



## ACCEPTANCE CRITERIA FOR ATTACHMENT DEVICES FOR RECESSED LIGHTING FIXTURES (LUMINAIRES) IN SUSPENDED CEILING SYSTEMS

AC184

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### PREFACE

Evaluation reports issued by ICC Evaluation Service, Inc. (ICC-ES), are based upon performance features of the International family of codes and other widely adopted code families, including the Uniform Codes, the BOCA National Codes, and the SBCCI Standard Codes. Section 104.11 of the *International Building Code*® reads as follows:

The provisions of this code are not intended to prevent the installation of any materials or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

Similar provisions are contained in the Uniform Codes, the National Codes, and the Standard Codes.

This acceptance criteria has been issued to provide all interested parties with guidelines for demonstrating compliance with performance features of the applicable code(s) referenced in the acceptance criteria. The criteria was developed and adopted following public hearings conducted by the ICC-ES Evaluation Committee, and is effective on the date shown above. All reports issued or reissued on or after the effective date must comply with this criteria, while reports issued prior to this date may be in compliance with this criteria or with the previous edition. If the criteria is an updated version from the previous edition, a solid vertical line (|) in the margin within the criteria indicates a technical change, addition, or deletion from the previous edition. A deletion indicator (→) is provided in the margin where a paragraph has been deleted if the deletion involved a technical change. This criteria may be further revised as the need dictates.

ICC-ES may consider alternate criteria, provided the report applicant submits valid data demonstrating that the alternate criteria are at least equivalent to the criteria set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria set forth in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise demonstrate compliance with the performance features of the codes, ICC-ES retains the right to refuse to issue or renew an evaluation report, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or if malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

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# ACCEPTANCE CRITERIA FOR ATTACHMENT DEVICES FOR RECESSED LIGHTING FIXTURES (LUMINAIRES) IN SUSPENDED CEILING SYSTEMS

## 1.0 INTRODUCTION

**1.1 Purpose:** The purpose of this criteria is to establish requirements for attachment devices, recognized in ICC Evaluation Service, Inc. (ICC-ES), evaluation reports, that are used to attach recessed lighting fixtures (luminaires) to suspended ceiling systems under Part III of UBC Standard 25-2, in the 1997 *Uniform Building Code*<sup>TM</sup> (UBC), and under CISCA 3-4 for Seismic Zones 3-4 as referenced in Section 13.5.6.2.2 of ASCE 7, which is referenced in Sections 1613.1 and 2506.2.1 of the 2006 *International Building Code*<sup>®</sup> (IBC).

The reason for development of this criteria is to establish guidelines for evaluation of attachment devices for recessed lighting fixtures in suspended ceiling systems, since the IBC, UBC and documents referenced by these codes do not specify requirements for testing and evaluation of these devices.

**1.2 Scope:** The attachment devices are manufactured from steel and are used to connect recessed, light-gage-steel lighting fixtures (luminaires) to the aluminum or steel framing members of suspension systems for acoustical tile and lay-in panel ceilings. A minimum of four attachment devices is required for each lighting fixture, and one device shall be located at each corner of the lighting fixture.

The attachment devices are used to provide positive attachment of the lighting fixtures to the suspended ceiling framing as required by Section 25.213 of UBC Standard 25-2 and CISCA 3-4 for Seismic Zones 3-4.

This criteria includes additional requirements for the attachment devices where they are used in lieu of the two No. 12 gage slack wires that are required by UBC Section 25.213 and CISCA 3-4-91 for attachment of lighting fixtures to the structural supports above the suspended ceiling. In this case, the attachment devices are used to perform the function of positive attachment and to address the requirement for two slack wires.

The maximum weight of the lighting fixture is 56 pounds (25.4 kg), which is the maximum weight beyond which the codes require direct attachment of fixtures to the structure above the ceiling.

The criteria addresses the use of the attachment devices in nonfire-resistive rated or fire-resistive rated construction.

### 1.3 Reference Standards:

**1.3.1** CISCA 3-4 for Seismic Zones 3-4, Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings, Seismic Zones 3-4, 2004, Ceilings and Interior Systems Construction Association.

**1.3.2** ASCE 7-05, Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers.

**1.3.3** ASTM C 635-00, Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings, ASTM International.

**1.3.4** ASTM C 636-04, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels, ASTM International.

**1.3.5** ASTM E 119-00, Standard Test Method for Fire Testing of Building Construction and Materials, ASTM International.

**1.3.6** UL 1598, January 31, 2000, Luminaires, Underwriters Laboratories Inc.

**1.3.7** 2006 *International Building Code*, International Code Council.

**1.3.8** 1997 *Uniform Building Code*.

## 2.0 BASIC INFORMATION

**2.1 General:** The following information shall be submitted:

**2.1.1 Product Description:** Complete information concerning material specifications, dimensions (including base-metal thickness of galvanized, or otherwise coated, steel products) and the manufacturing process of the attachment device and components.

