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Driving Indiana's Economic Growth

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Eric Holcomb, Governor
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DATE: February 11, 2022

OPERATIONS MEMORANDUM 22-01
LIGHTING

TO: District Deputy Commissioners
District Capital Program Management Directors
District Technical Services Directors
District Traffic Engineers

FROM: Daniel P. McCoy
Director, Traffic Engineering Division

SUBJECT: INDOT Roadway Lighting Policy

Table of Contents

This memorandum provides a policy on lighting needs and responsibilities. It contains changes in agency practice that will 1) provide a safer, better operating nighttime driving environment for motorists and 2) enhance use of our highways for pedestrians and bicyclists. In so doing, this revised policy also promotes equity in transportation by increasing INDOTs commitment to lighting in rural and urban areas. This policy is effective as of the date of issue and replaces content on the same subject found in the Indiana Design Manual, sections 502-4.01(3), 502-4.01(04), and 502-4.02.

I References

A. TRB, NCHRP Report No. 152, *Warrants for Highway Lighting*;
B. TRB, NCHRP Report No. 256, *Partial Lighting of Interchanges*
C. TRB, NCHRP Report No. 672, *Roundabouts: An Informational Guide, 2nd edition*

NCHRP Report 152, Highway Lighting Warrants may be used for a thorough methodology to determine need for lighting on existing non-freeway facilities.

II State and Local Responsibilities

The following describes the responsibilities shared between the Department and a local public agency for a lighting installation along a state-maintained highway.

A. INDOT Jurisdiction. The Department may illuminate a portion of a state, U.S., or interstate highway whether inside or outside incorporated city or town limits consistent with the policy and warranting conditions provided herein.

   Within incorporated limits INDOT will provide all illumination that is needed as follows:

   1. on interstate and other freeway routes including the intersecting roadway at the interchange (see Section III);

   2. at roundabouts or other types of intersections on state and U.S. highways (Section IV);

      INDOT will provide and assume operational responsibility for lighting at a roundabout and on its approaches with the following exceptions.

      While INDOT does not normally provide lighting for the exiting lanes, the local agency may request such lighting. The local agency will enter into an agreement with INDOT stipulating that it will provide funding for the additional installation costs. INDOT will provide maintenance.

      If the local agency requests decorative poles, decorative fixtures, or an alternative lighting technology such as plasma, induction, etc., it will enter into an agreement to reimburse INDOT for additional installation costs and to assume energy costs and maintenance responsibilities for the life of the system.

   3. on non-freeway state and U.S. highways where needed for safety and not provided by the local agency (Section V).

B. Local Jurisdiction. A local public agency may install lighting along a state highway within its jurisdictional limits provided the agency finds sufficient benefit in the form of convenience, safety, policing, community promotion, public relations, etc. The local agency will develop appropriate warranting guidelines for installing lighting. If the city or town has not developed warrants, the Department warrants described herein should be considered. The local agency will be responsible for installing, maintaining, and operating the lighting facilities. The plans for lighting a state highway within local jurisdictional limits must satisfy Department criteria and must receive INDOT approval through a formal contract prior to installation. The plans and specifications should be submitted for review to the Traffic Engineering Division, Office of Traffic Design.

A federally funded, local agency project with decorative lighting structures or other non-standard lighting equipment that has not received proprietary-item approval will require full funding by the local agency. Prior to contract document submission, the local agency must enter into a fully executed contract with the Department for the non-participating pay items.

Lighting designed by or on behalf of a local agency for a project on the state system must meet INDOTs design criteria for light levels and for roadway departure safety. Plans including those submitted under a permit application must be signed and sealed by an Indiana registered professional engineer, see Permits Operation Memo 16-03.

C. Installation. Installation by the Department will be done under the Department's programming and contracting procedures. The installation, however, may be performed through a contract with a utility company.

D. Operation. For each location where the Department is responsible for paying the energy costs, a contract must be negotiated between the local utility company and the Department for payment for the electrical current. The current should be metered. All bills should be submitted to the district office.

E. Maintenance. Maintenance of a department lighting system may be furnished by contract with a local utility company, by a qualified lighting contractor, or by trained INDOT personnel.

F Contract. A contract for a department lighting system should be prepared according to INDOT contract policy. According to Indiana Code, IC 8-23-22-2, the Department is required to enter into a contract when sharing the installation, utility, and/or maintenance costs with a local agency.

G. Local Agency requested Special Features/Equipment. For a lighting system on the state highway system installed through an INDOT contract, special features or non-standard INDOT

equipment (e.g., decorative poles, luminaires) may be provided but the local agency will be required to pay for any additional costs and pending the nature of the request may need to enter into a contract to provide on-going maintenance or provide replacement equipment that is non INDOT standard.

H. Existing System. Where a contract between INDOT and a local agency on maintenance and operation of an existing lighting system along a state-maintained highway cannot be resolved, the following will apply.

1. If a system installed by the Department is annexed into city or town corporate limits and the local agency does not agree to take over the maintenance and operation costs, the system should be considered for removal if the lighting is not warranted, i.e., if it is not prescribed by agency policy and if a cost analysis shows such action to be cost effective. A removal study as defined in Section VII should be conducted.

2. If the system was installed by the local agency and the local agency is no longer willing to pay for the operation and maintenance costs, INDOT will determine if the system is warranted. If it is warranted, the Department may take over the responsibilities for maintaining and operating the system. If the system is not warranted, the local agency can be requested to remove the system. If the local agency will not remove the system, the Department may remove it as described in Section VII.

3. If the system was installed in accordance with a contract entered into between the Department and the local governmental agency, and the agency is no longer abiding by the stipulations of the contract, the Department may conduct a study to determine if the system is warranted. If continuation of the system is not determined to be cost effective, INDOT may remove it as described in Section VII.

I. Other Construction Project. Where a proposed project, e.g., roadway reconstruction, is within city or town incorporation limits, the following will apply relative to lighting.

1. If the existing lighting system is owned by the local agency and the project requires the system to be relocated, INDOT will be responsible for all relocation expenses.

2. If the existing lighting system is owned by a utility company and the project requires the system to be relocated, the utility company will be responsible for all relocation expenses.

3. If there is no existing lighting and INDOT is not providing lighting based on policy (see Sections III - V) or site-specific study and lighting is requested by the local agency, INDOT will include the lighting system in the project if the local agency agrees to pay for all

installation costs and will assume responsibility for the operation and maintenance of the system unless the location is listed in item A.

4. If the existing luminaire arms are mounted on utility company poles and the lighting hardware is owned by the local agency, INDOT will be responsible only for the relocation expenses associated with the lighting hardware, if requested by the local agency. No upgrades in the existing lighting are accomplished under this option.

III Lighting of Freeways and Grade Separated Expressways

As an element of new interchange construction or interchange modification at minimum partial lighting will be provided at all interchanges, whether urban or rural. This promotes safe nighttime travel and enhances ITS camera function. Full interchange lighting is required where 1) continuous lighting is present on at least one side of the interchange or 2) there are at least three lanes in each direction of travel. Lighting design models should be generated as full interchange lighting even if the project is providing only partial. In this way future expansion of the lighting can be accommodated.

As an element of a new construction, 4R, or added travel lanes project continuous lighting will be provided on segments with more than 6 continuous lanes for the combination of both directions of travel. Other freeway and grade separated expressway lighting may be provided based on study - see section VI.

IV Lighting at Intersections

A. Roundabouts. As part of a new construction or modernization project lighting will be provided at a roundabout. The lighting of a roundabout should be in accordance with the AASHTO *Roadway Lighting Design Guide* and NCHRP *Report 672*. Lighting at the roundabout should include the central circulatory roadway and extend at least 400 ft from the circulatory roadway along all approaches. Lighting on the approaches should also extend through any pedestrian crosswalks and/or splitter islands. The remaining limits of the intersection can be delineated with RPM's or by other methods (see page 14).

