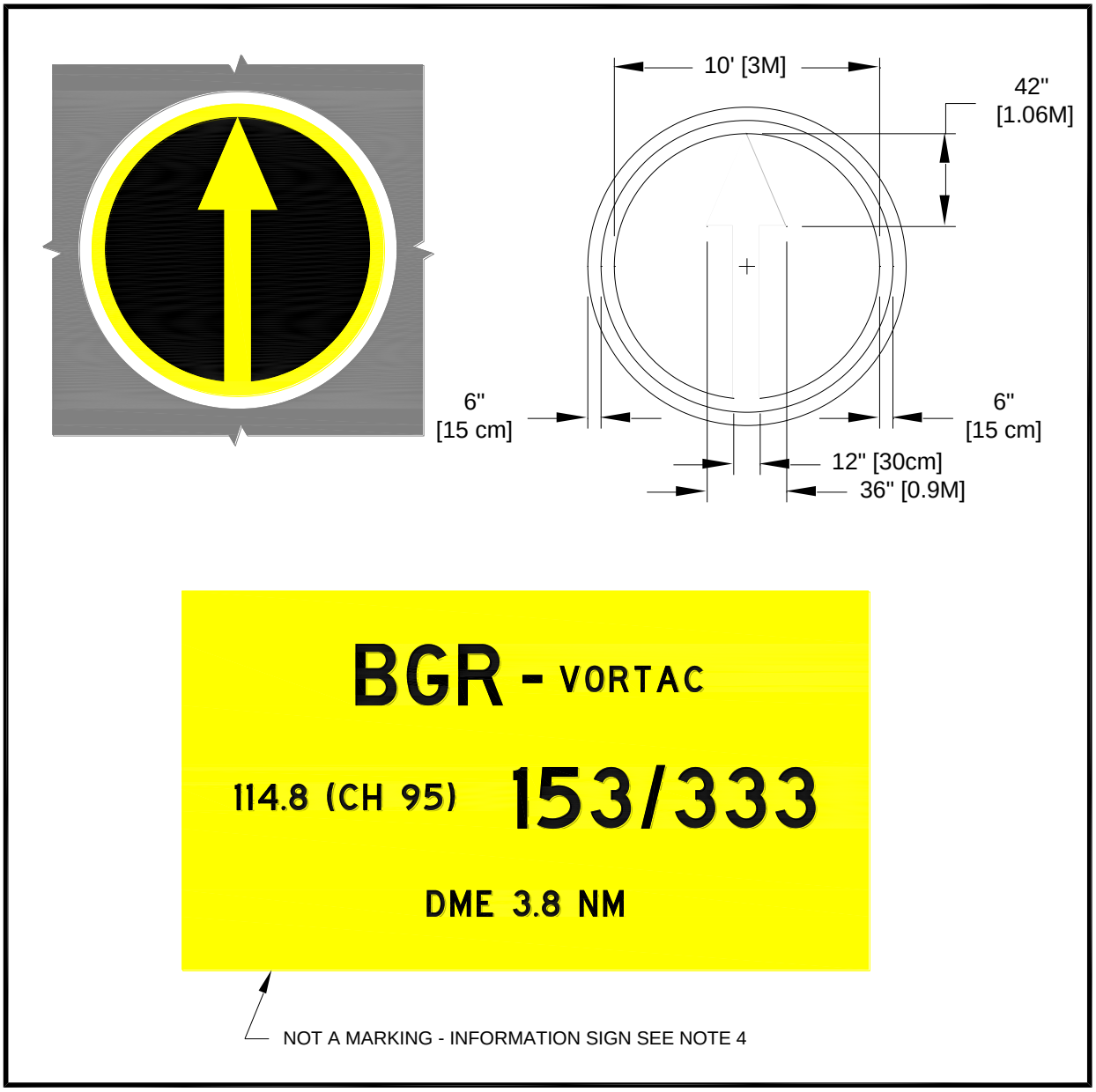


Figure A-24. Geographic position markings



Note: Refer to Figure A-15.

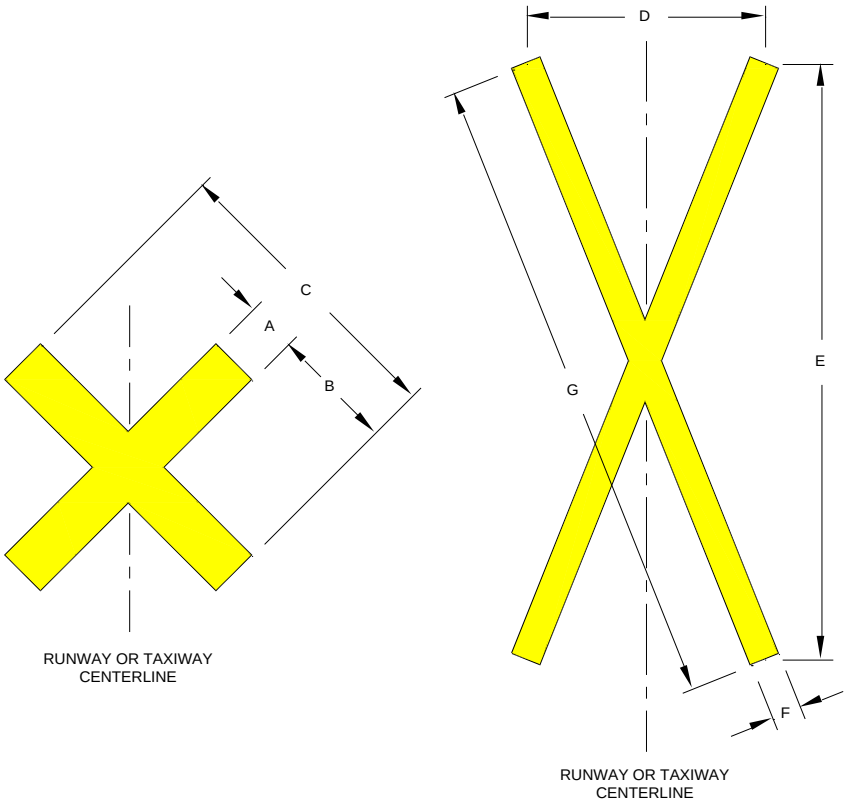
Figure A-25. Vehicle roadway markings



Notes:

1. Arrow is to be aligned toward the facility.
2. Interior of circle is to be painted black on concrete surfaces only.
3. Circle may be bordered on inside and outside with a 6 inches (15 cm) black band if necessary for contrast.
4. Refer to AC 150/5340-18.

Figure A-26. VOR receiver checkpoint markings



PATTERN	SYMBOL TYPE / DIMENSION	A	B	C	D	E	F	G
A	CLOSED RUNWAY	10' [3M]*	25' [7.5M]	60' [18M]	-	-	-	-
B	CLOSED RUNWAY (ALTERNATE)	-	-	-	48 [14.4M]	120 [36M]	6 [1.8M]	129.25' [39M]
C	CLOSED TAXIWAY	5' [1.5M]**	12.5' [3.8M]	30' 9M]	-	-	-	-
D	CLOSED TAXIWAY (ALTERNATE)	-	-	-	24 [7.2M]	60 [18M]	3 [.09M]	64.6 [20M]

Note: Both symbols are always painted yellow.
* For temporary symbol, this dimension may be changed to 8 ft (2.4m).
** For temporary symbol, this dimension may be changed to 4 ft (1.2m).

Figure A-27. Closed runway and taxiway markings

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Appendix B. Inscriptions for Signs and Geographic Position Markings