**2.1.2 Installation Instructions:** Installation details, including requirements, limitations and fastening methods.

**2.1.3 Packaging and Identification:** A description of the method of packaging and field identification of the attachment device and components. Identification must include the ICC-ES evaluation report number.

**2.2 Testing Laboratories:** Testing laboratories shall comply with Section 2.0 of the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES Rules of Procedure for Evaluation Reports.

**2.3 Test Reports and Product Sampling:** Test reports shall comply with AC85. Products for testing shall be sampled in accordance with Section 3.2 of AC85.

## 3.0 TEST AND PERFORMANCE REQUIREMENTS

**3.1** The steel devices shall be provided with coatings or finishes complying with Section 25.204 of UBC Standard 25-2 and ASTM C 635, as verified by the testing laboratory.

**3.2** Based on a visual inspection by the testing laboratory, the devices, after forming, shall show no fracturing in either the protective coating or the base material. The minimum quantity of inspected devices shall be 20 times the number of devices required per assembly.

**3.3** Static load tests shall be conducted in accordance with Section 4.1.

**3.4** For recognition of attachment devices to be used in lieu of the UBC and IBC required two No. 12 gage slack wires attaching light fixtures to the structure above the ceiling, analysis of data in accordance with Section 4.1.4.2 and dynamic load tests in accordance with Section 4.2 shall be submitted.

**3.5** For recognition of the devices in fire-resistive construction, tests of ceiling assemblies, consisting of the attachment devices, conducted in accordance with UBC Standard 7-1 (UBC) or ASTM E 119 (IBC), shall be conducted. The use of the attachment devices in fire-resistive construction will be limited to the tested assemblies.

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**4.0 TEST METHODS**

**4.1 Static Load Tests:**

**4.1.1 Test Series:**

**4.1.1.1** A separate series of static load tests is needed for each of the following loads:

**4.1.1.1.1** Gravity load.

**4.1.1.1.2** Vertical uplift load.

**4.1.1.1.3** Load parallel to the main runners of the suspended ceiling system.

**4.1.1.1.4** Load parallel to the cross runners of the suspended ceiling system.

**4.1.1.2** Each series of load tests shall consist of a minimum of three assemblies tested to failure, with none of the results varying by more than 15 percent from the average of the three. If the 15 percent variation is exceeded, then the average result used in the data analysis shall be based on either a minimum of five tests per test series regardless of the variation, or the lowest value of the three tests.

**4.1.2 Test Assembly:**

**4.1.2.1** Each test assembly shall consist of a 2-foot-by-4-foot (610 mm by 1219 mm) recessed lighting fixture and suspended ceiling main and cross runners in the configuration depicted in Figure 1, with the lighting fixture attached to the ceiling framing system with the attachment devices in accordance with the attachment device manufacturer's instructions. Each main runner shall have a main tee splice located between the assembly supports as noted in Figure 1.

**4.1.2.2** The tested assembly shall consist of representative main and cross runners. Unless recognition is limited to the specific main and cross runners used in the tests, the end tab connectors shall be removed from the cross tees at the main runner to cross runner intersections.

**4.1.2.3** The lighting fixtures shall be representative recessed fluorescent luminaires that are light gage steel, taper or box profile fixtures complying with UL Standard 1598.

**4.1.2.4** For all test series except when loads are applied parallel to the cross runners, the main runners of the test assembly shall be supported and secured by the test frame at the four locations noted in Figure 1, and the test loads shall be applied to the center of the lighting fixture.

**4.1.2.5** For the test series with loads applied parallel to the cross runners, the main runners of the test assembly shall be supported at the four locations noted in Figure 1, but secured only at the two support locations on one of the two main runners. The test load shall be applied to the top of the lighting fixture at the end closest to the secured main runner with the load applied towards the end of the light fixture with the unsecured main runner.

**4.1.2.6** A minimum clearance of 1½ inches (38.1 mm) shall be provided between the lighting fixture and any assembly supports. Movement of the lighting fixture shall not be restrained by supplemental elements.

**4.1.3 Test Procedure:**

**4.1.3.1** Loads shall be applied using a hydraulic ram and pump system. The load shall be measured using a load cell with a data acquisition system calibrated to the nearest pound.

**4.1.3.2** The load shall be applied in 10-pound (44.5 N) increments up to the ultimate load. At each increment, the load shall be applied and maintained for not less than 1 minute.

**4.1.3.3** Where tests are not conducted to failure, the highest load achieved will be assumed to be the ultimate load.

**4.1.4 Analysis of Data:**

**4.1.4.1 Attachment Devices Used for Positive Attachment of Lighting Fixtures to Suspended Ceiling Framing:** The average ultimate test result of each test series shall be divided by an adjustment factor of 6. The resulting adjusted values for each test series shall be compared, and the lowest value is the maximum weight of the light fixture that can be recognized. The maximum fixture weight that can be recognized is 56 pounds (25.4 kg). The adjustment factor of 6 is based on the UBC and IBC requiring a minimum of two devices, where each device shall have an allowable load equal to 100 percent of the weight of the lighting fixture, and a safety factor of 3.