B. Other intersection types requiring full lighting. As part of a new construction or improvement projects INDOT will provide full lighting at any intersection on the state highway system that is a Displaced Left, Jughandle, or Green T. Transition light levels should be provided at intersections in a segment without continuous lighting. See the figures on pages 15 - 17 for typical lighting coverage area. Lighting promotes safe navigation at night, particularly for movements that are unusual or at conflict points.

C. Intersection types requiring partial lighting. As part of a new construction or improvement projects INDOT will provide partial lighting at minimum at any intersection on the state highway system that is a Restricted Crossing U Turn (RCUT), Reduced Conflict Intersection (RCI), or Michigan Boulevard Left. Partial lighting encompasses the conflict points (main and crossover areas). Full lighting is required if the intersection is within a segment that is continuously lighted. Transition light levels should be provided at intersections with full lighting in a segment without continuous lighting. See the figures on pages 18 - 20 for typical lighting coverage area. Lighting promotes safe navigation at night, particularly for movements that are unusual or at conflict points.

D. Intersection types that may need lighting. As an element of their construction or modernization consideration should be given to providing lighting at Quadrant Roadway, and rural Signalized Conventional intersections- see section V.A.1 for lighting at urban signalized conventional intersections. Nighttime traffic volume, speeds, presence of lighting adjacent to the intersection, the amount of development/adjacent land use are among the factors that should be considered- greater nighttime volume, high speeds, extensive lighting, or development adjacent to the intersection support the decision to provide lighting. See the figures on pages 21 and 22 for typical lighting coverage area.

E. Intersection types that generally do not necessitate lighting. Lighting at Offset T, unsignalized intersections, and grade separations is needed only under special circumstances. Spot lighting through use of a single luminaire on a corner may be provided at rural, unsignalized intersections to identify the presence of an intersection. Should lighting be needed see page 23 for a figure of the lighting coverage area.

V Lighting of Urban Highways

According to the criteria provided in Sections III and IV, INDOT will provide lighting on freeways, grade separated expressways, roundabouts, and at other alternative intersections within incorporated limits.

Lighting at other types of urban locations is usually provided by the local agency through an agreement with INDOT. Within the agreement responsibilities for installation and operational costs are defined. Should the local agency not enter into an agreement, INDOT will address lighting as described in subsections A and B.

A. Location types/circumstances where lighting is needed. Lighting is fundamental at certain locations for safety and proper operation of the highway. As an element of a new construction, 4R, added travel lanes, or intersection improvement project, or a 3R project provided adequate right-of-way exists or will otherwise be acquired, lighting will be added, modernized, or

maintained as the case may be on any highway within an incorporated limit under the following circumstances:

1. Signalized Intersections with Pedestrian Features or evidence of Pedestrian activity (e.g., worn dirt paths to the intersection). At minimum spot lighting will be provided on one or more of the corners- generally this can be accomplished by adding a luminaire arm to the signal support. The number of luminaires needed to light the central intersection area and pedestrian crosswalks is a determination made by the designer. Consideration should be given to full intersection lighting (lighting the approaches through the area where turn lanes develop as well). If signalized intersections are within 500 ft, continuous lighting between the intersections should be considered particularly when full intersection lighting exists or is to be provided.

2. Bike Lanes. For the safe accommodation of bicyclists if bike lanes exist or will be added with the project continuous lighting will be provided, right of way allowing.

3. Pedestrian/Shared Use path crossings. If a pedestrian, shared use path, bicycle path crossing exists or will be added with the project the crossing will be lighted. This can be done with one or two luminaires depending on the width of the highway. If lighting exists in close proximity to the crossing consideration should be given to extending the new lighting to form a continuous system.

4. Central Business District (CBD)/ For personal security as well as driver safety continuous lighting will be provided on any highway through a CBD. The Indiana Office of Community & Rural Affairs has a directory of main street communities at https://www.in.gov/ocra/mainstreet/community-directory/ that is useful for identifying CBDs in Indiana but it does not include all CBD's. Generally, the local agency will or already has provided this type of lighting, often they prefer decorative post top luminaires in the courthouse/central downtown area. CBDs are defined in the ITE Traffic Engineering Handbook, 7th edition, as a town center or regional activity center that concentrates employment and also offers a variety of dining, shopping, and cultural amenities at a density that supports high mobility due to its limited geographic area.

5. College Campuses. Continuous lighting will be provided on a highway that travels through or borders a college with a traditional residential campus.

B. Urban Lighting based on Site Specific Study. For pedestrian safety and security, a new construction, 4R, added travel lanes, intersection improvement, or 3R project should include lighting of any intersection or segment that is in an area. with a concentration of businesses,

offices, or industry or other segments with distinct nighttime pedestrian activity such as routes bordering secondary schools if the following conditions are met:

1. sidewalk exists or will be added with the project and

2. the pedestrian volume is at least 200 per nighttime period at the intersection or any intersection within the project limits- research has shown that this amount of pedestrian activity results in heightened safety risk. In the case of new facilities or where sidewalk will be added to an existing highway this volume may be estimated for certain types of land uses. The ITE Trip Generation Manual, 11th edition, includes pedestrian trip generation data for the following land uses: convenience market, pharmacy, high-turnover restaurant, fast food restaurant, and coffee/donut shop. Volume 2 of the ITE Trip Generation Manual, 11th edition, contains data plots for other land uses with urban data.

   Additionally, lighting should be considered if sidewalk exists or will be added and the pedestrian volume is at least 50 per night at the intersection or any intersection within the project limits and one or more of the following conditions are met:

   a. the segment has 8 or more lanes
   b. there are 15 or more median openings per mile (divided highway consideration)
   c. curb cuts occupy >40% of the edge line
   d. sight distance is less than 200 ft
   e. there are frequent unsignalized intersections in the segment
   f. operating speed is 45 mph or greater
   g. adjacent land is lighted (advertising or area)

   Lighting in urban areas by study will be included per the guidance noted above and with the recommendation or concurrence of the District Traffic Engineer.

C. Adaptive Lighting (Dimming). Lighting that is provided for pedestrian safety or based on pedestrian activity may be dimmed during periods where pedestrian activity is reduced. Solid state ballasted (LED) luminaires make this possible but INDOTs standards do not require the control, only a shorting cap for the receptacle for the control, so a special provision would be needed to add this feature.

VI Lighting by Site Specific Study

Lighting may be provided at any location based on site specific study, whether associated with a road construction project or not.

A Lighting Studies

If a request is made for a new lighting installation along a state-maintained highway the following procedure should be used.

1. Lighting Request. The local agency or other interested party seeking the lighting system is required to submit a request to the District Traffic Office petitioning the Department to consider the installation of a new lighting system along the state highway.

2. Lighting Study. The District Traffic Office will conduct a study to determine if the request justifies further action. If the location falls under one of the scenarios describes in items 3 through 5 then lighting should be provided and no further study is needed. For other locations section the criteria in VI.B should be studied to make a determination on whether lighting should be provided.

3. Programming. If the location warrants lighting the District Traffic Office will submit a project to provide lighting at the location.

B Criteria for Lighting Studies

Providing lighting along every highway is not practical or necessary. The District Traffic Team will be responsible for determining if the lighting system is justified along a state-maintained highway for locations not prescribed by agency policy. An editable version of the Highway Lighting Accident Analysis Worksheet is available for download from the Department's website at www.in.gov/dot/div/contracts/design/dmforms/ - the study may include this analysis. A location which satisfies these criteria does not obligate INDOT to provide funding for the requested highway lighting project. INDOT's objective is to identify each roadway which should be considered in the process of setting priorities for the allocation of available funding to a roadway-lighting project.