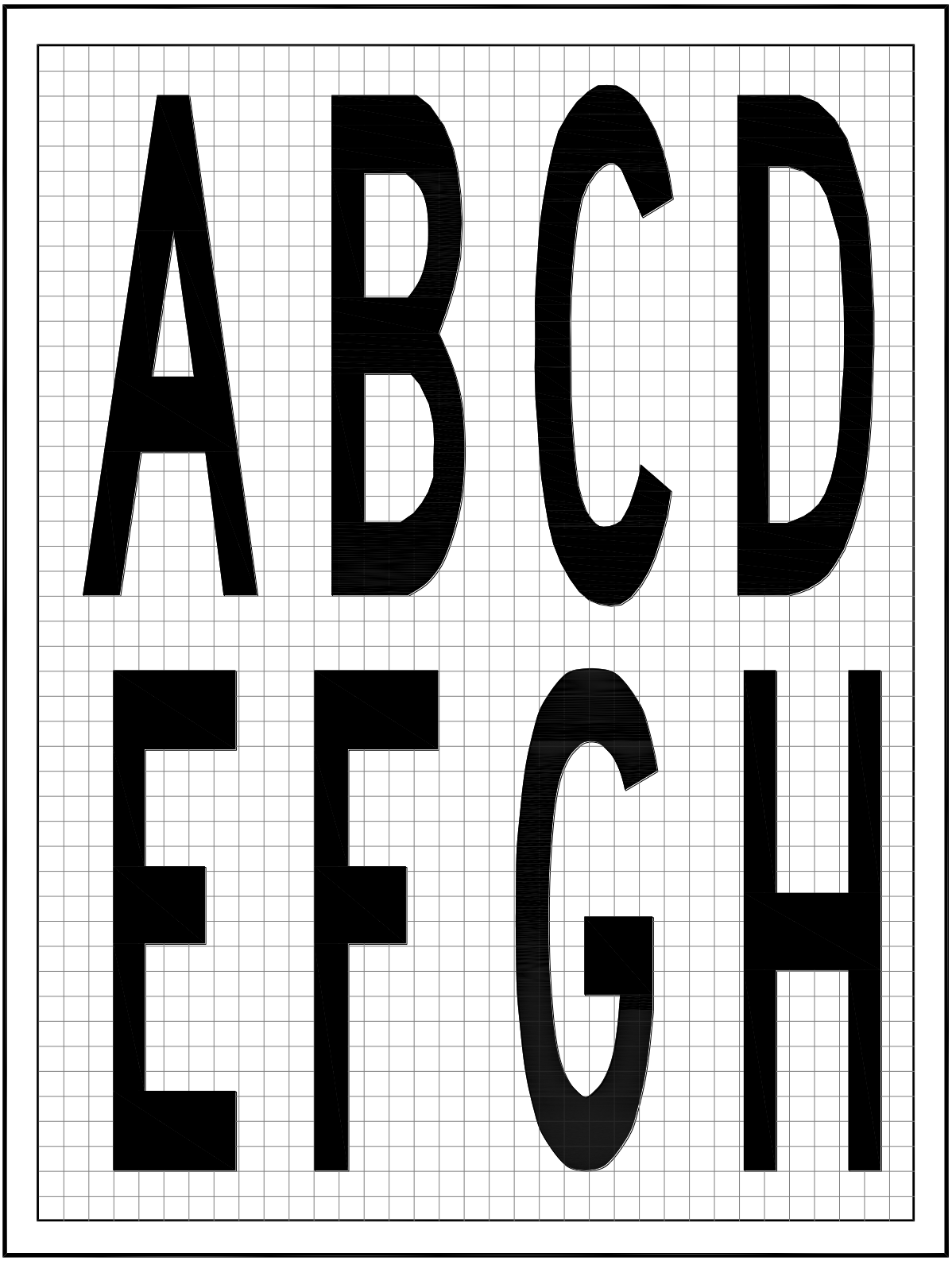

Figure B-1. Pavement markings ABCDEFGH

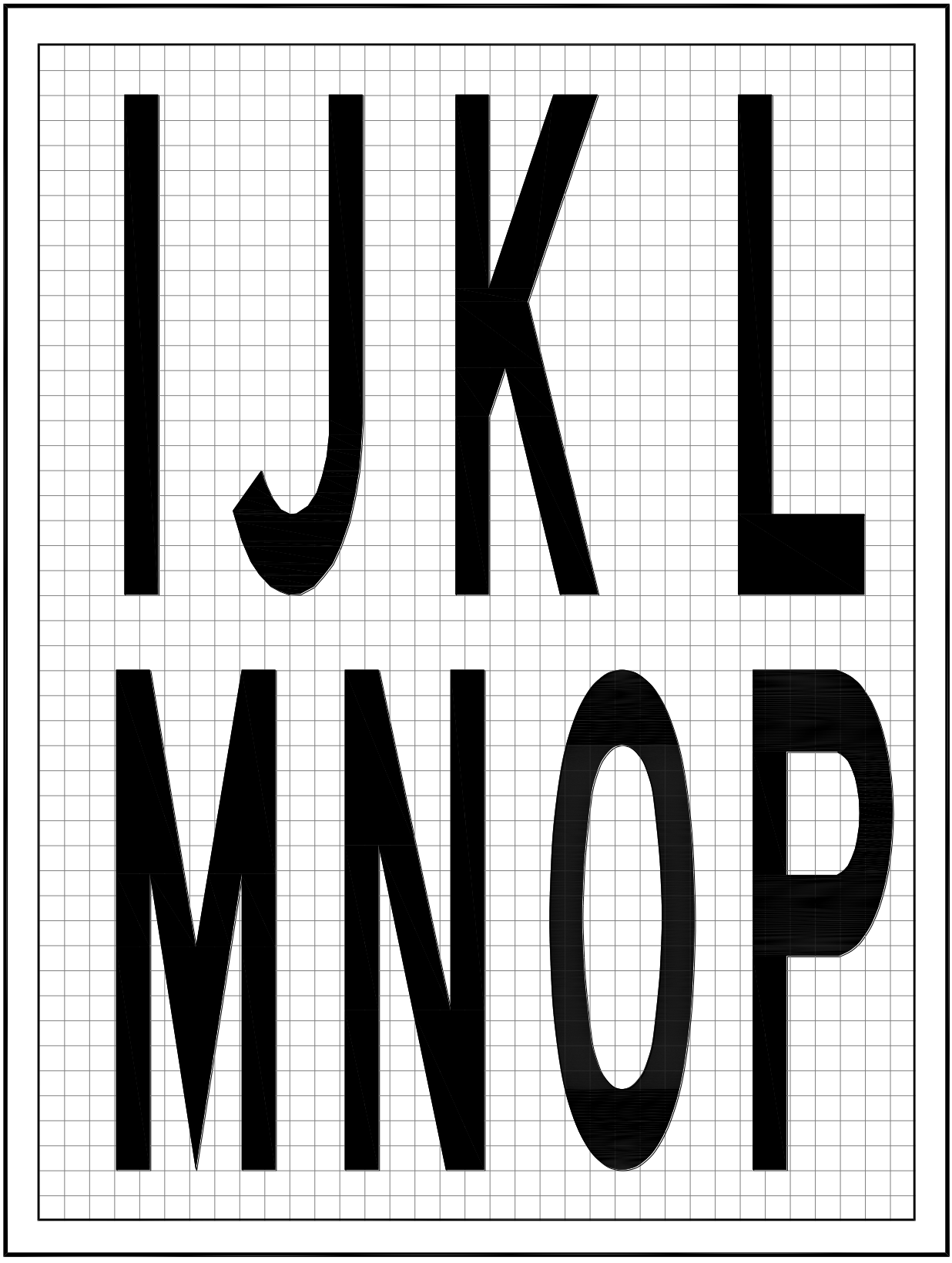

Figure B-2. Pavement markings IJKLMNOP

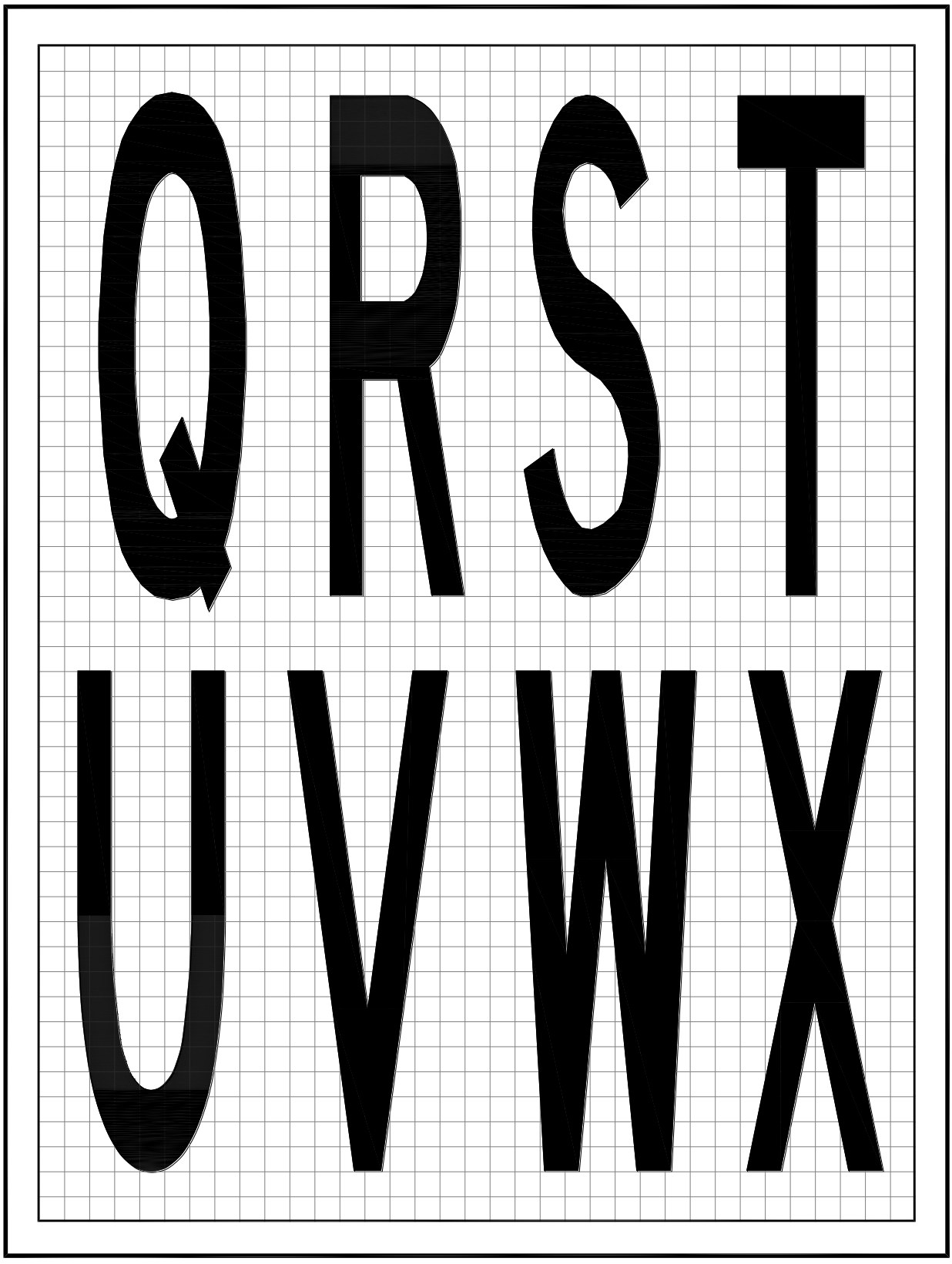

Figure B-3. Pavement markings QRSTUVWX

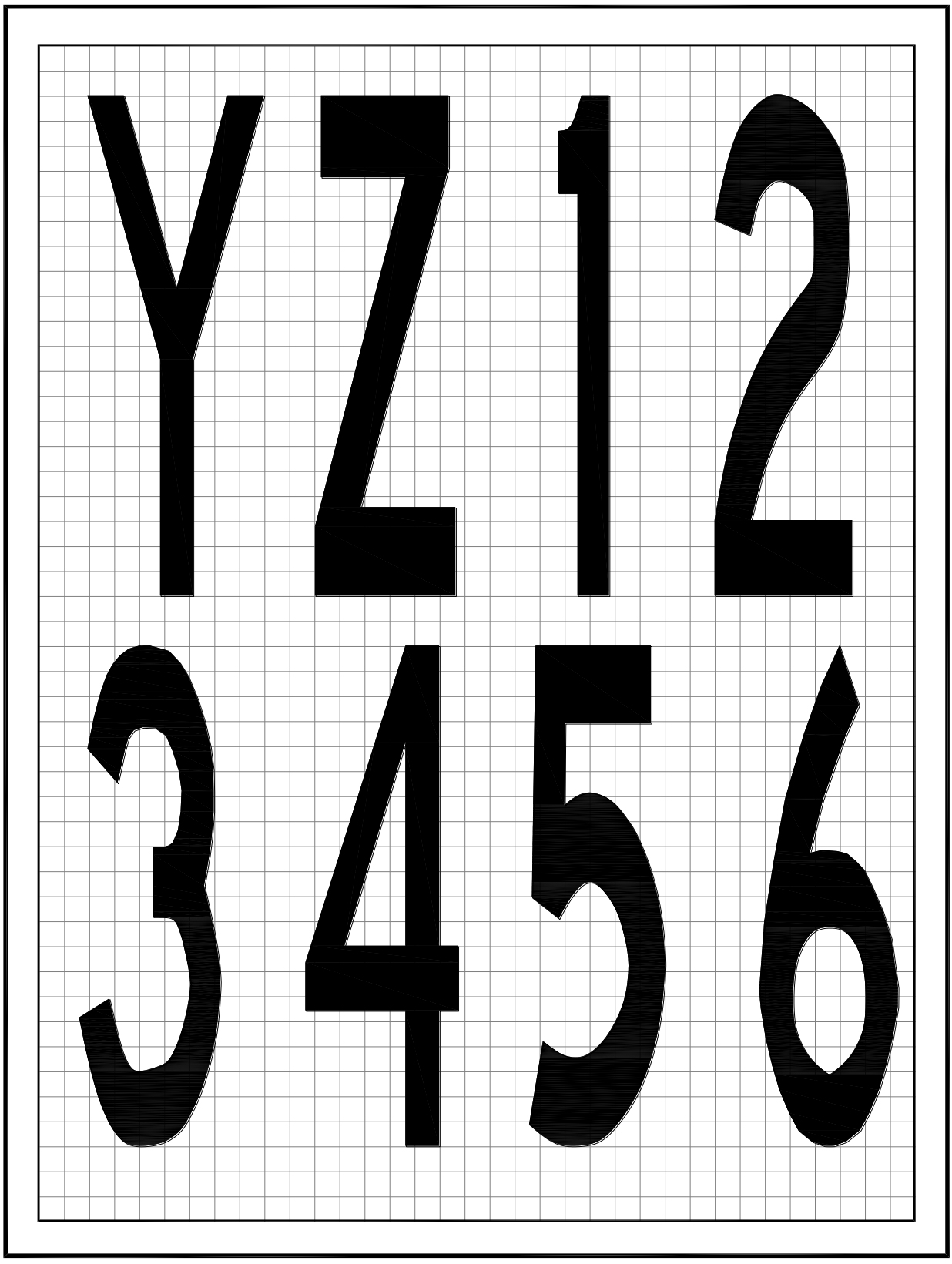

Figure B-4. Pavement markings YZ123456

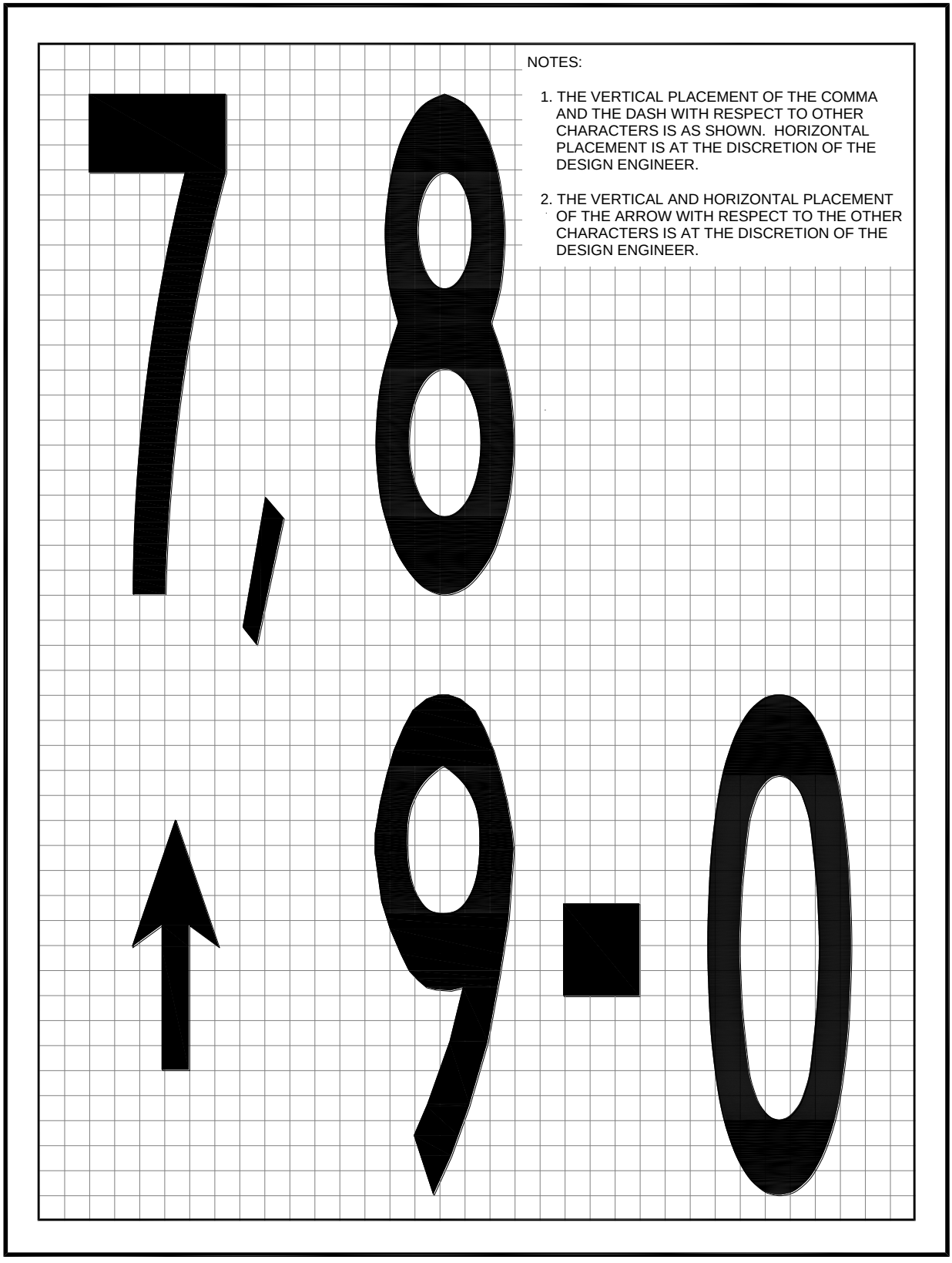

Figure B-5. Pavement markings 7890-,↑

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Appendix C. Examples of Markings Outlined in Black

This appendix illustrates the acceptable layout for various markings outlined in black. The black paint extends at least 6 inches (15 cm) beyond the outside edge of the markings. All spaces between paint lines in markings composed of two or more lines or dashes are painted in black as illustrated in the figures below. An alternate outlining pattern is provided for dashed taxiway edge line markings. These figures are not drawn to scale.