**4.1.4.2 Attachment Devices Used in Lieu of Code Requirements for Two Slack No. 12 Gage Wires Attaching Light Fixtures to the Structure Above the Suspended Ceilings:** The average ultimate test result, as determined in Section 4.1.1.2, of each test series shall be equal to or greater than 600 pounds (2669 N). The 600-pound (2669 N) value is based on applying a safety factor of 3 to an assumed ultimate load capacity of 100 pounds (444.8 N) for each of the two No. 12 gage slack wires required by the code.

**4.2 Dynamic Load Tests:**

**4.2.1 Test Series:**

**4.2.1.1** A separate series of dynamic load tests is needed for each light fixture configuration that is to be recognized in the evaluation report. The following are the light fixture assembly configurations considered under this criteria:

**4.2.1.1.1** Single light fixture, perpendicular to main runner. See Figure 2.

**4.2.1.1.2** Single light fixture, parallel to main runner. See Figure 3.

**4.2.1.1.3** Two light fixtures, end-to-end, perpendicular to main runner. See Figure 4.

**4.2.1.1.4** Two light fixtures, end-to-end, parallel to main runner. See Figure 5.

**4.2.1.1.5** Two light fixtures, side-by-side, perpendicular to main runner. See Figure 6.

**4.2.1.1.6** Two light fixtures, side-by-side, perpendicular to main runner. See Figure 7.

**4.2.1.1.7** Four light fixtures, perpendicular to main runner. See Figure 8.

**4.2.1.1.8** Four light fixtures, parallel to main runner. See Figure 9.

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**4.2.1.2** Each series of dynamic tests shall consist of two assemblies. One assembly is for loads applied parallel to the main runners and the second assembly is for loads applied perpendicular to the main runners.

### **4.2.2 Test Assembly:**

**4.2.2.1** The suspended ceiling assembly shall be attached to, and supported by, a frame that is rigidly attached to the shake table.

**4.2.2.2** The suspended ceiling shall be suspended a minimum of 3 feet (919 mm) below the support above.

**4.2.2.3** The suspended ceiling assembly shall have a minimum area of 100 square feet (9.3 m<sup>2</sup>).

**4.2.2.4** The tested assemblies shall consist of representative main and cross runners.

**4.2.2.5** The light fixtures shall be representative recessed fluorescent luminaires that are light gage steel, taper or box profile fixtures complying with UL Standard 1598. Light fixtures weighing less than 56 pounds (25.4 kg) shall have additional weight attached to the light fixture to increase the combined load to 56 pounds (25.4 kg), or the maximum light fixture weight permitted will be limited to the light fixture weight used in the tests.

**4.2.2.6** The ceiling tiles installed in the test assemblies shall be rigid tile with a weight of 0.65 lb/ft<sup>2</sup> (3.17 kg/m<sup>2</sup>).

**4.2.2.7** The suspended ceiling system shall be installed with No. 12 gage (2.7 mm) hanger wires spaced 4 feet (1219 mm) on center attached to the main runners in accordance with ASTM C 636. All wires must be plumb. Main runners and cross runners shall be attached to the perimeter member at two adjacent walls with clearance at the opposite end of the runners between the runners and the frame attached to the shake table. The attachment of the runners to the perimeter member shall have an ultimate load connection capacity of not less than 180 pounds (801N). Ends of the non-attached main runners and cross runners at the perimeter of the assembly shall be tied together to prevent their spreading. The terminal ends of each main runner and cross runner shall be supported independently a maximum of 8 inches (203.2 mm) from each wall with No. 12 gage [0.1205 inch (3 mm)] hanger wire or approved wall support.

A vertical strut located as shown in the figures in this criteria, fastened to the main runner, shall be extended to and fastened to the support above. The strut shall be spaced not more than 6 feet (1829 mm) from each of the adjacent walls with the main runner and cross runners

attached to the perimeter member. Four No. 12 gage [0.1205 inch (3 mm)] wires shall be secured to the main runner at the strut location, within 2 inches (50.8 mm) of the cross runner intersection, and splayed 90 degrees from each other at an angle not exceeding 45 degrees from the plane of the ceiling. The light fixture(s) shall be attached to the suspended ceiling framing system in accordance with the attachment device manufacturer's installation instructions.

**4.2.3 Test Procedure:** The testing procedure shall be in accordance with Section 6.0 of the ICC-ES Acceptance Criteria for Seismic Qualification by Shake-table Testing of Nonstructural Components and Systems (AC156), using biaxial motion (i.e., in-plane motion plus vertical motion). Alternative testing procedures are acceptable provided it is clearly demonstrated that such procedures include requirements that are at least equivalent to those specified in Section 6.0 of AC156.

### **4.2.4 Qualification Criteria:**

**4.2.4.1** The results of the dynamic load tests shall demonstrate that the tested assemblies satisfy the following criteria:

**4.2.4.1.1** The light fixture(s) remain in place, attached to the main runners and cross runners and supported by the hanger wires.