Local officials may determine the feasibility of providing lighting on a state highway within city or town limits.

1 Freeways

For freeway segments not addressed by section III, lighting should be considered where the night-to-day ratio of crashes is greater than 0.5 and the lighting is expected to be cost effective.

In addition, warrant CFL-2 and CFL-3 of the AASHTO *Roadway Lighting Design Guide* may be considered.

2 Interchanges

For interchanges not addressed by section III, full lighting should be considered where the night-to-day ratio of crashes is greater than 0.5 and the lighting is expected to be cost effective.

In addition, AASHTO *Roadway Lighting Design Guide* warrants CIL-1 and CIL-2 for complete interchange lighting may be considered.

3 Non-Freeways

For locations where lighting is not required by policy- see sections IV and V - non-freeway lighting should be considered where the night-to-day ratio of crashes is greater than 0.5 and the lighting is expected to be cost effective.

In addition, lighting should be considered for locations with a relatively high potential for crashes, such as a section with numerous driveways, channelized islands, significant commercial or residential development, a high percentage of trucks, or geometric deficiencies such as substandard stopping sight distance.

Where a state-maintained highway intersects with or closely parallels local streets with existing lighting or which may have future lighting, provisions should be made for possible future illumination on the state-maintained highway.

4 Sign Lighting

Sign lighting will be provided only where it is determined by the District Traffic Office that the reflective sign sheeting by itself is not sufficient for nighttime visibility.

5 Rest Areas

Lighting will be provided for all areas within a rest area that have pedestrian activities including but not limited to sidewalks, pathways, shelters, vending areas. Rest area ramps and parking areas are also lighted. Highway-type light poles and luminaires should be used to light the parking areas and the ramps.

6 Truck Weigh Stations

Each permanent truck weigh station should be lighted where weighing will occur after daylight hours. Highway-type light poles and luminaires should be used to light the weighing area, parking areas, speed change lanes, and ramps. Lighting may be provided for the sign preceding a truck weigh station which indicates that the station is open or closed.

7 Bridge Structures

The following should be considered when determining the need for lighting on a bridge structure.

a. Lighted Approaches. Lighting should be placed across or under a bridge where one or both approaches have or are planned to have lighting. Ownership of the lighting will be determined in the same manner as for a roadway.

b. Geometrics. Lighting can be considered for a long, narrow bridge, though the approaches are not lighted. Lighting should be considered where there is unusual or critical roadway geometry under or adjacent to the underpass area.

8 Tunnels and Underpasses

The lighting of a tunnel or underpass should be in accordance with the AASHTO *Roadway Lighting Design Guide*. Lighting of underpasses that are less than 75 ft in length is not normally needed. Daytime lighting should be considered for tunnels or underpasses with a length to height ratio that exceeds 10:1. *ANSI/IESNA RP-22-11* publication on American National Standard Practice for Tunnel Lighting contains additional information.

9 Other Facilities

Lighting should be considered at the following locations:

1. commuter park-and-ride lot;
2. bikeway;
3. walkway; or
4. other pedestrian facility.

The need for lighting at one of these locations will be determined as required for each situation. See the *AASHTO Roadway Lighting Design Guide* for information on the lighting of walkways/bikeways separated from the roadway.

VII Reduction or Removal of Lighting

Other than lighting that is prescribed by INDOT policy, where an existing highway lighting system is no longer warranted, feasible, or cost effective, it should be considered for reduction in the lighting level or for removal. Where light levels are reduced, they should not be reduced below the criteria described in the Indiana Design Manual, Figure 502-4E. Prior to reducing lighting or removing the system, an engineering investigation will be required. Concurrence by the District Traffic Engineer and approval by the District Deputy Commissioner will be required. If federal-aid funds were used for the original installation and the project is on the National Highway System and is not exempt from FHWA oversight, a copy of the report should be submitted to the FHWA.

Reduction or removal of lighting that is prescribed by INDOT policy also requires the concurrence of the Manager, Office of Traffic Administration-in addition to the study procedure described in items A through D.

If determining whether an existing lighting system should be removed or the lighting reduced, the following should be considered.

A. Freeway Lighting. Continuous freeway lighting may be removed or reduced where a cost analysis shows that such action will be cost effective. The cost analysis will be similar to the one prepared for the installation of a new lighting system. However, this study must consider the increase in crashes and cost to remove the system. A 50% increase in nighttime accidents should be assumed over a period of three years for analysis purposes.

B. Interchange Lighting. Complete interchange lighting may be reduced to partial interchange lighting where the average traffic volume falls below the levels given in the *AASHTO Lighting Design Guide,* table 3-3, both cases CIL-1 and CIL-2, but satisfies that shown in table 3-4, case PIL-1. An engineering analysis will be required to determine the extent of lighting reduction. Removal of complete will require a cost analysis to determine the cost effectiveness of removing the lighting system. A 50% increase in nighttime crashes should be assumed for analysis purposes.

C. Non-Freeway Lighting. Before lighting is reduced or removed on a non-freeway section, a benefit/cost analysis should be conducted to confirm that the lighting is no longer warranted. A 50% increase in crashes should be assumed for this analysis. Section II.H describes the procedure for removal of lighting if the local agency no longer can or is willing to pay the maintenance and operation costs for the lighting system.

D. Obsolete or Substandard System. Where it has been determined that a lighting system is obsolete, substandard, or is beyond its useful service life, it should be removed, replaced, or

modified. An engineering investigation should be conducted to determine the appropriate action. If removal is considered, local input should be included in the investigation. A new replacement system should be installed only if it satisfies the warrants for a new system. Current crash data may be used for the analysis. However, the data should be adjusted to reflect the expected increase in crashes if the system is removed.

To study the effects of removing or reducing lighting, the Department may turn off part or all of the system. This may only be performed after an engineering analysis has been conducted to determine the expected effect of turning the lights off. This study period should not be less than one year or more than four years. After the study has been completed, the system may be either re-energized or removed.

After the decision has been made to remove or reduce the level of highway lighting, the lights should be turned off but left in place for a period of at least one year and not longer than four years. A crash analysis study will be required during this time period to determine the effects of the reduced lighting. A final cost analysis will be required with the updated crash and capital-improvement data. A system removal will be accomplished either by state forces or by a contractor as part of other project work.