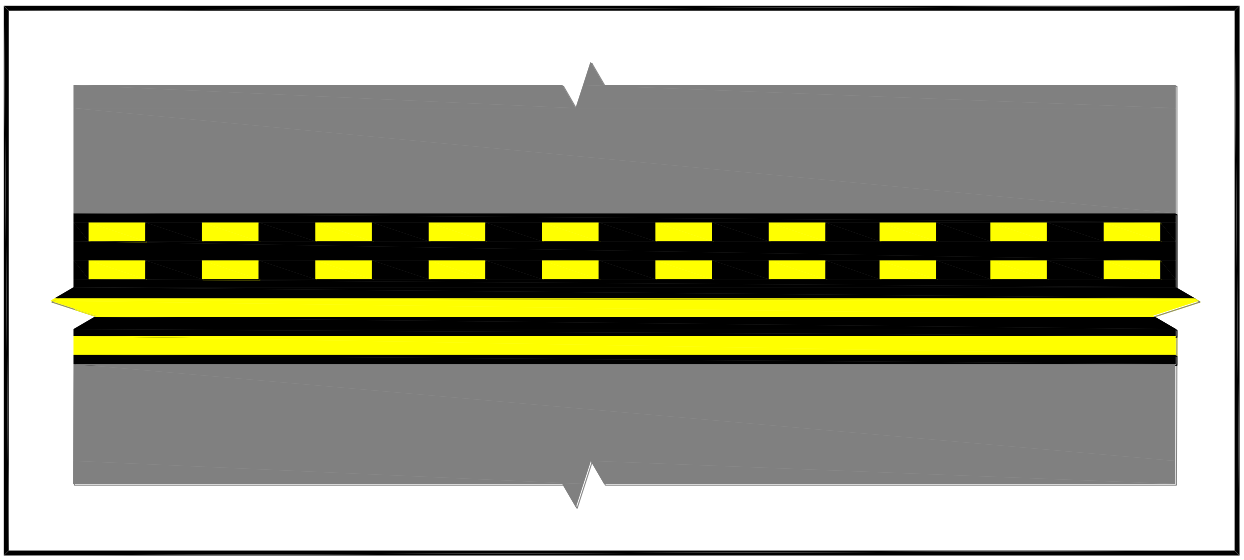


Figure C-1. Runway holding position marking

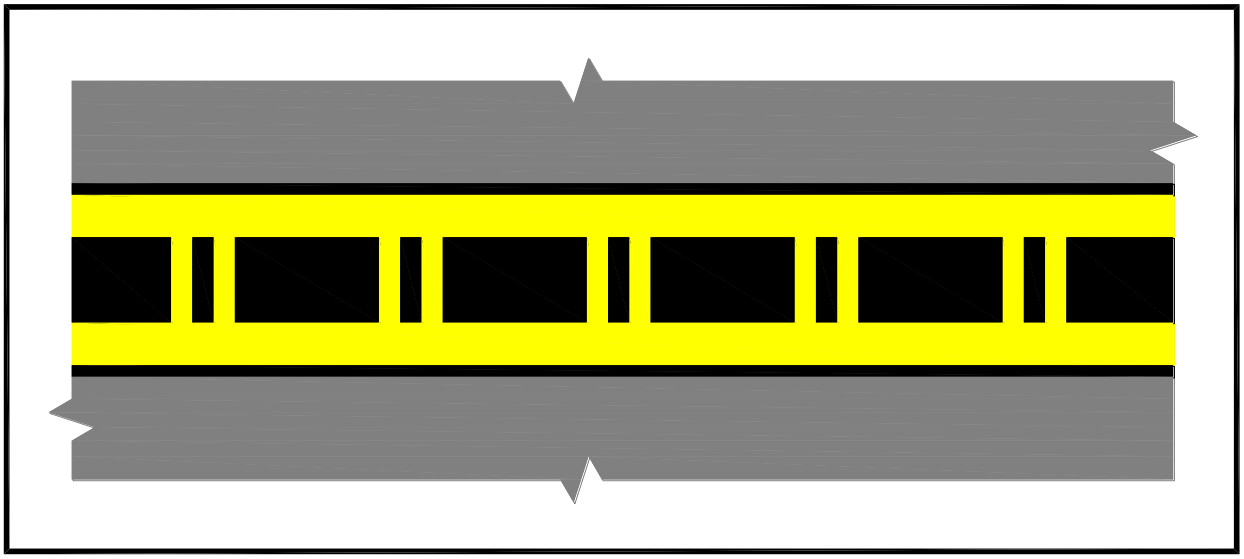


Figure C-2. ILS/MLS holding position marking

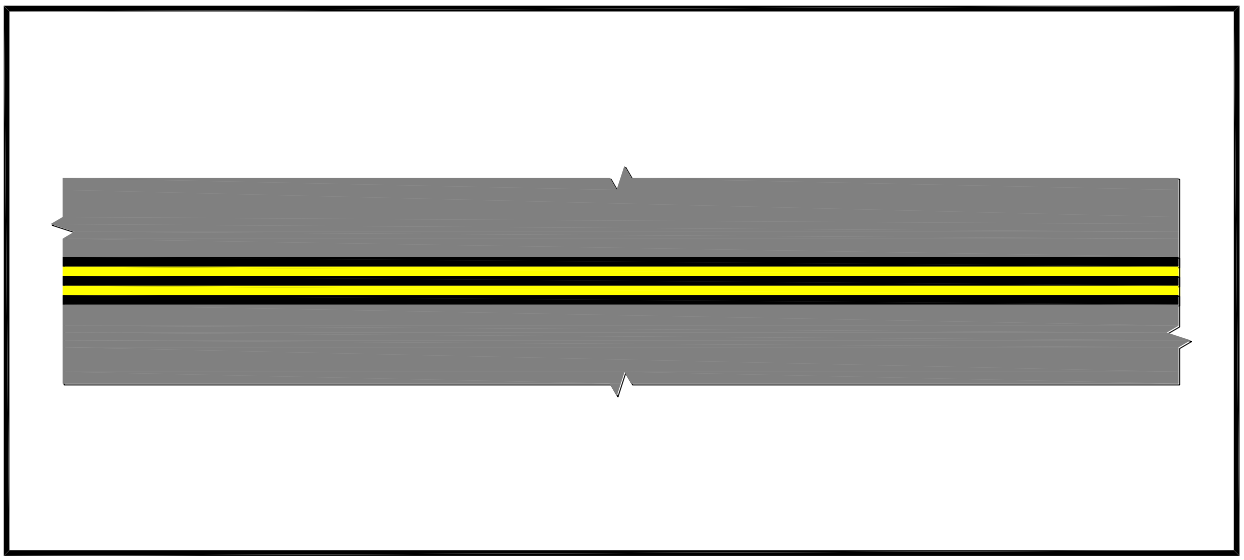


Figure C-3. Continuous taxiway edge line marking

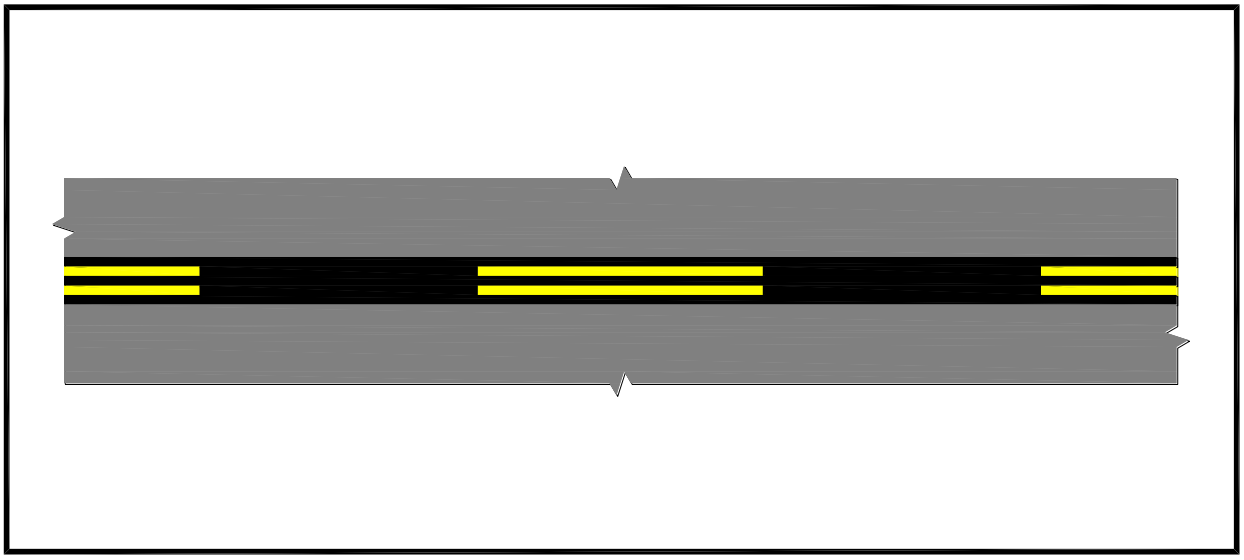


Figure C-4. Dashed taxiway edge line marking

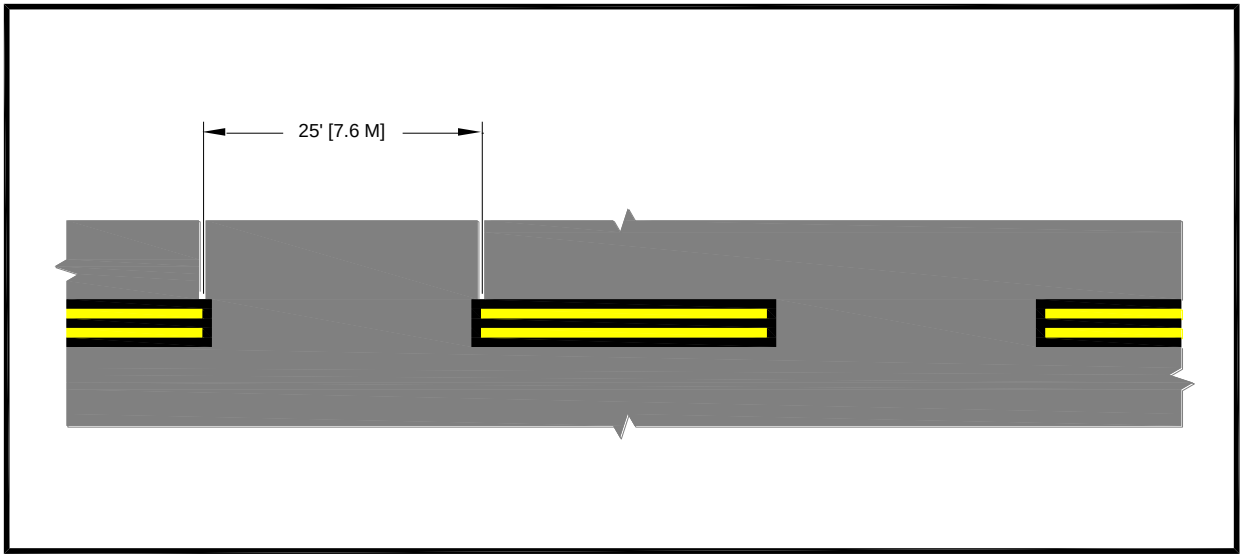


Figure C-5. Alternate outlining method for dashed taxiway edge line marking

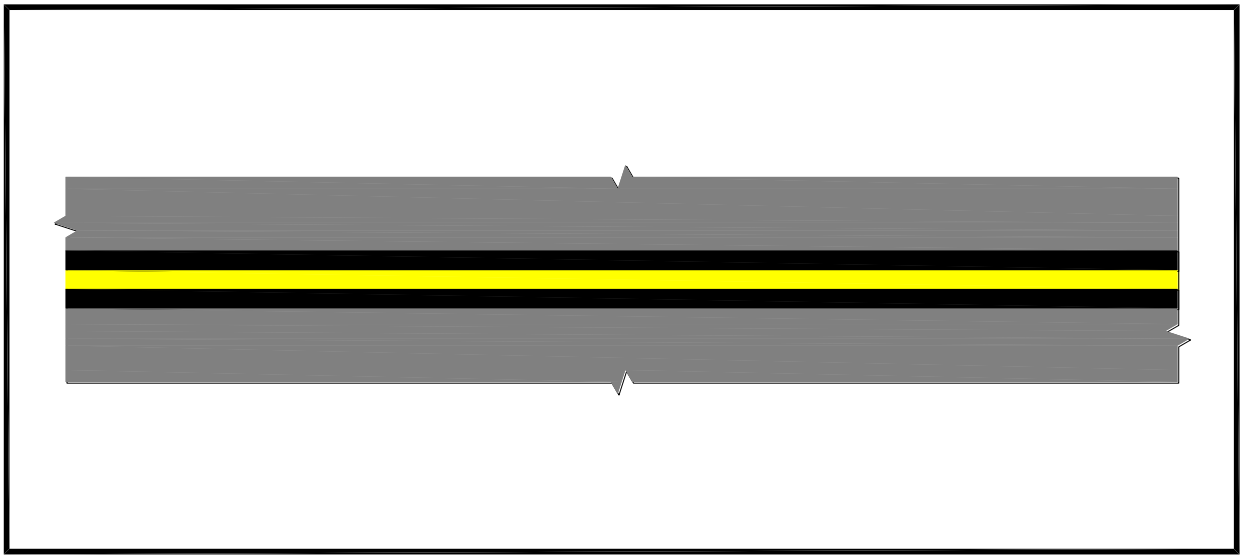


Figure C-6. Taxiway centerline marking

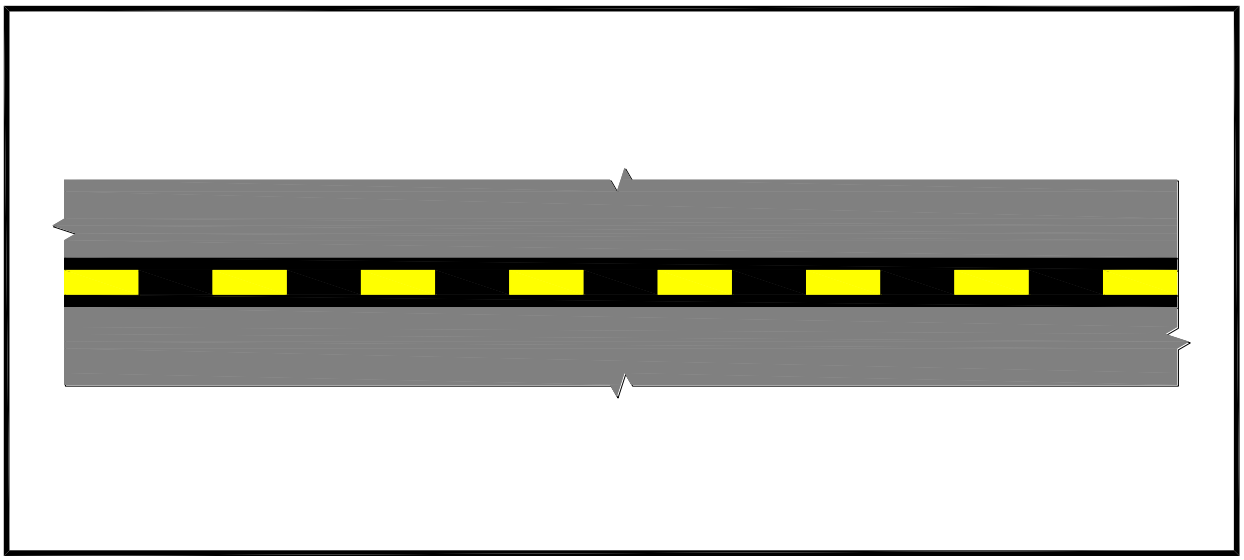


Figure C-7. Intermediate holding position markings

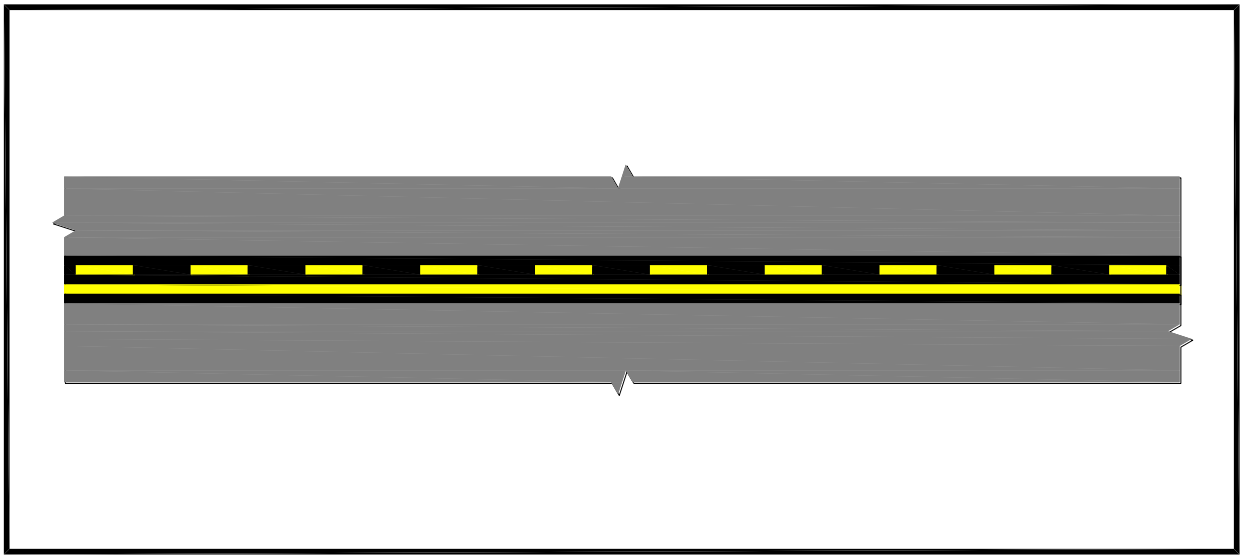


Figure C-8. Non-movement area boundary marking

Appendix D. Enhanced Markings for Runway Holding Position

D-1. General.

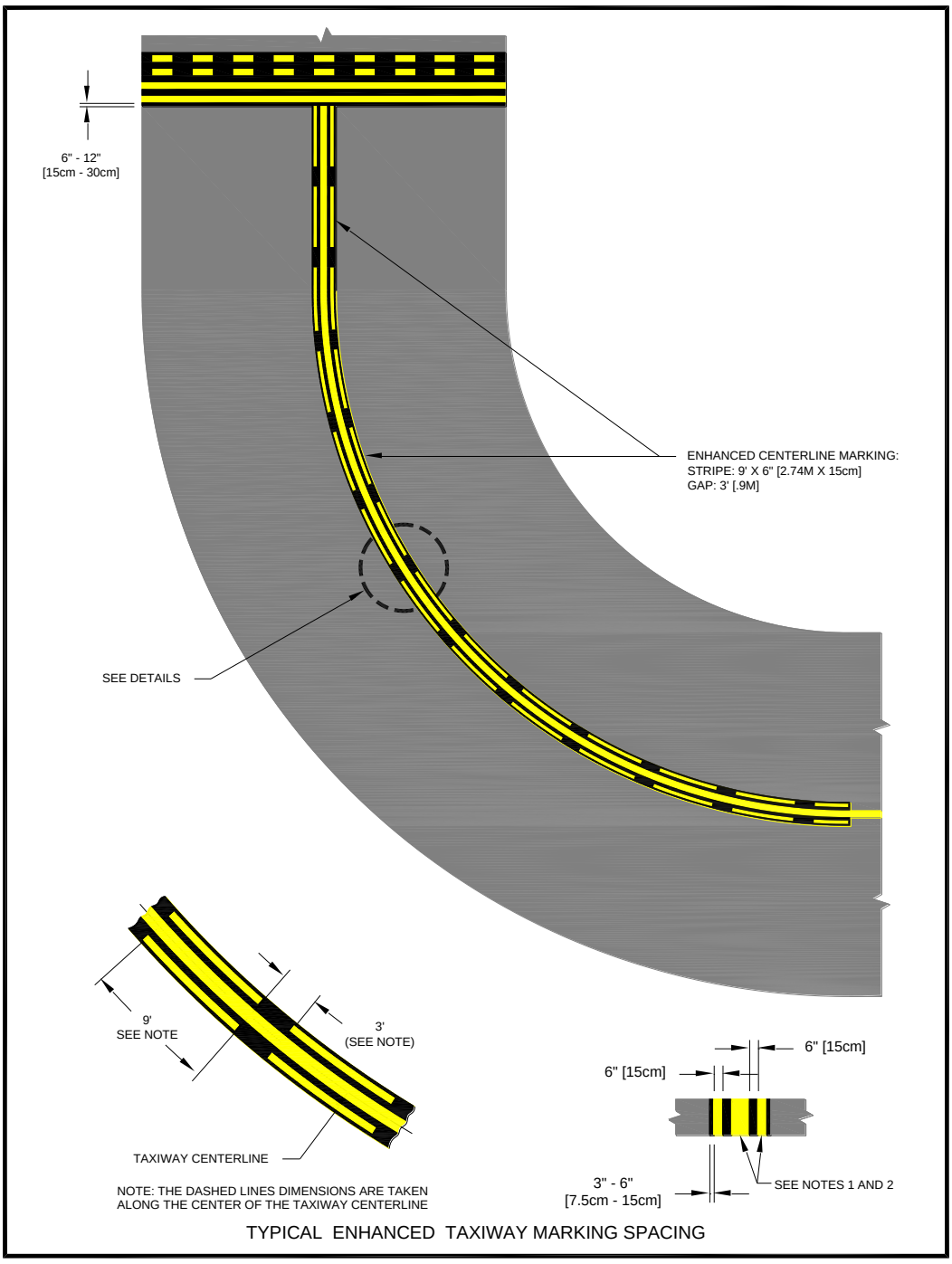