**4.2.4.1.2** The main runners and cross runners remain attached by the device at each main-runner-to-cross-runner intersection.

**4.2.4.1.3** The plastic light diffuser and fluorescent tubes of the light fixtures remain in place and intact.

## **5.0 QUALITY CONTROL**

**5.1** Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted.

**5.2** Third-party follow-up inspections are not required under this acceptance criteria.

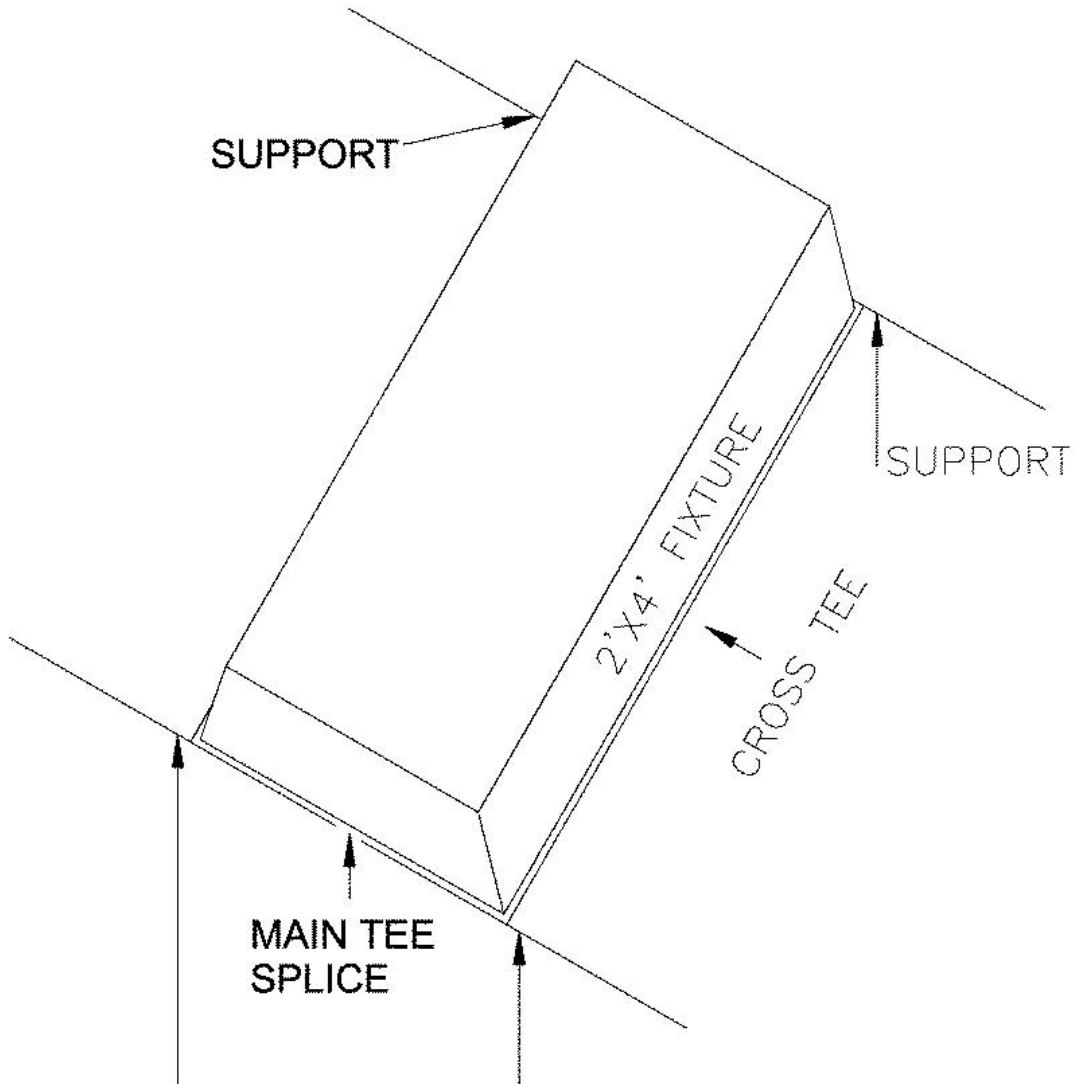
## **6.0 EVALUATION REPORT RECOGNITION**