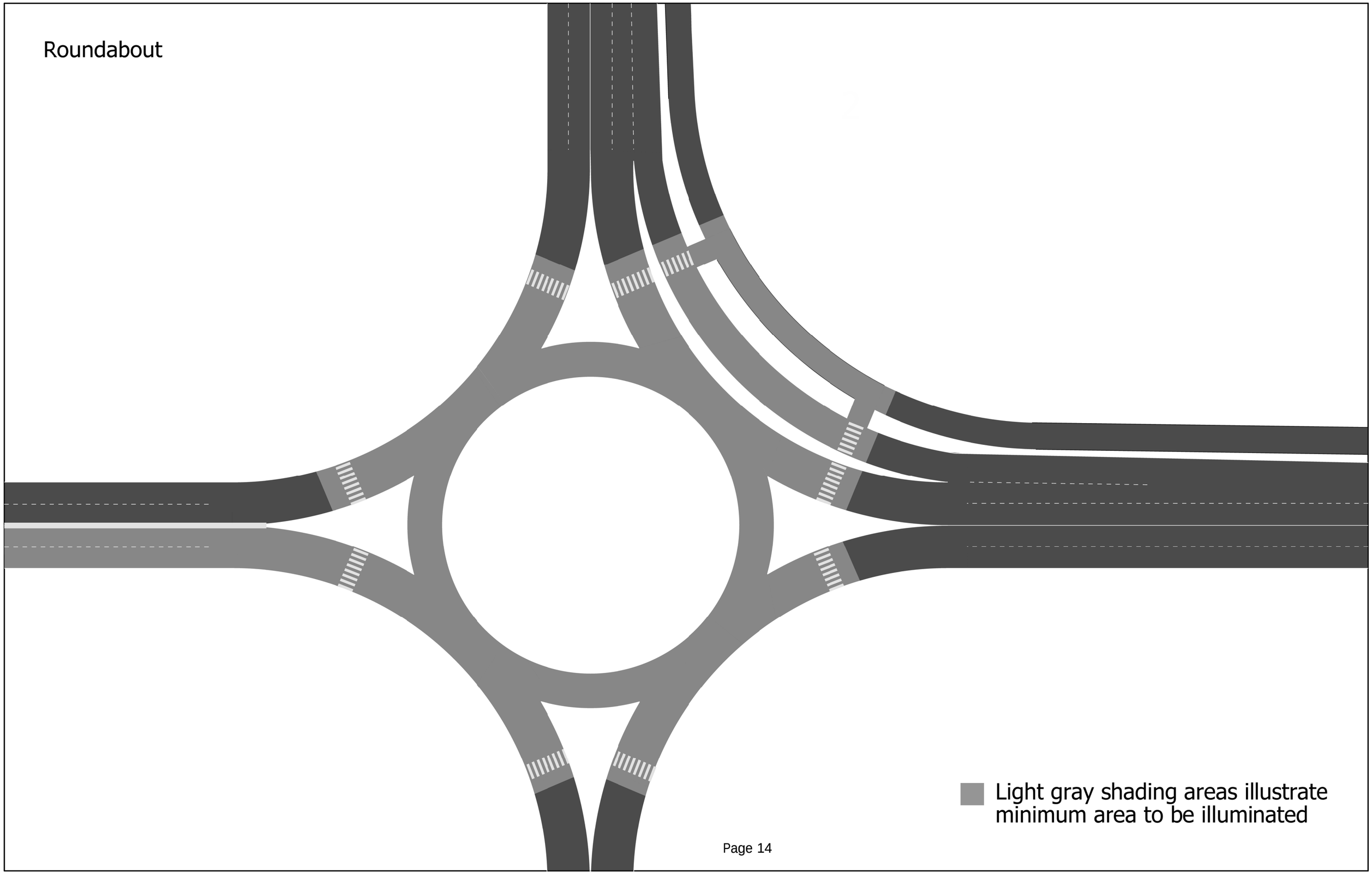
VIII Transition Lighting

Where light levels are significant consideration should be given to providing a gradual transition to segments that are not lighted. See ANSI/IESNA RP-8.

DPM/dhb/lmg

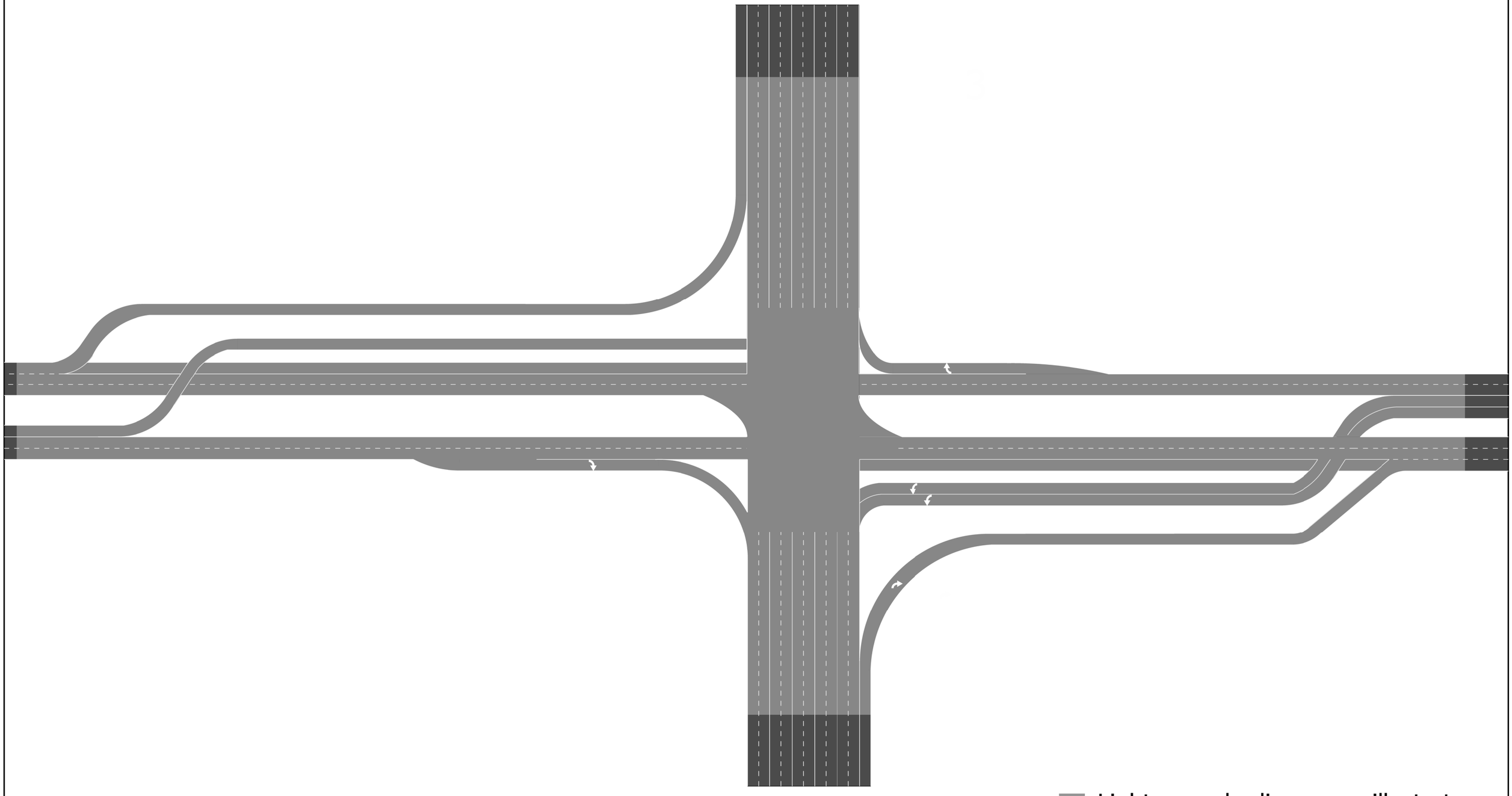
cc: Travis Underhill, J.D. Brooks, Louis Feagans, Jim Sturdevant, Jeremy Hunter, Subhi Bazlamit, Elizabeth Mouser, Prakash Patel, Paul Schmidt, Mike Holowaty, and Ed King