Enhanced taxiway markings are intended to provide additional visual cues to taxiing pilots to help them identify the location of the runway holding position. This appendix provides standards for these enhanced markings and guidance, including examples, on where to use the enhanced markings.

The figures included in this appendix are not drawn to scale.

D-2. Applicability.

The guidelines and standards for enhanced taxiway markings contained in this appendix may be used as a runway incursion prevention initiative. They may be used in combination or separately with existing taxiway markings. However, all intersections at an airport must use the same combination of markings.

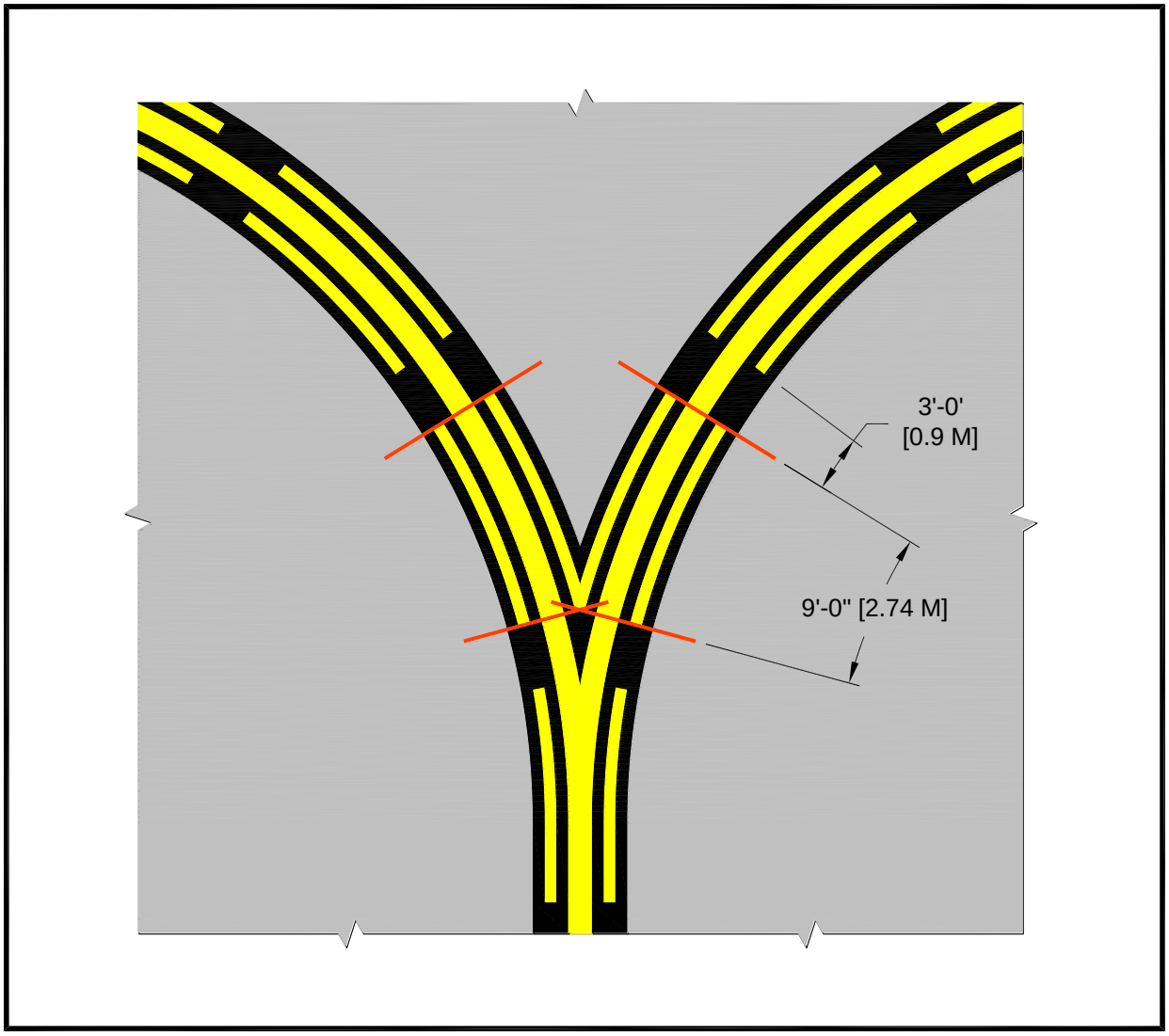
D-3. Enhanced taxiway centerline markings.



Notes:

1. Dashed lines for the enhanced taxiway centerline marking are 6 inches (15cm) in width and separated 6 inches (15 cm) from the taxiway centerline. This applies to both 6 inches (15 cm) and 12 inches (30 cm) taxiway centerline markings.
2. The taxiway centerline markings may be shifted left or right to avoid interference with the taxiway centerline lights.