**6.1** The fasteners used to attach the device to the grid system must be identified in the evaluation report.

**6.2** The grid component requirements must be identified in the evaluation report.

**6.3** The luminaire requirements must be identified in the evaluation report. ■

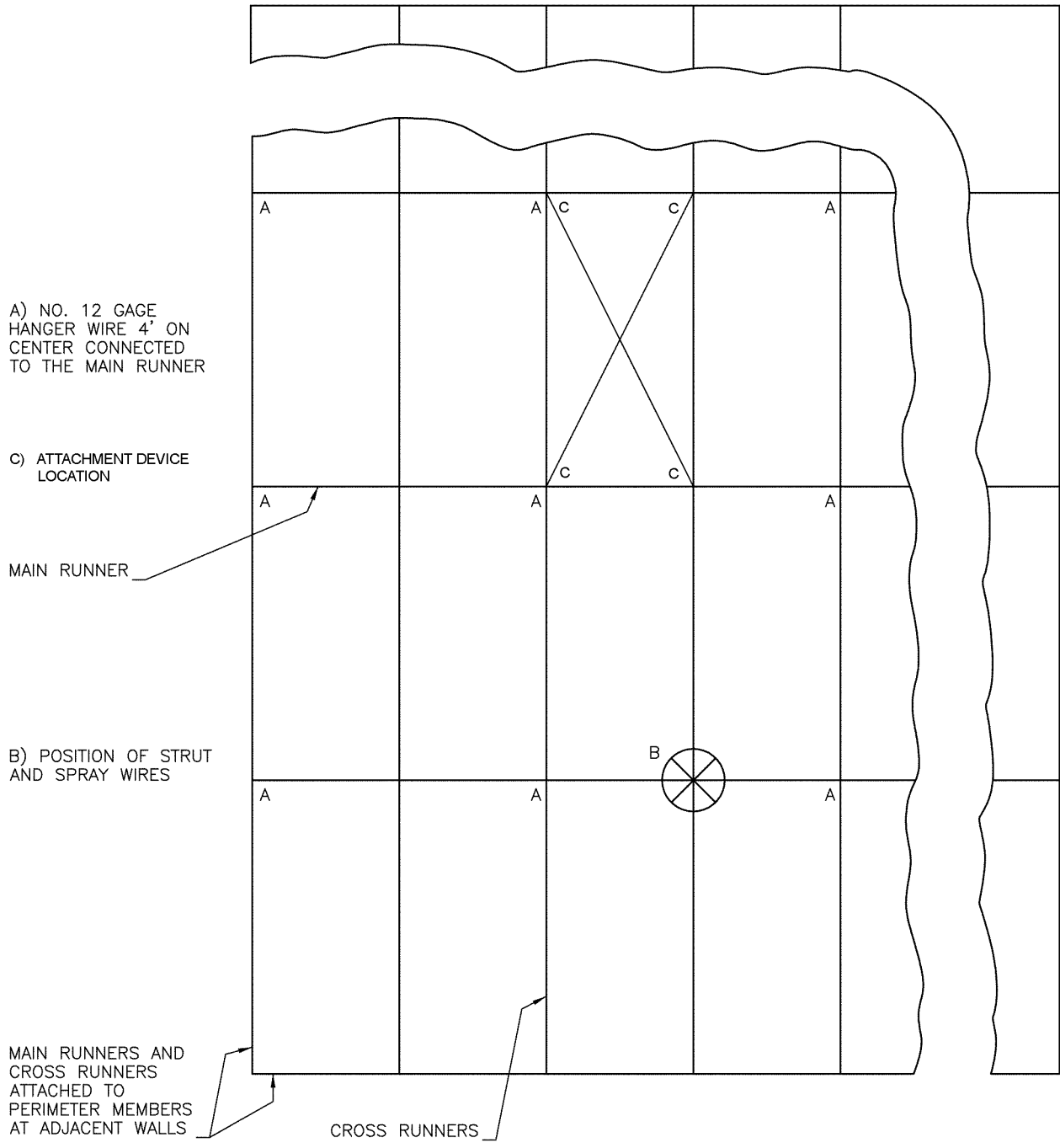
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SUPPORT TWO POINTS  
EACH END 1.5" FROM LIGHT FIXTURE