Roundabout



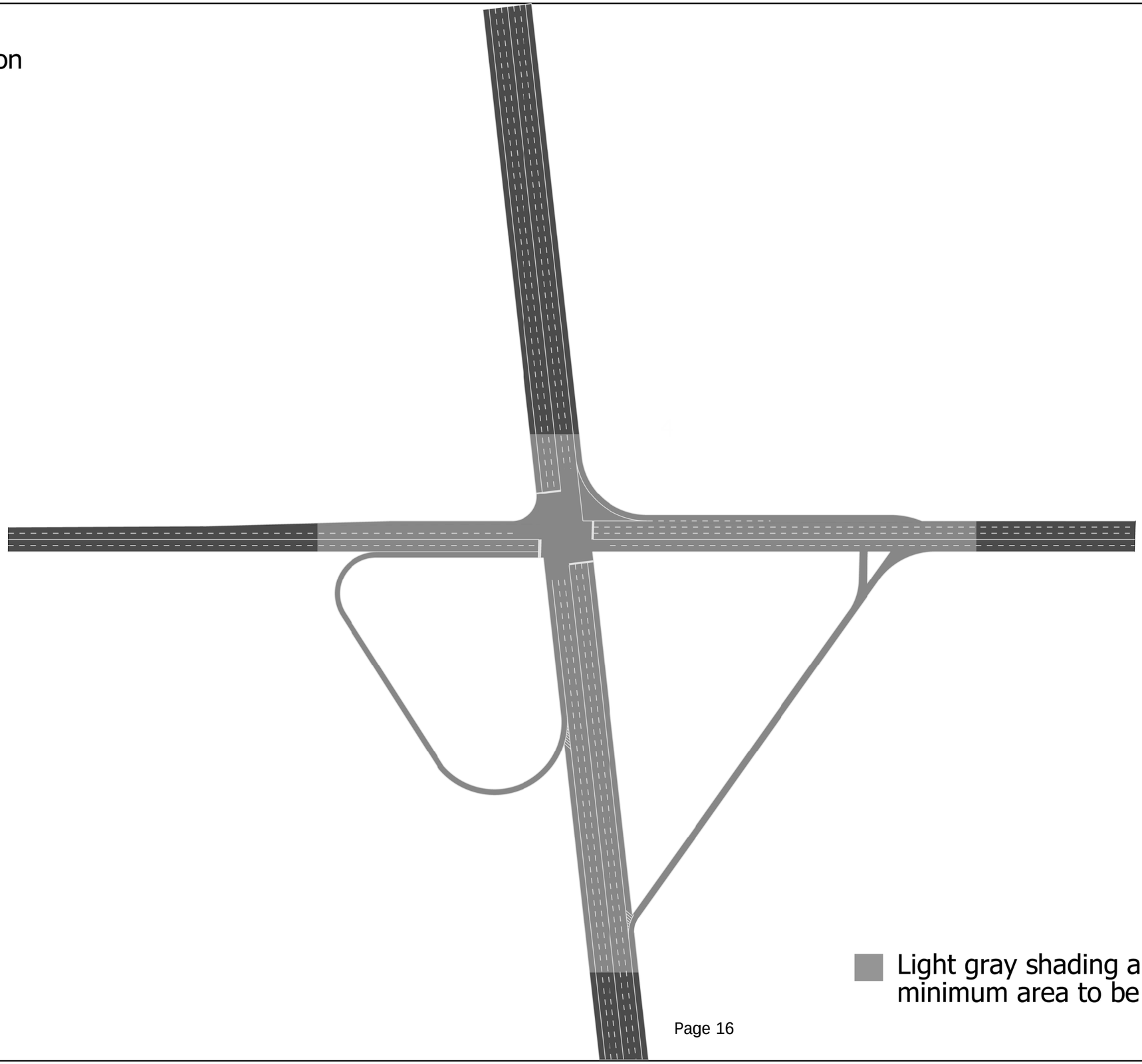
Light gray shading areas illustrate minimum area to be illuminated

Displaced Left Turn Intersection



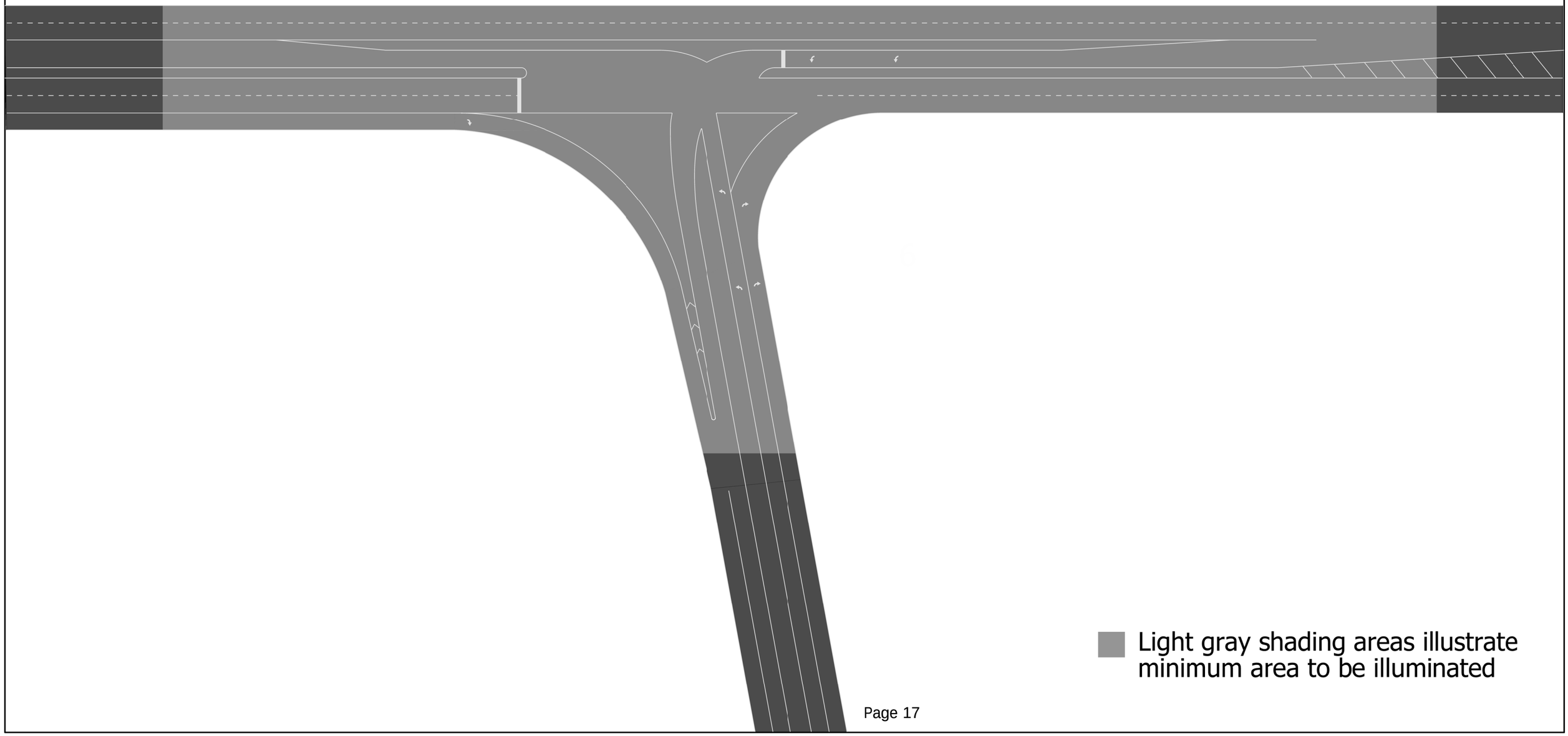
Light gray shading areas illustrate minimum area to be illuminated