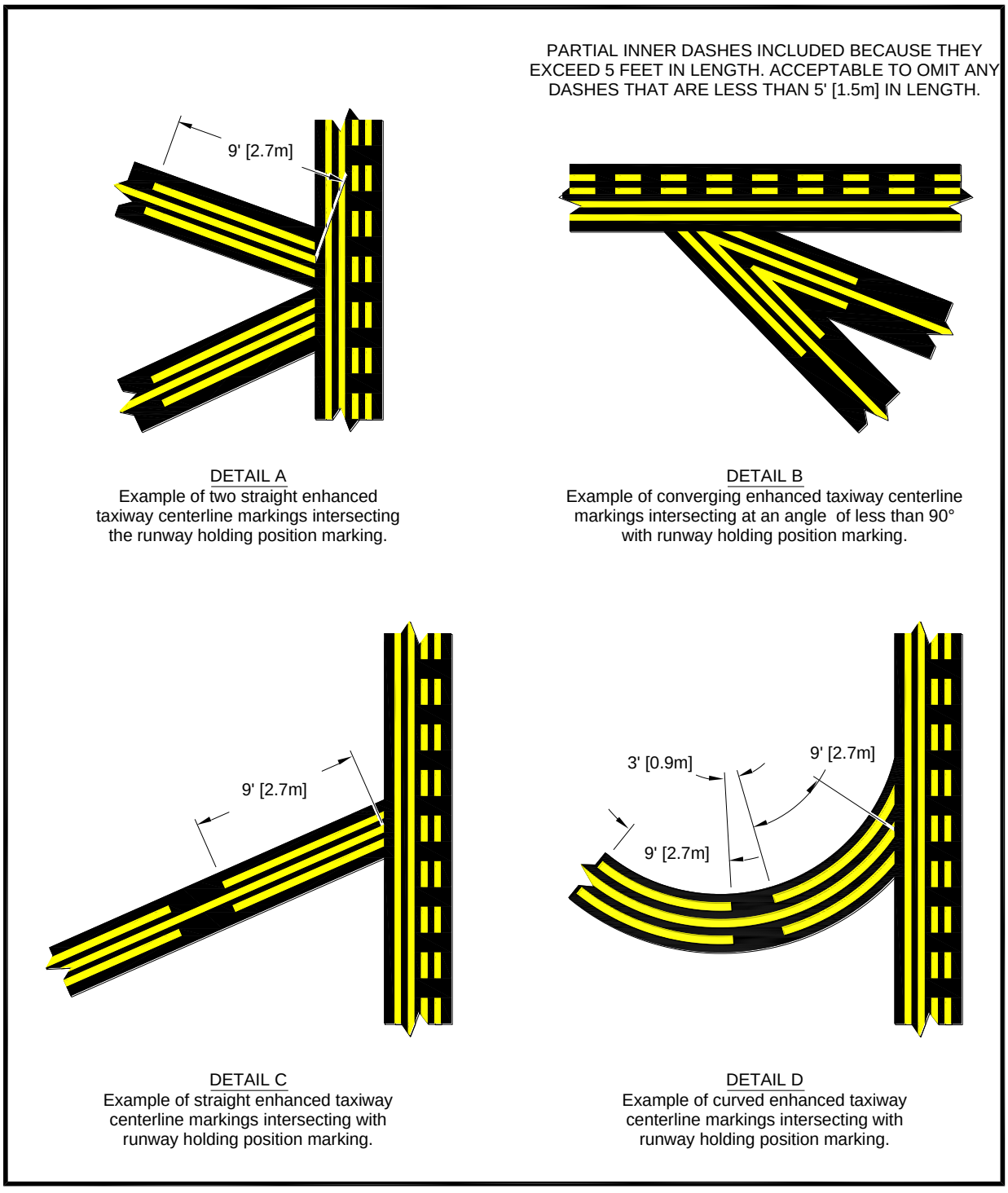
Figure D-1. Enhanced taxiway centerline markings



Notes:

1. As shown in this case the V-shaped inner dashes start and stop with the outside 9-foot (3 m) dashes. - However, this may not always be the case for the inner dashes. If the v-shaped are less than 5 feet (1.5 m) they may be omitted.
2. Measurements are taken along the center of the centerline stripe.

Figure D-2. Dashed lines at converging taxiway centerlines



Note: All measurements are taken along the center of the centerline.

Figure D-3. Converging, straight, and curved enhanced taxiway centerlines intersecting with holding position marking

D-4. Enhanced runway holding position markings.

The enhanced runway holding position marking, applicable only to those taxiway entrances that serve Airplane Design Group (ADG) V or VI airplanes, measures 125 feet (38 m) from one paved shoulder to the other paved shoulder, i.e., 62.5 feet (19 m) from the main taxiway centerline. Figure D-4 illustrates the enhanced surface marking on a standard 75-foot (23-m) wide taxiway with a standard 35-foot (10.5-m) wide taxiway shoulder for TDG-6. For taxiways wider than 75 feet (22.9 m) that connect to the runways that serve ADG V or VI aircraft, the holding position line is extended so it is 25 feet (7.5 m) on both paved taxiway shoulders.

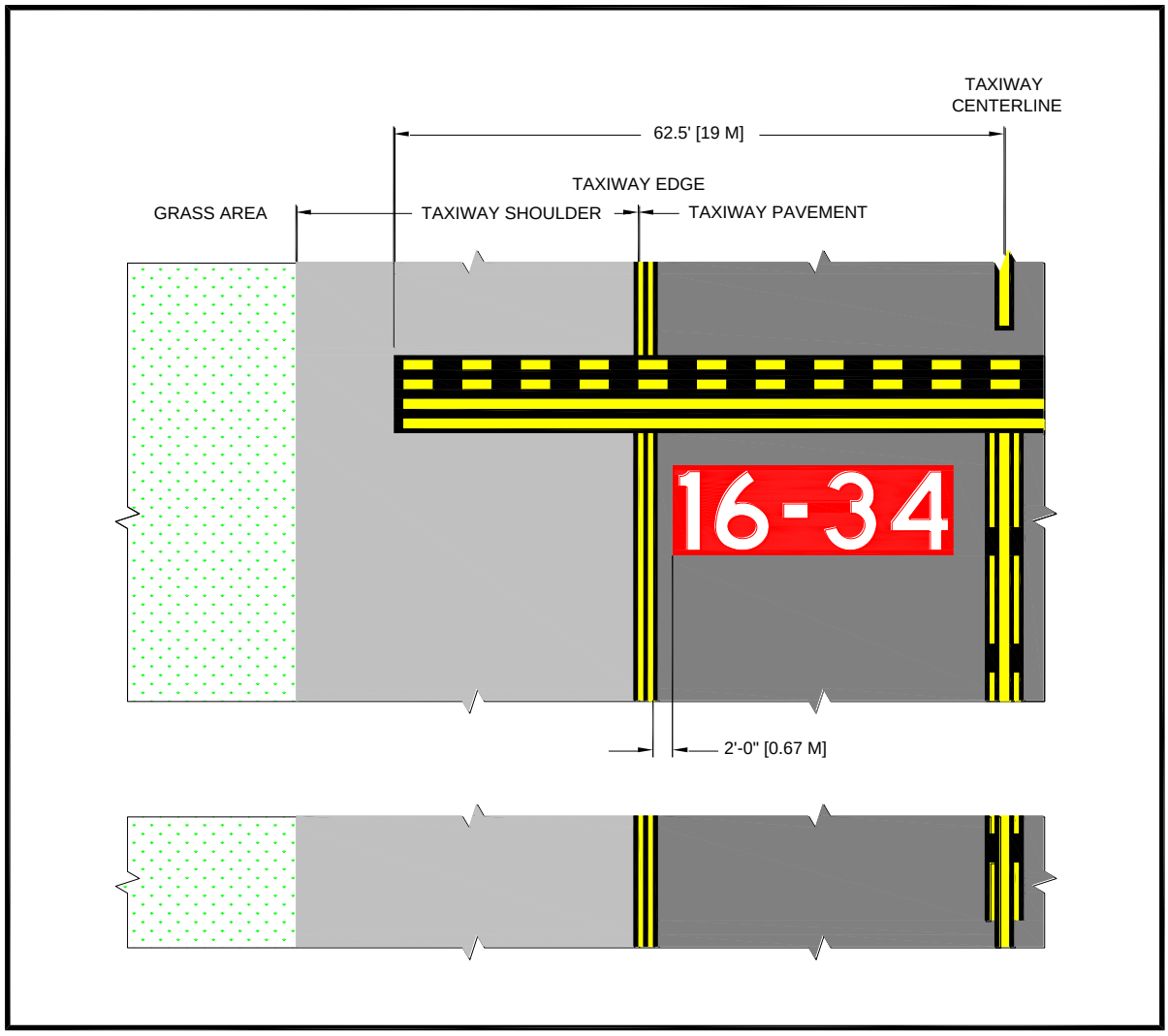


Figure D-4. Enhanced runway holding position markings on taxiways

D-5. Surface painted holding position signs.

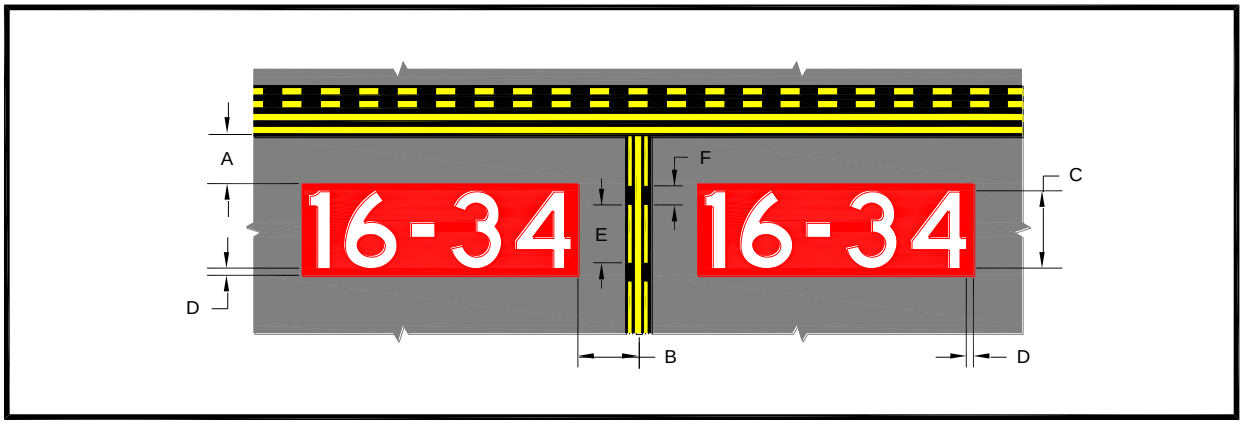


Figure D-5. Surface painted holding position signs for taxiway widths greater than 35 feet (10.5 m)

Table D-1.

Dimension Letter	Dimension feet (meters)	Notes
A	2 – 4 (0.67 – 1.34)	
B	3 – 10 (0.91 – 3.0)	
C	9 – 12 (2.75 – 3.7)	Inscriptions must have a height of 12 feet (3.7 m); however, the height may be reduced, as necessary, to the minimum height of 9 feet (2.75 m). In special situations, the surface painted marking may be reduced to less than 9 feet (2.75 m) in order to fit the marking appropriately. Examples of special situations include taxiways with widths narrower than 75 feet (22.9 m) or taxiways that need to display multiple runway designations with arrows. In all cases, inscriptions follow Appendix B inscription criteria. All other taxiway entrances to the same runway not needing the reduction are to maintain the 12 foot (3.7 m) height dimension. For practicality, the lowest height reduction is 6 feet (1.8 m). In all cases, the dimension D is not reduced.
D	15 inches (38 cm)	
E	9 (2.75)	
F	3 (0.91)	

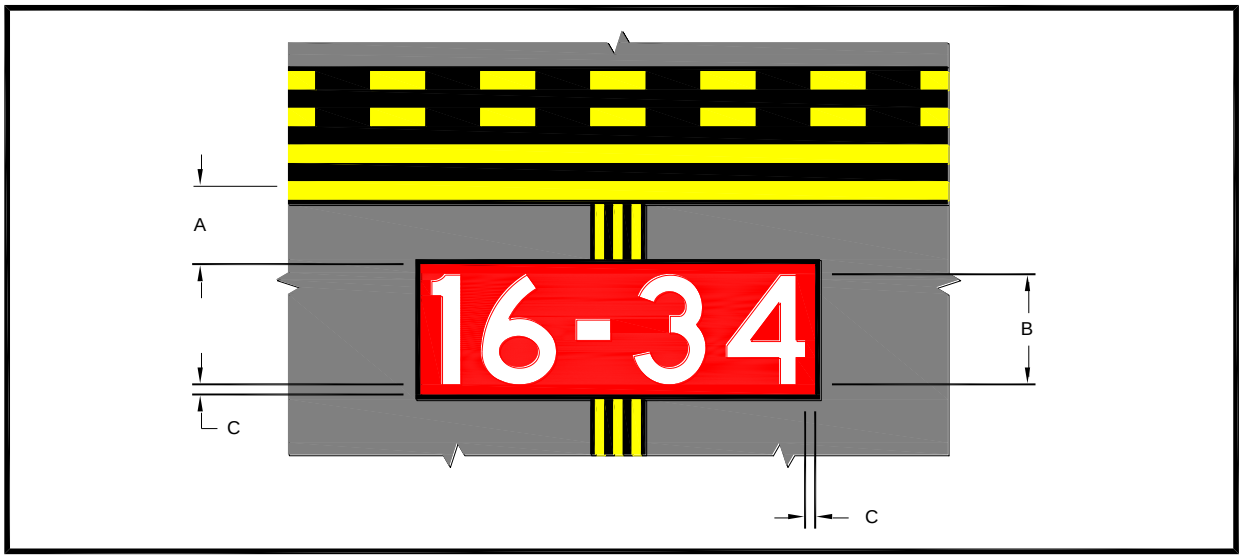


Figure D-6. Surface painted holding position sign for taxiway widths equal to or less than 35 feet (10.5 m)

Table D-2.