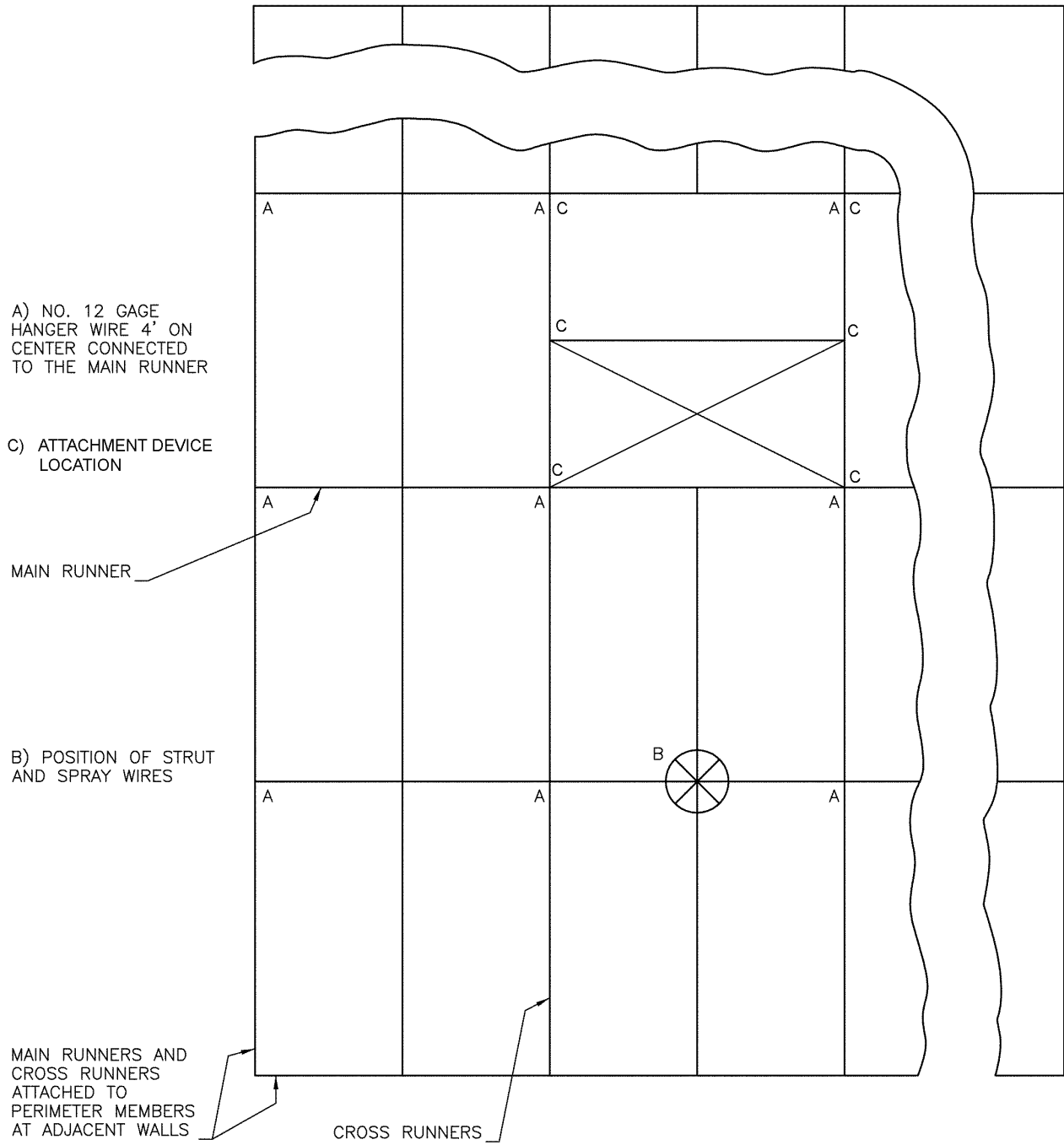
FIGURE 1

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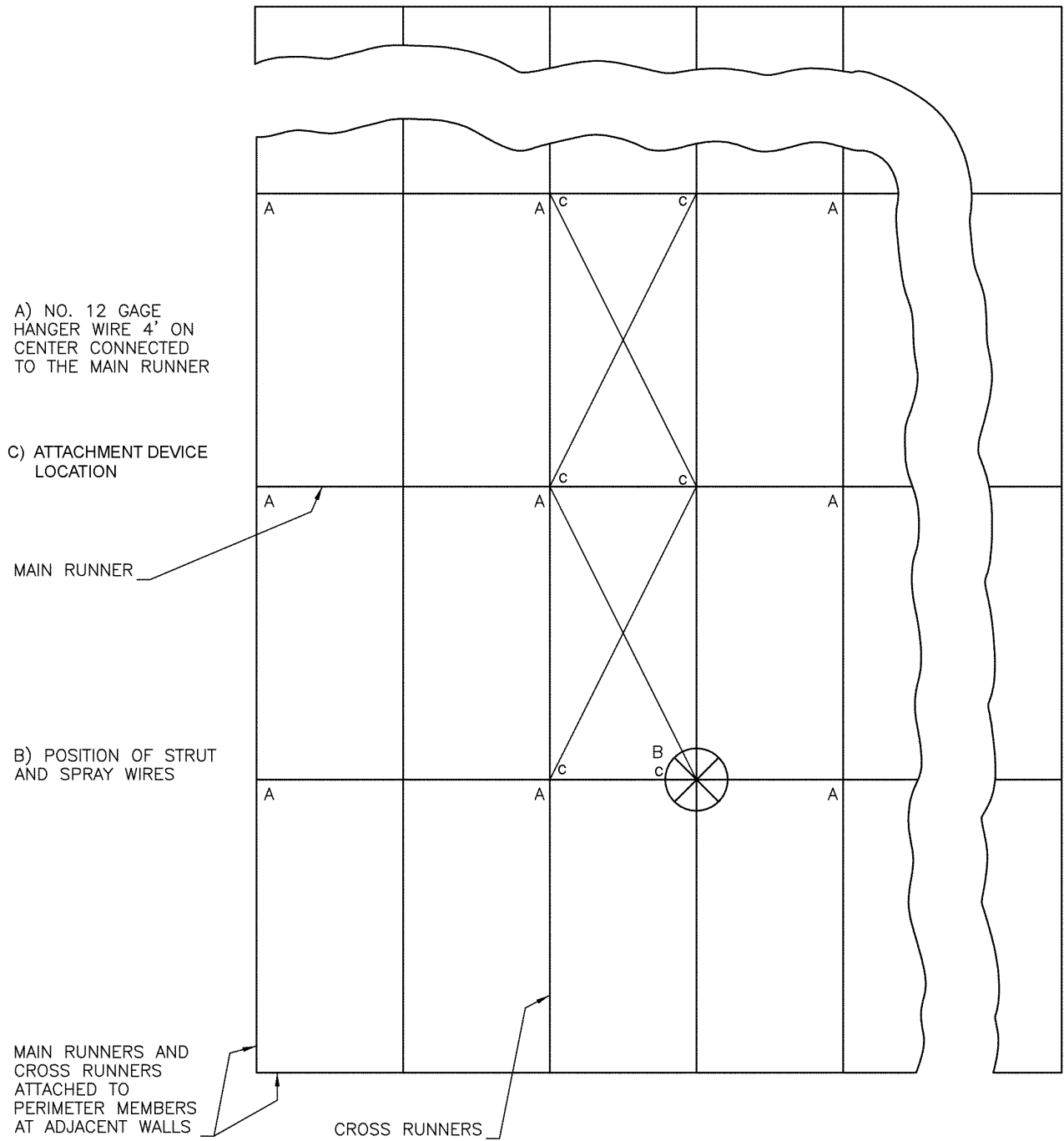
**FIGURE 2—SINGLE LIGHT FIXTURES (LUMINAIRES) PERPENDICULAR TO MAIN RUNNERS**