Jug Handle Intersection



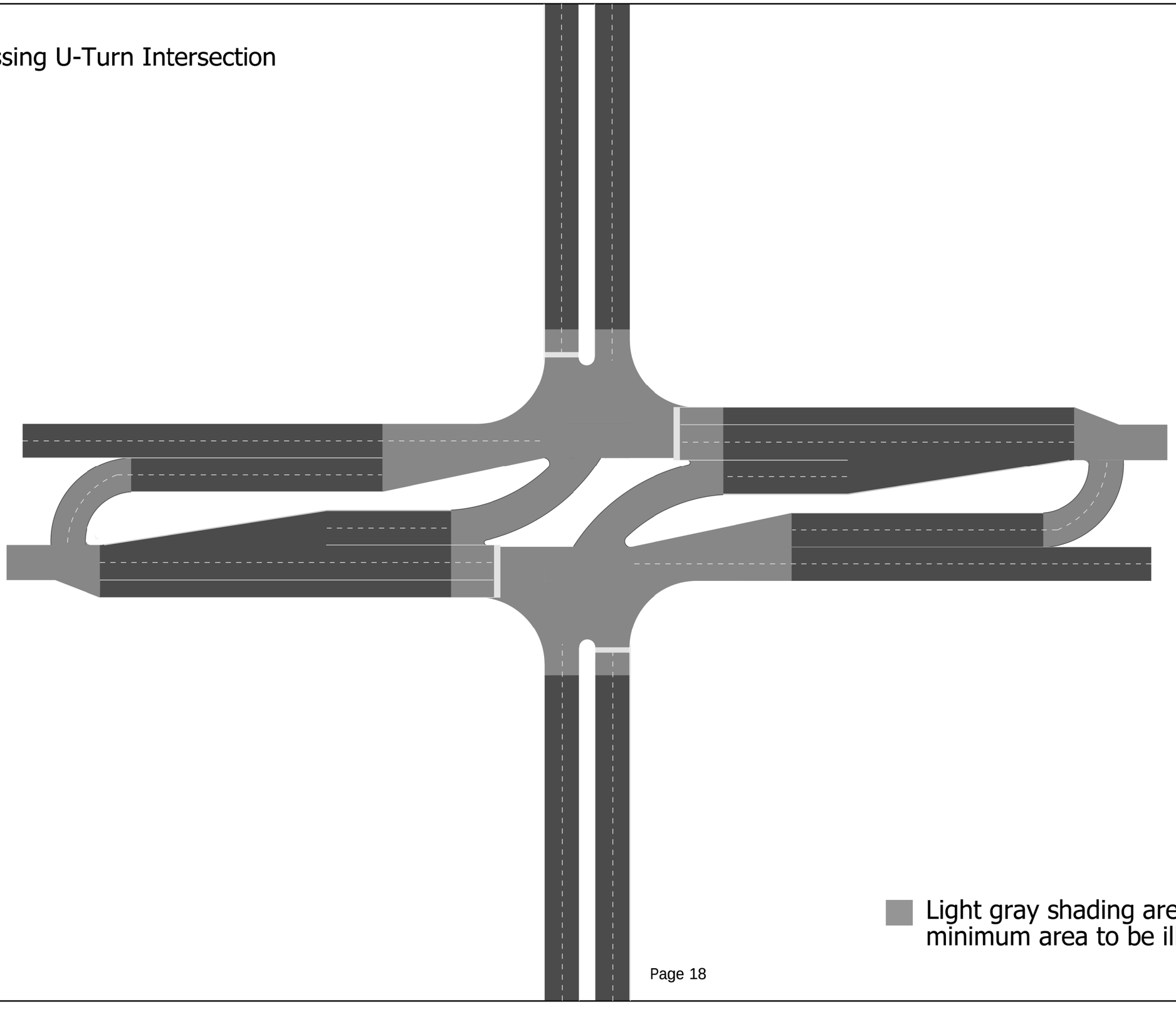
Light gray shading areas illustrate minimum area to be illuminated

Green T Intersection



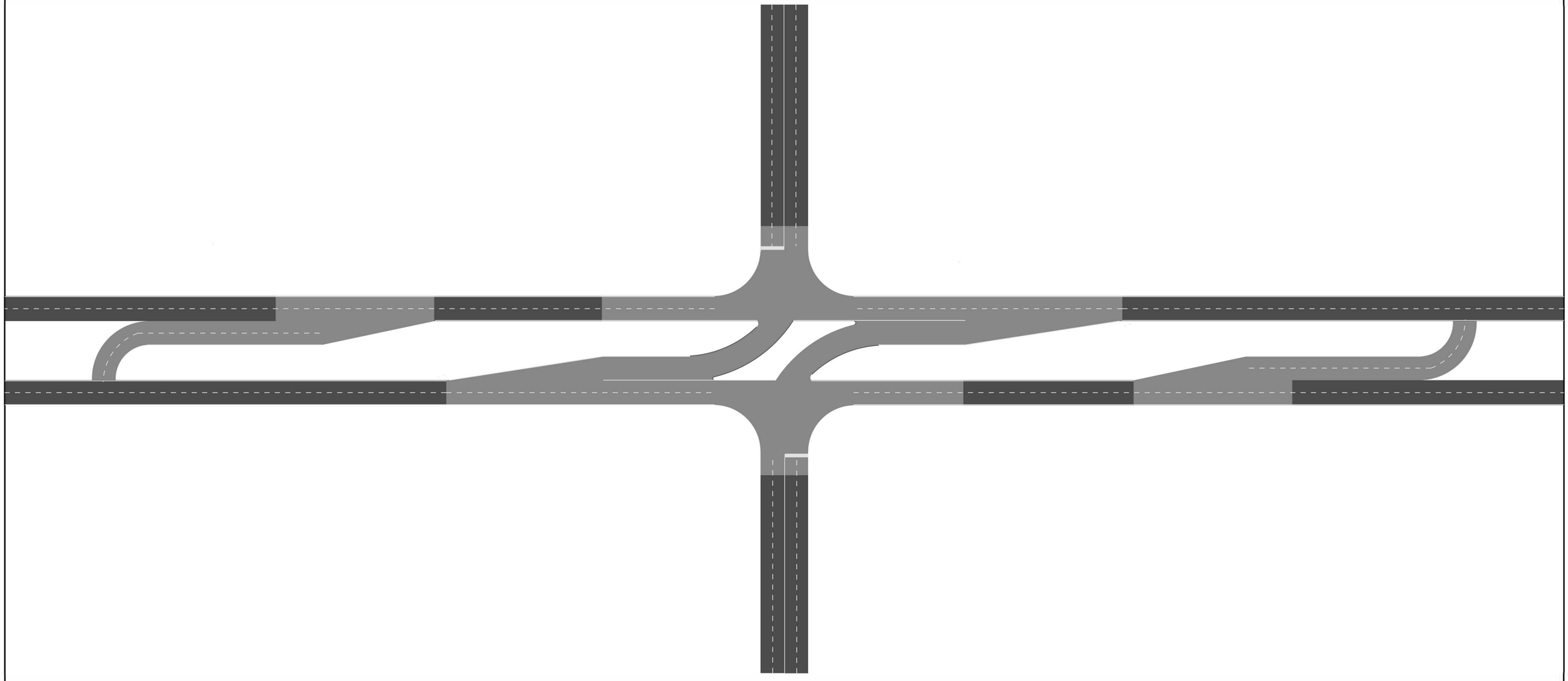
Light gray shading areas illustrate minimum area to be illuminated