Dimension Letter	Dimension feet (meters)	Notes
A	2 – 3 (0.67 – 0.91)	
B	6 (1.8)	Inscriptions follow Appendix B inscription criteria. The size of the sign inscription is scaled to fit taxiways 35 feet (10.5 m) or less in width for TDG-1A, TDG-1B, and TDG-2. Reference AC 150/5300-13. In special situations, the surface marking may be reduced to less than 6 feet (1.8 m) in order to fit the marking appropriately. Examples of special situations include taxiways that need to display multiple runway designations with arrows. In all cases, the inscriptions follow Appendix B inscription criteria. All other taxiway entrances to the same runway not needing the reduction are to maintain the 6-foot (1.8-m) height dimension. For practicality, the lowest height reduction is 3 feet (0.91 m).
C	7.5 in (19 cm)	
NOTE		The dimensions for the enhanced taxiway centerline are in Figure D-1. The spacing between the enhanced taxiway centerline and the surface painted holding position sign is 6 -12 inches (15 – 30 cm) see Figure D-1.

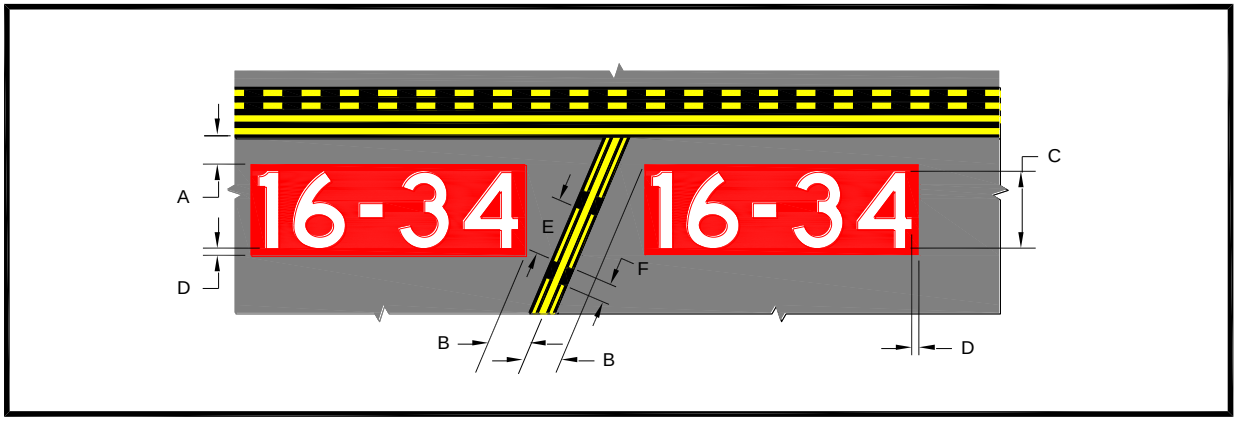


Figure D-7. Surface painted holding position signs when taxiway centerline is not perpendicular to runway holding position marking

Table D-3.

Dimension Letter	Dimension feet (meters)	Notes
A	2 – 4 (0.67 – 1.34)	
B	3 – 10 (0.91 – 3.0)	
C	9 – 12 (2.75 – 3.7)	Inscriptions must have a height of 12 feet (3.7 m); however, the height may be reduced, as necessary, to the minimum height of 9 feet (2.75 m). In special situations, the surface painted marking may be reduced to less than 9 feet (2.75 m) in order to fit the marking appropriately. Examples of special situations include taxiways with widths narrower than 75 feet (22.9 m) or taxiways that need to display multiple runway designations with arrows. In all cases, inscriptions follow Appendix B inscription criteria. All other taxiway entrances to the same runway not needing the reduction are to maintain the 12-foot (3.7-m) height dimension. For practicality, the lowest height reduction is 6 feet (1.8 m). In all cases, the dimension D is not reduced.
D	15 inches (38 cm)	
E	9 (2.75)	
F	3 (0.91)	

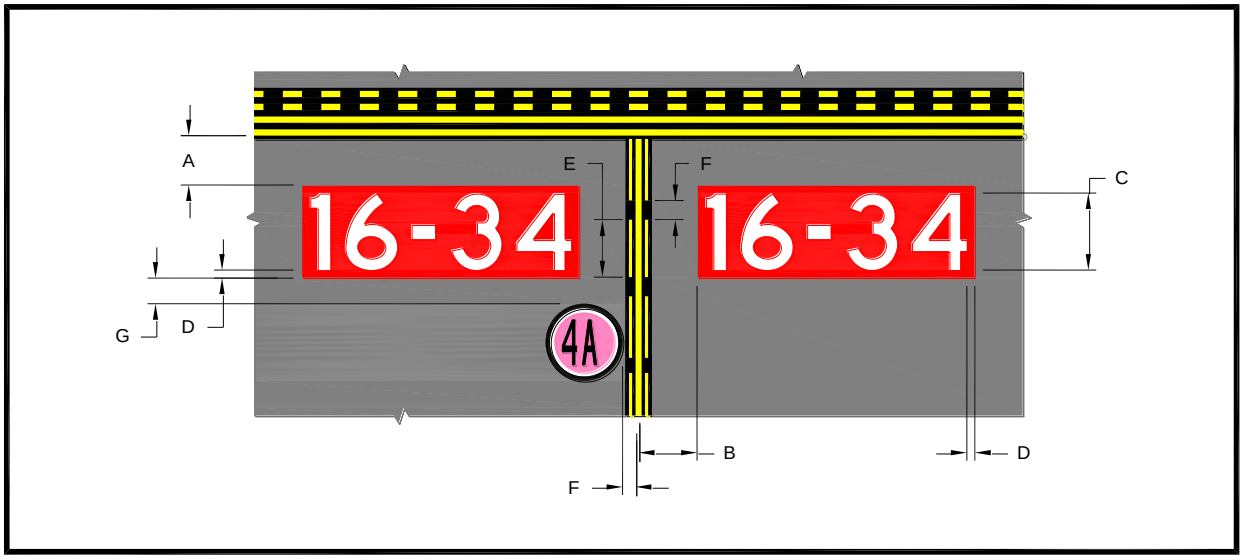


Figure D-8. Surface painted holding position signs co-located with geographic position marking

Table D-4.

Dimension Letter	Dimension feet (meters)	Notes
A	2 – 4 (0.67 – 1.34)	
B	3 – 10 (0.91 – 3.0)	
C	9 – 12 (2.75 – 3.7)	Inscriptions must have a height of 12 feet (3.7 m); however, the height may be reduced, as necessary, to the minimum height of 9 feet (2.75 m). In special situations, the surface painted marking may be reduced to less than 9 feet (2.75 m) in order to fit the marking appropriately. Examples include taxiways with widths narrower than 75 feet (22.9 m) or taxiways that need to display multiple runway designations with arrows. In all cases, the inscriptions follow Appendix B inscription criteria. All other taxiway entrances to the same runway not needing the reduction are to maintain the 12-foot (3.7-m) height dimension. For practicality, the lowest height reduction is 6 feet (1.8 m). In all cases, the dimension D is not reduced.
D	15 inches (38 cm)	
E	9 (2.75)	
F	3 (0.91)	
G	4 (1.3)	From edge of red border
H	2 (0.65)	From outermost edge of main yellow taxiway centerline

Note: Because the geographic position marking cannot be located at a runway holding position for the low-visibility runway (see paragraph 4.11), this figure applies only where the designated taxi route for low-visibility operations crosses a runway that is not itself the low-visibility runway.

D-6. Additional guidelines for application.

The following illustrations provide examples of various runway holding position locations using the enhanced markings. The figures included in this appendix are not drawn to scale.

a. Two Taxiway Centerlines Converging at a Runway Holding Position Marking. Where two taxiway centerlines converge at a runway holding position marking, the surface painted holding position signs must be installed parallel to the runway holding position marking. As shown in Figure D-9, only one sign on either side of the two taxiway centerlines is practical.

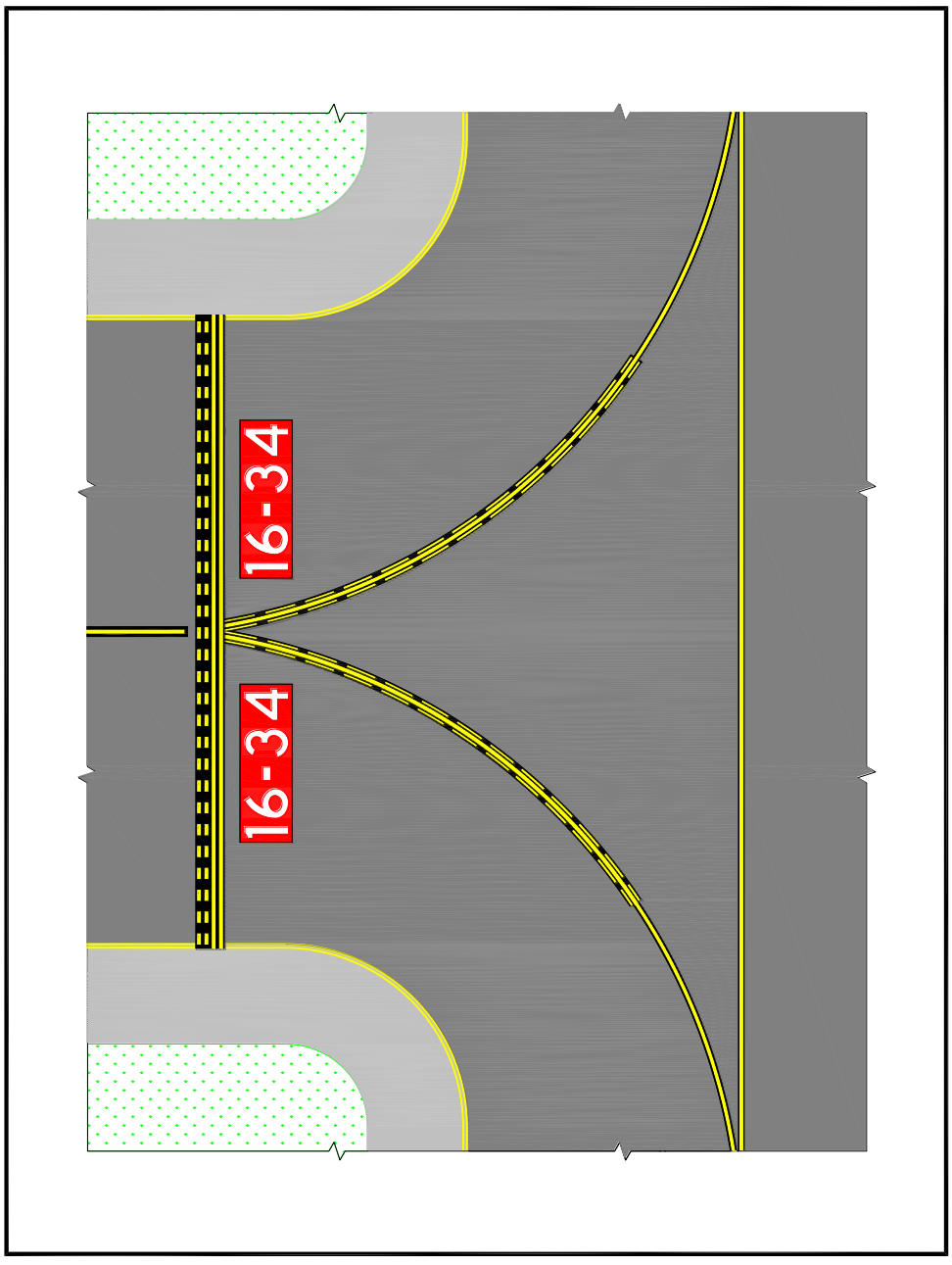


Figure D-9. Two taxiway centerlines converging at a runway holding position marking

b. Intersection of Two Taxiways at Runway End. In the case of two converging taxiway centerlines, surface painted holding position signs containing a single runway designator must be positioned parallel to the runway holding position marking, as shown in Figure D-10.