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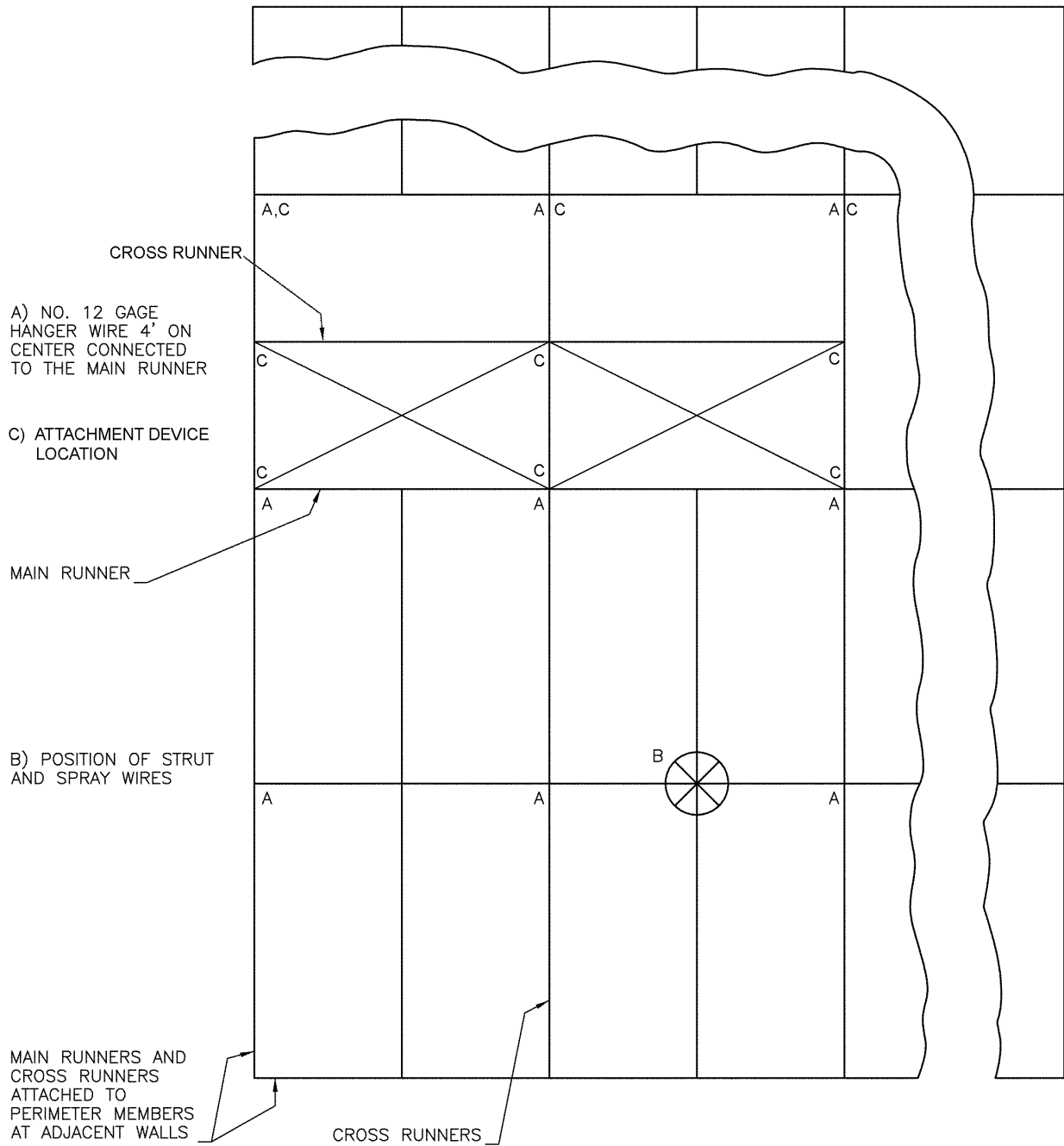
**FIGURE 3—SINGLE LIGHT FIXTURES (LUMINAIRES) PARALLEL TO MAIN RUNNERS**