Restricted Crossing U-Turn Intersection



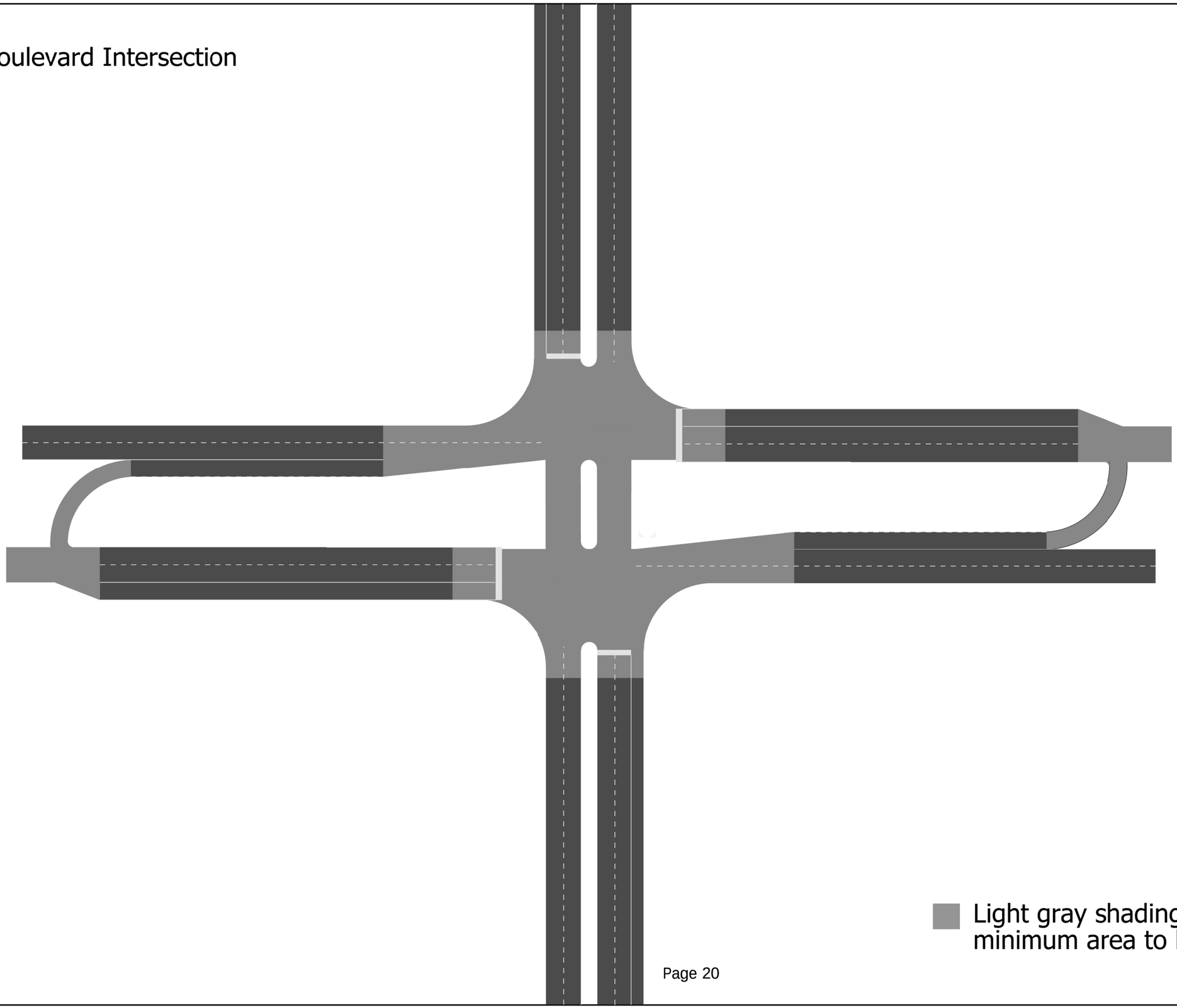
Light gray shading areas illustrate minimum area to be illuminated

Reduced Conflict Intersection



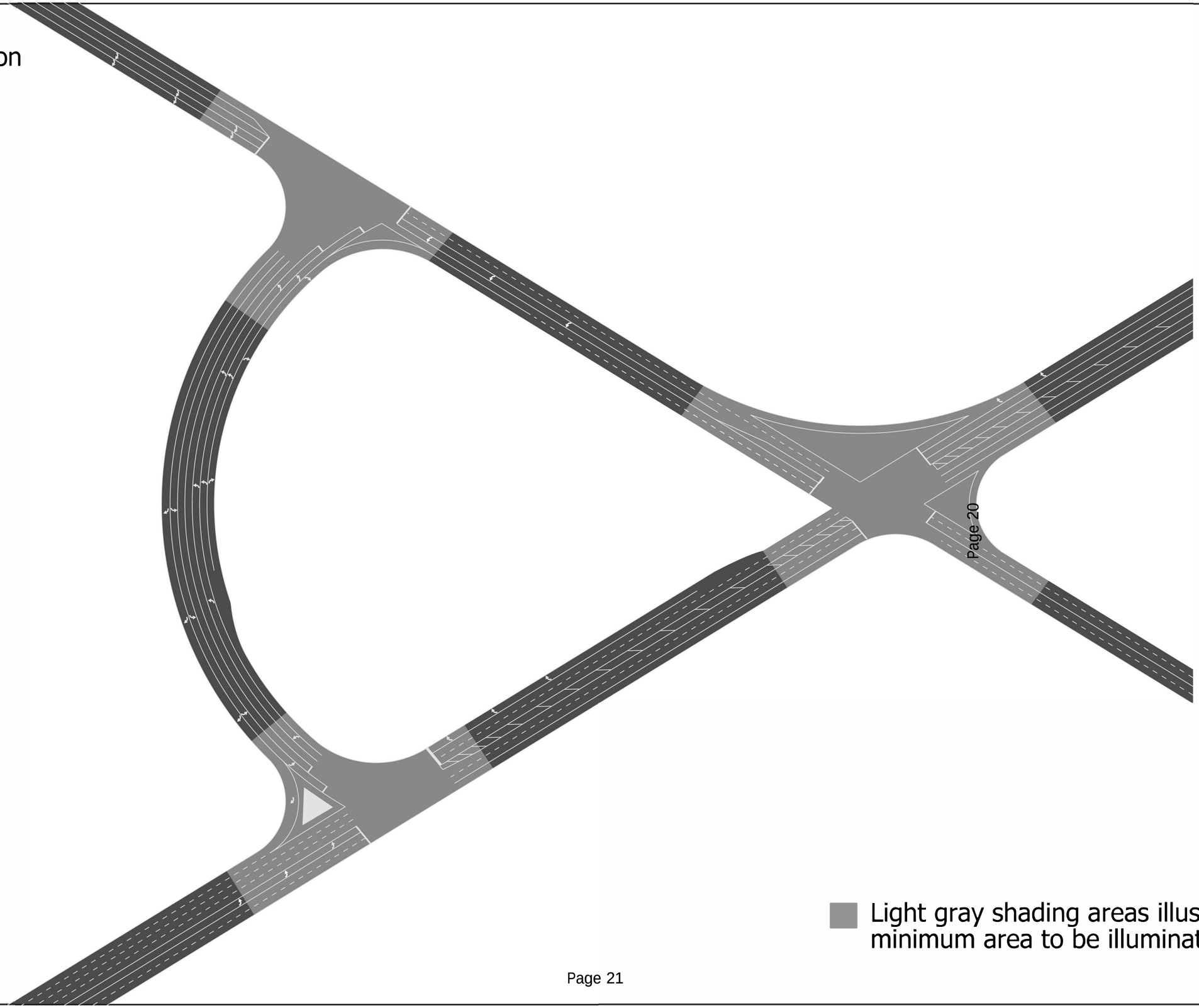
Light gray shading areas illustrate minimum area to be illuminated