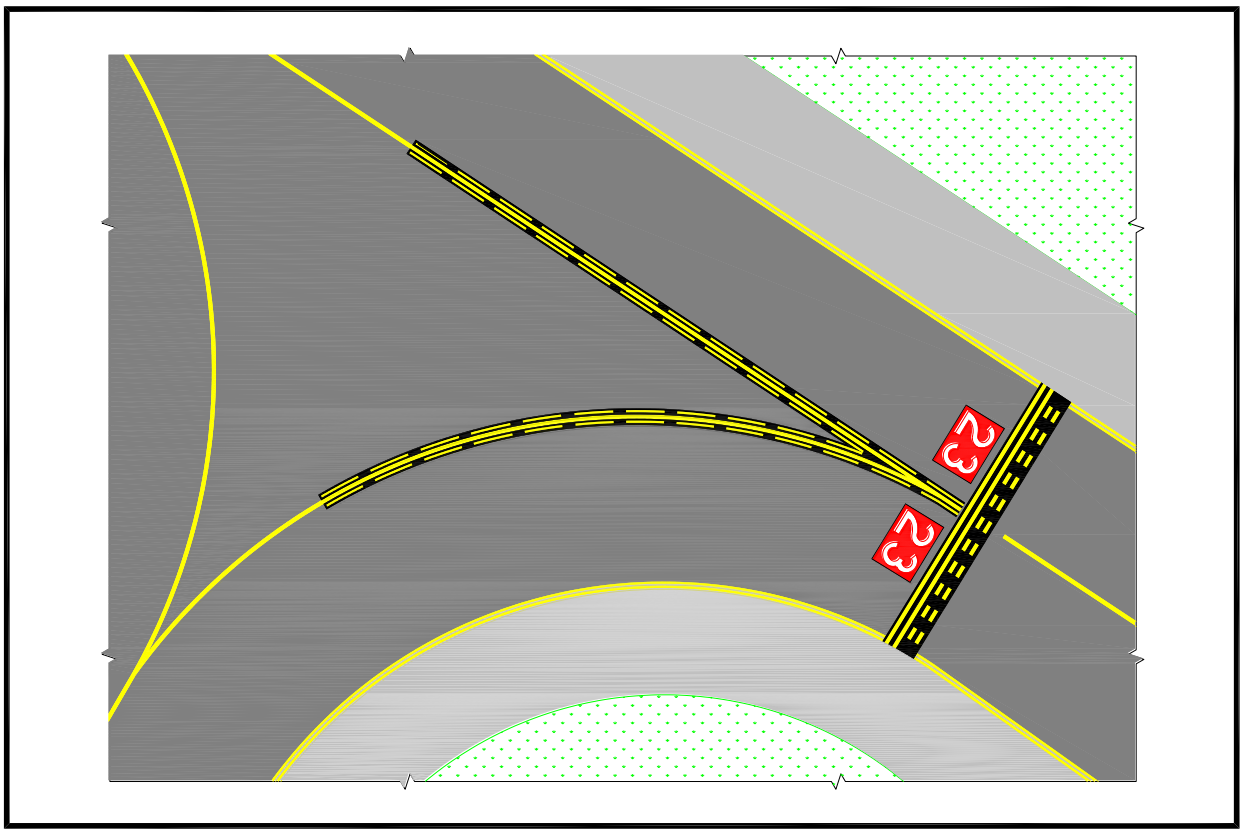
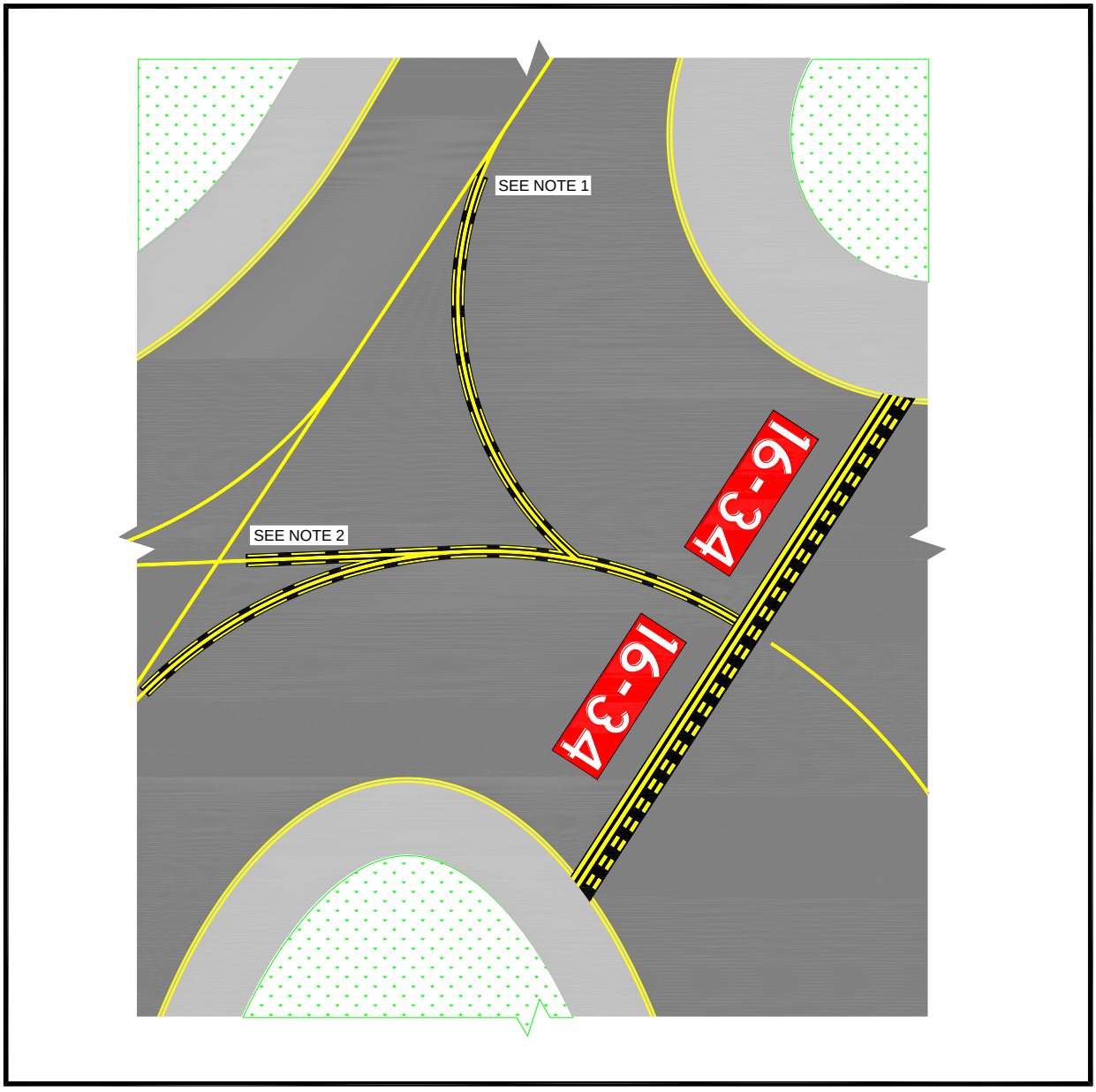


Figure D-10. Intersection of two taxiways at runway end

c. Intersection of Three Converging Taxiway Centerlines. Figure D-11 illustrates taxiway centerline configurations when there are three converging centerlines.

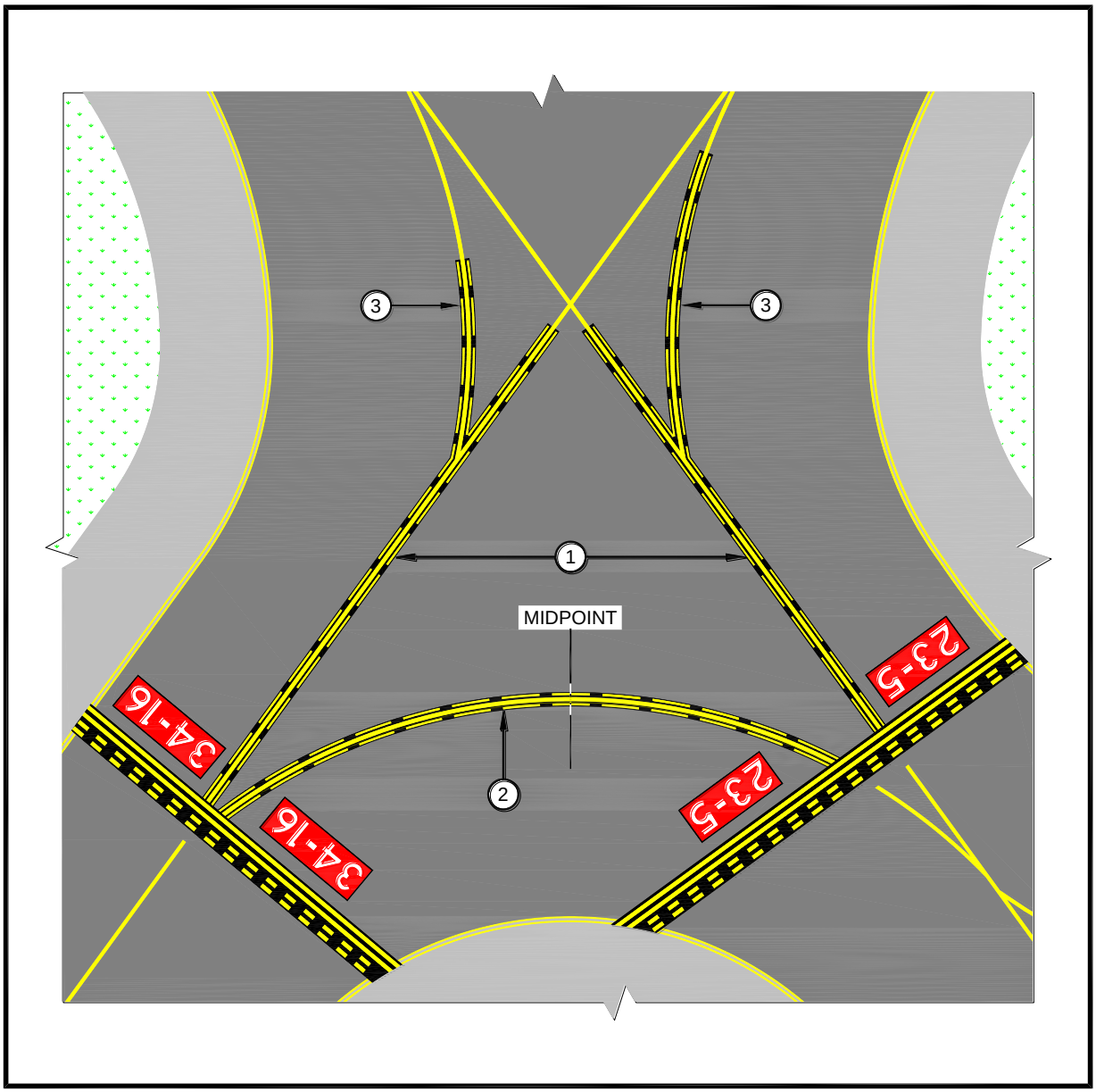


Notes:

1. Enhancement is tangent to merging curve.
2. Enhancement terminates 5 feet (1.5 m) from intersection.

Figure D-11. Intersection of three converging taxiway centerlines

d. Intersection of Multi-Taxiway Centerlines with Less than 150 Feet (45.7 m) Between Taxiways. Figure D-12 illustrates different taxiway centerline configurations when there are three converging centerlines, less than 150 feet (45.7 m) between the runway holding position markings, and potential difficulty in positioning surface painted holding position signs in the available space.



Notes:

1. Illustrates perpendicular taxiway centerlines less than 150 feet (45.7 m) (see paragraph 4.3.d).
2. Illustrates a curved taxiway centerline between two runway holding position markings with less than 150 feet (45.7 m) along the taxiway centerline (see paragraph 4.3.d).
3. Illustrates a converging taxiway centerline curving toward two runway holding positions.

Figure D-12. Intersection of multi-taxiway centerlines with less than 150 feet (45.7 m) between taxiways

e. Two Taxiway Centerlines Intersecting a Runway Holding Position Marking. Figure D-13 illustrates an angled runway holding position marking that is intersected by two taxiway centerlines.

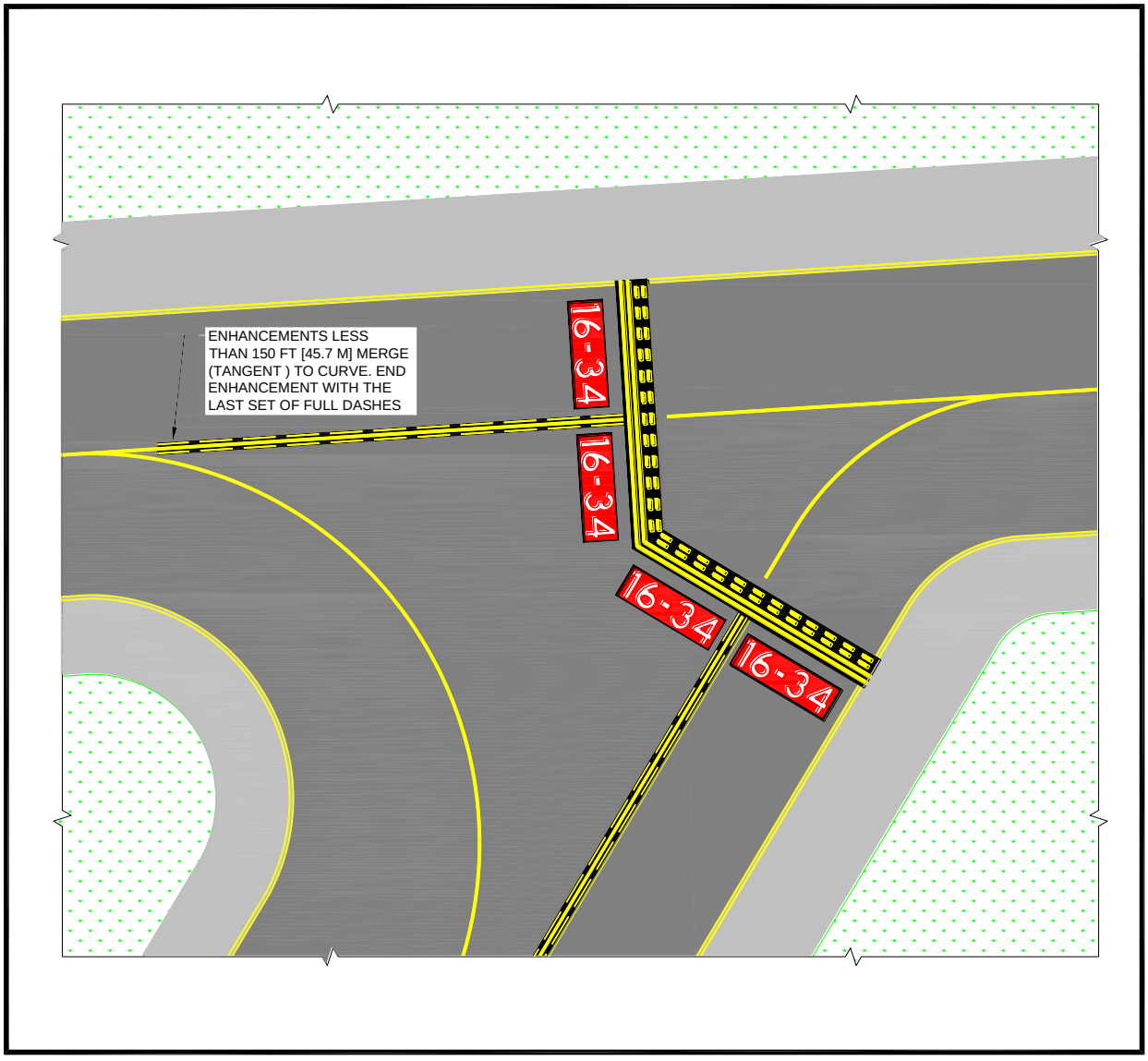


Figure D-13. Two taxiway centerlines intersecting a runway holding position marking

f. Intersection of Stub Taxiway and Runway. Figure D-14 illustrates a solution for a stub taxiway that is less than 150 feet (45.7 m) long, with a 90-degree turn and angled taxiway shoulder areas. Per paragraph 4.3.d, the enhancement terminates 5 feet (1.5 m) from a taxiway/taxiway intersection.

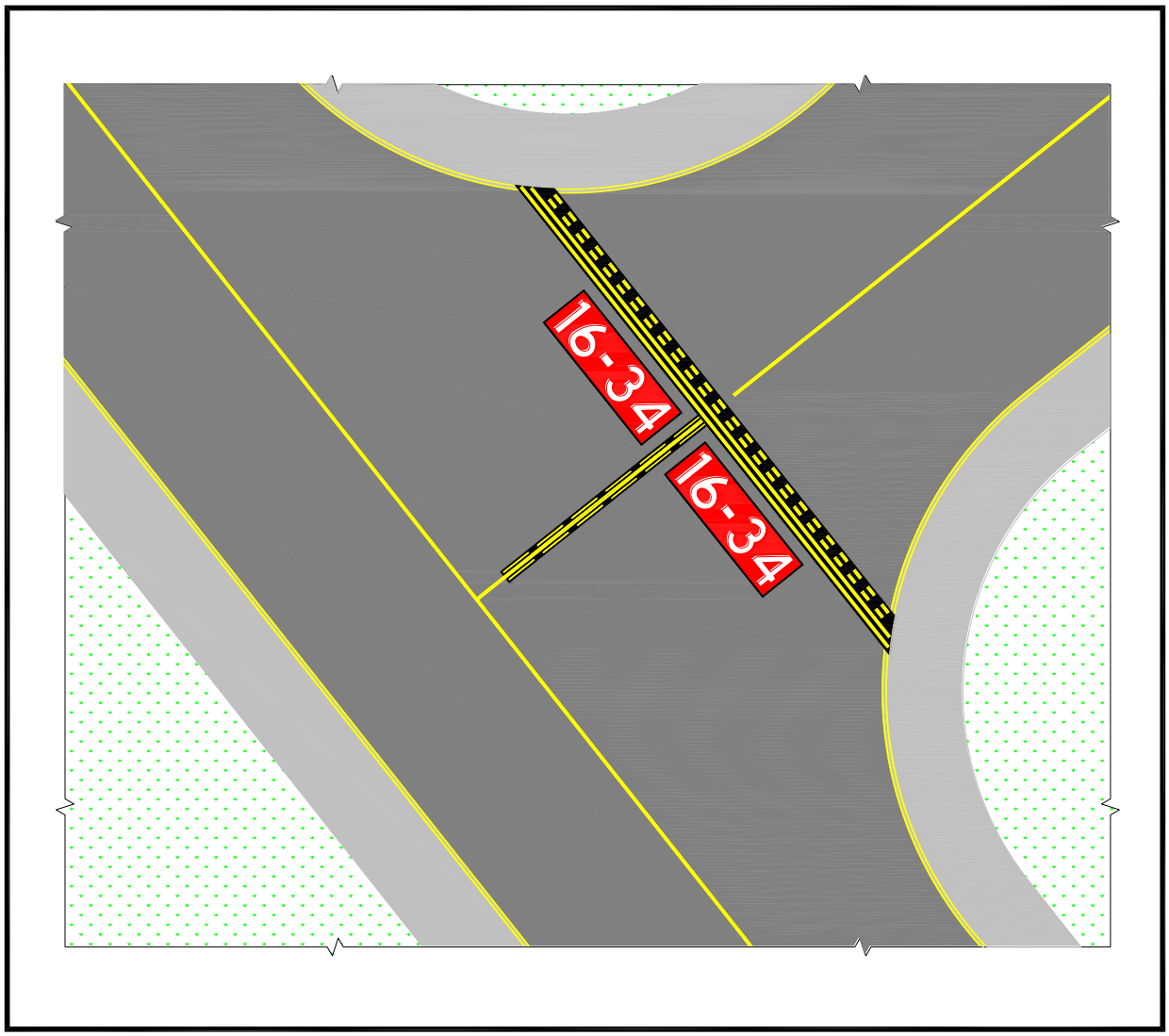
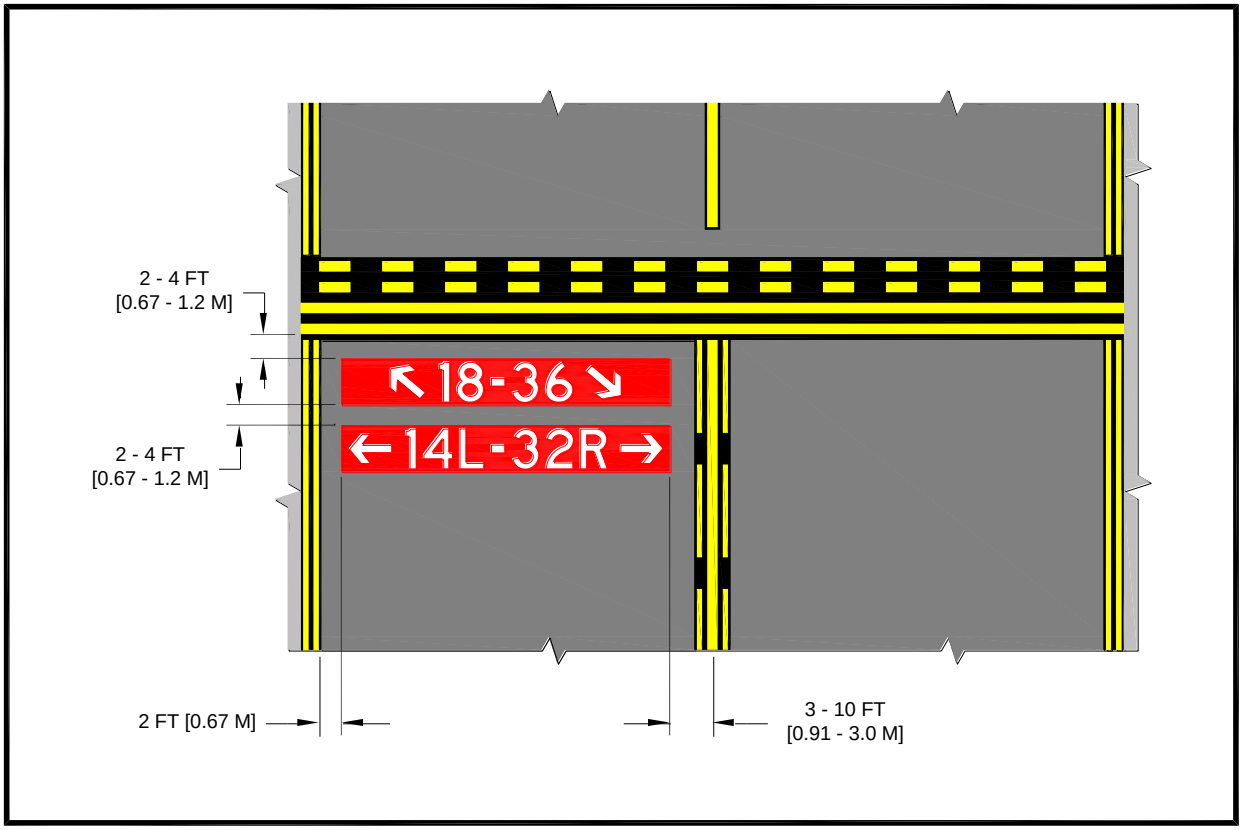


Figure D-14. Intersection of stub taxiway and runway



Notes:

1. Stacked surface painted holding position signs for narrow taxiways - only to be used per paragraph 4.5.d(1)(ii).
2. The recommended order of appearance follows:
   a. If the "stacked" surface painted holding position signs are for a taxiway that clearly accesses one runway (for example, RWY 14L-32R) before another runway (RWY 18-36), then the order of appearance is from "bottom up" as shown above.
   b. If the "stacked" surface painted holding position signs are for a taxiway that equally offers access to two or more runways, then follow a "clockwise" order of appearance as viewed for the holding position. Hence, the bottom surface painted holding position sign is the first runway as viewed from the holding position. This practice follows the signage convention.
3. For taxiways less than or equal to 35' wide, the stacked surface painted holding position signs are located centered on the taxiway in accordance with Figure D-6.

Figure D-15. Narrow taxiway stacked surface painted holding position sign

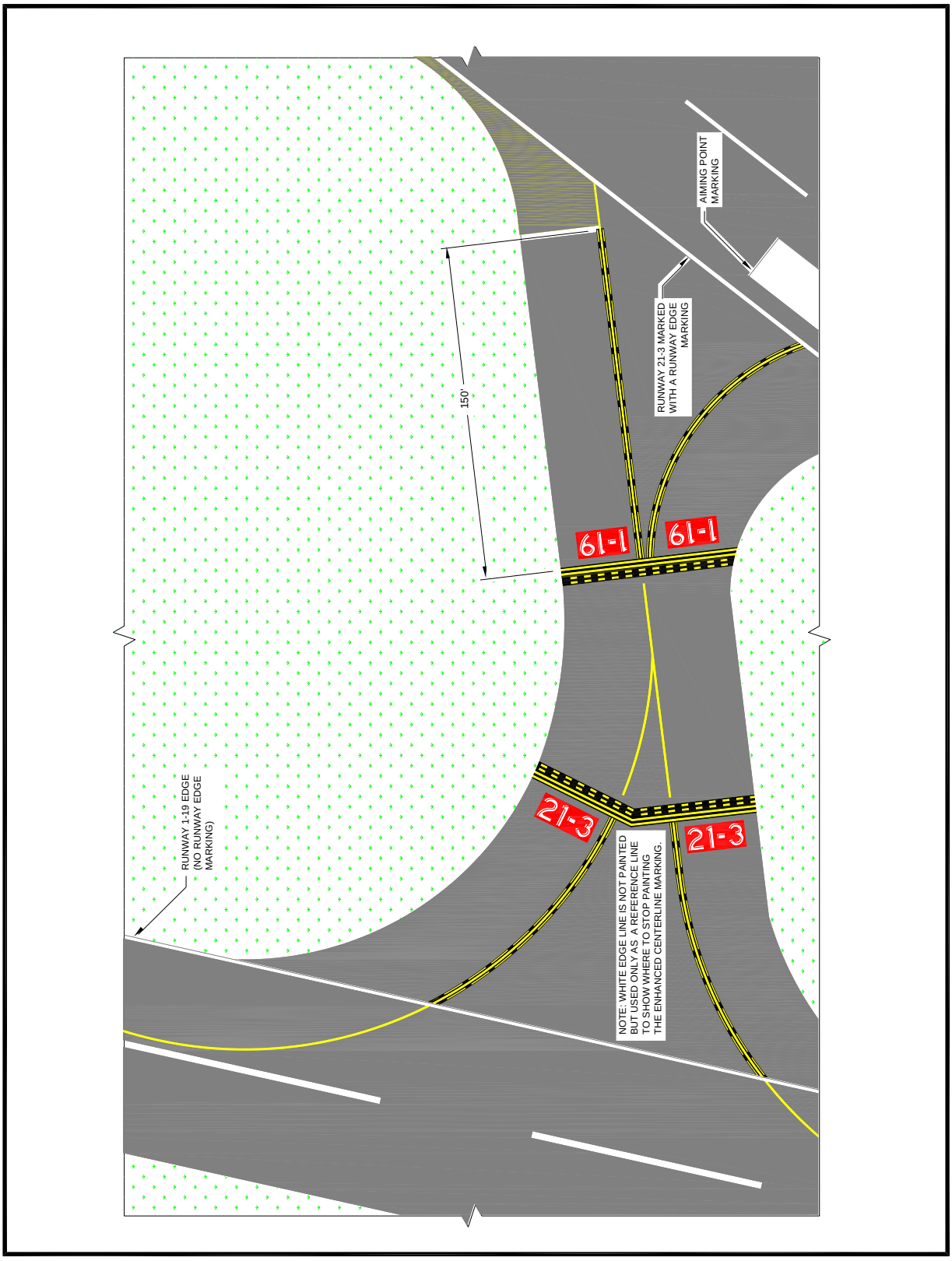


Figure D-16. Enhanced taxiway centerlines when a taxiway connects closely spaced runways

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