Michigan Boulevard Intersection



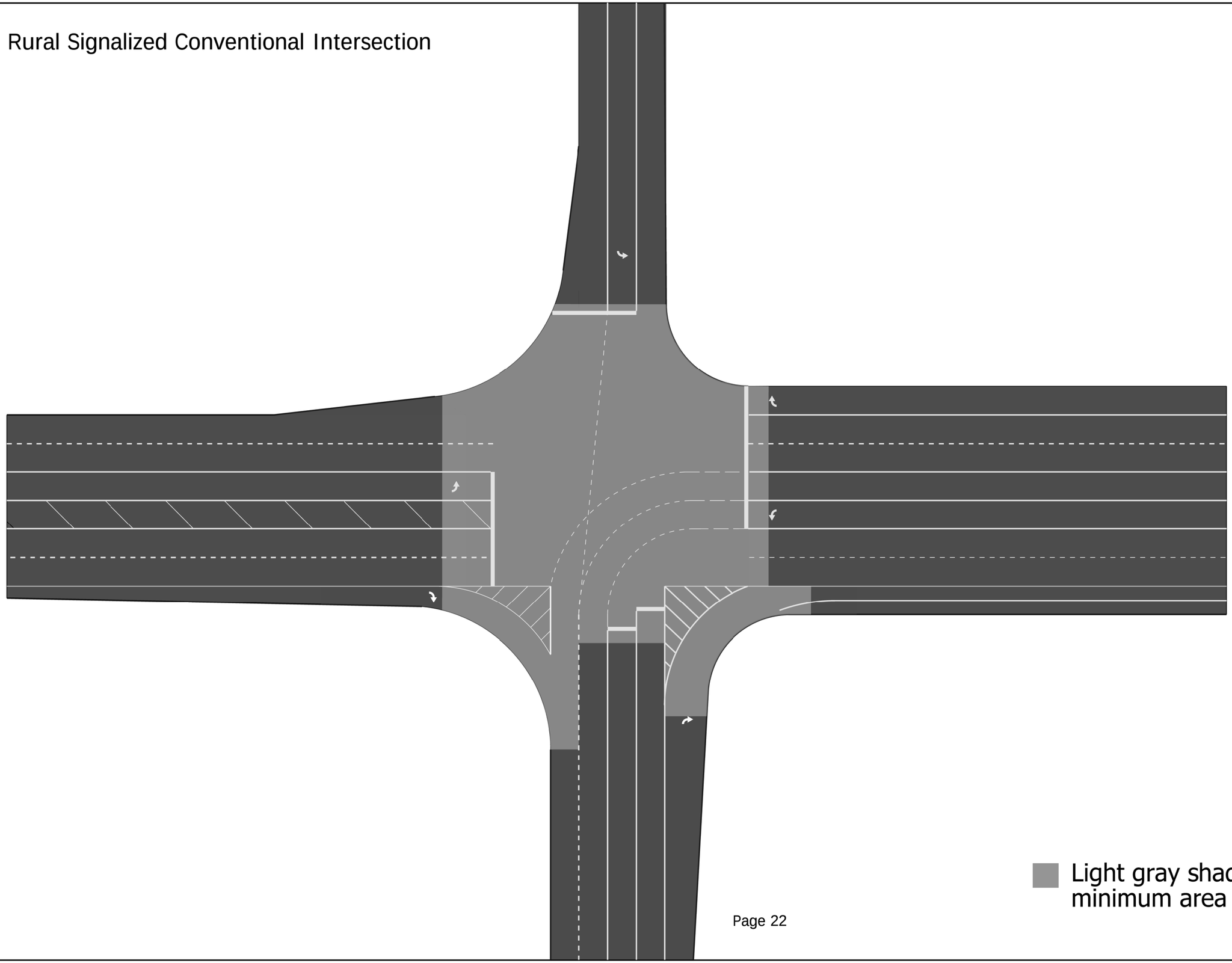
Light gray shading areas illustrate minimum area to be illuminated

Quadrant Intersection



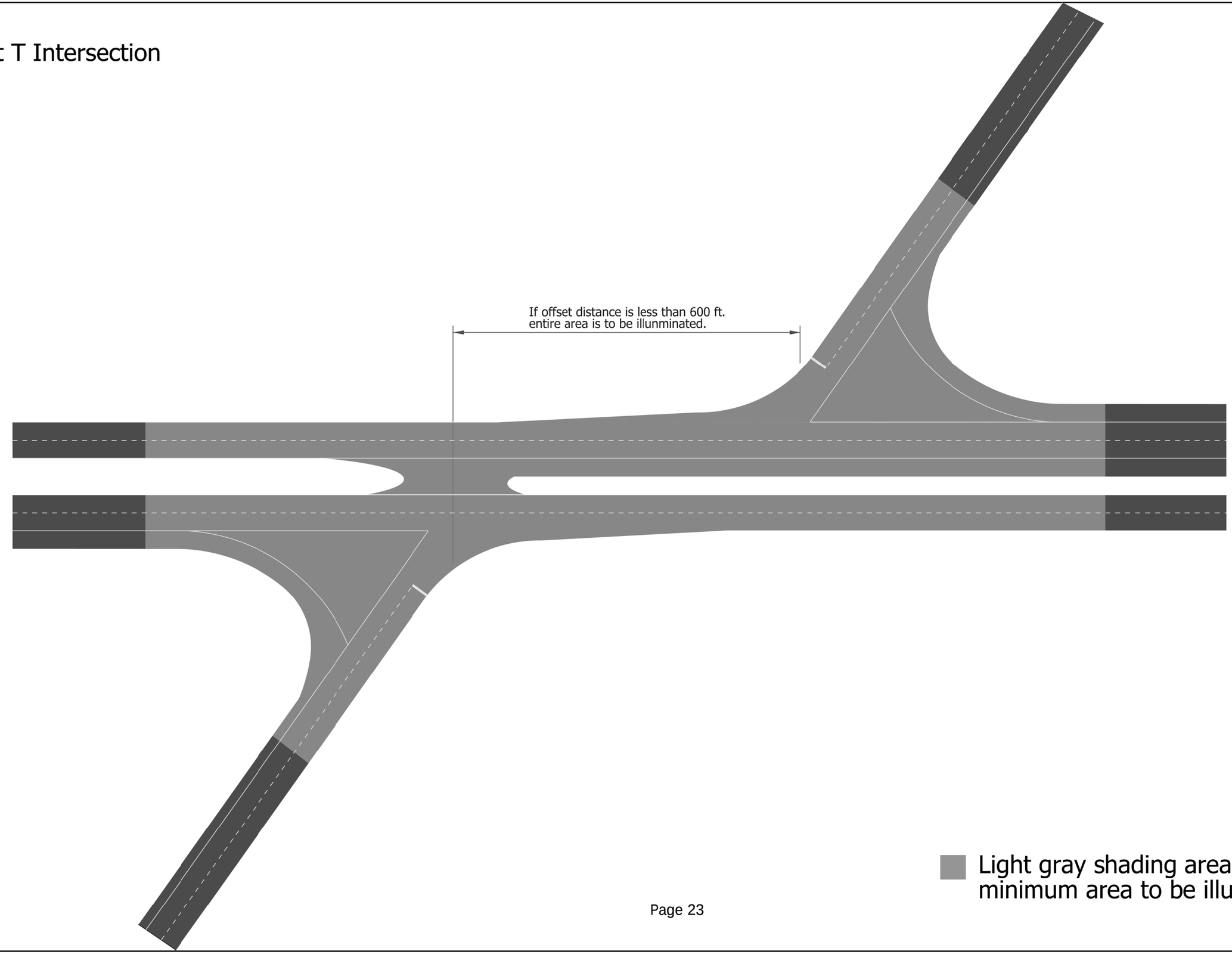
Light gray shading areas illustrate minimum area to be illuminated

Rural Signalized Conventional Intersection



Light gray shading areas illustrate minimum area to be illuminated

Offset T Intersection



Light gray shading areas illustrate minimum area to be illuminated