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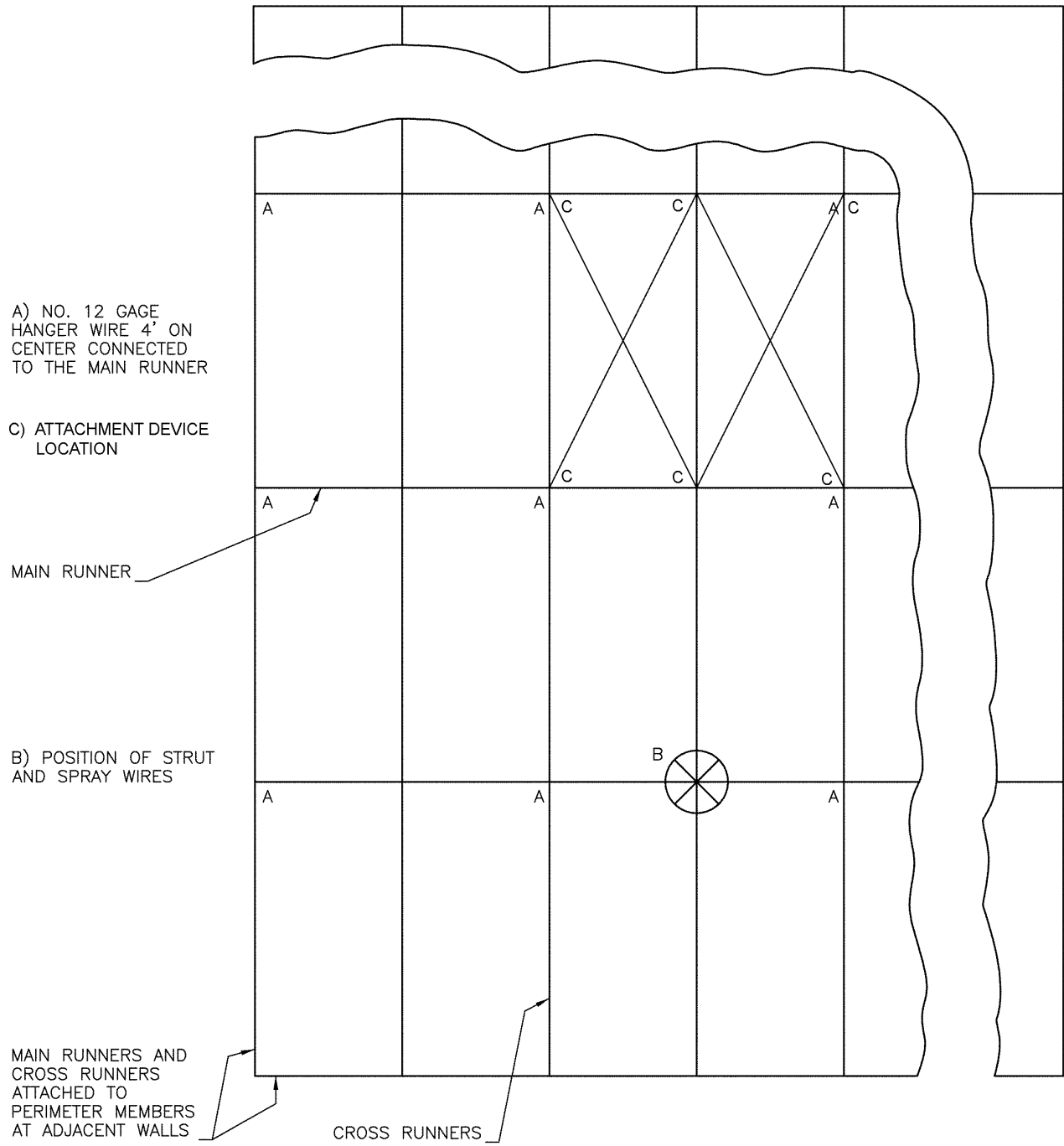
**FIGURE 4—TWO LIGHT FIXTURES (LUMINAIRES) PERPENDICULAR TO MAIN RUNNERS, END TO END**

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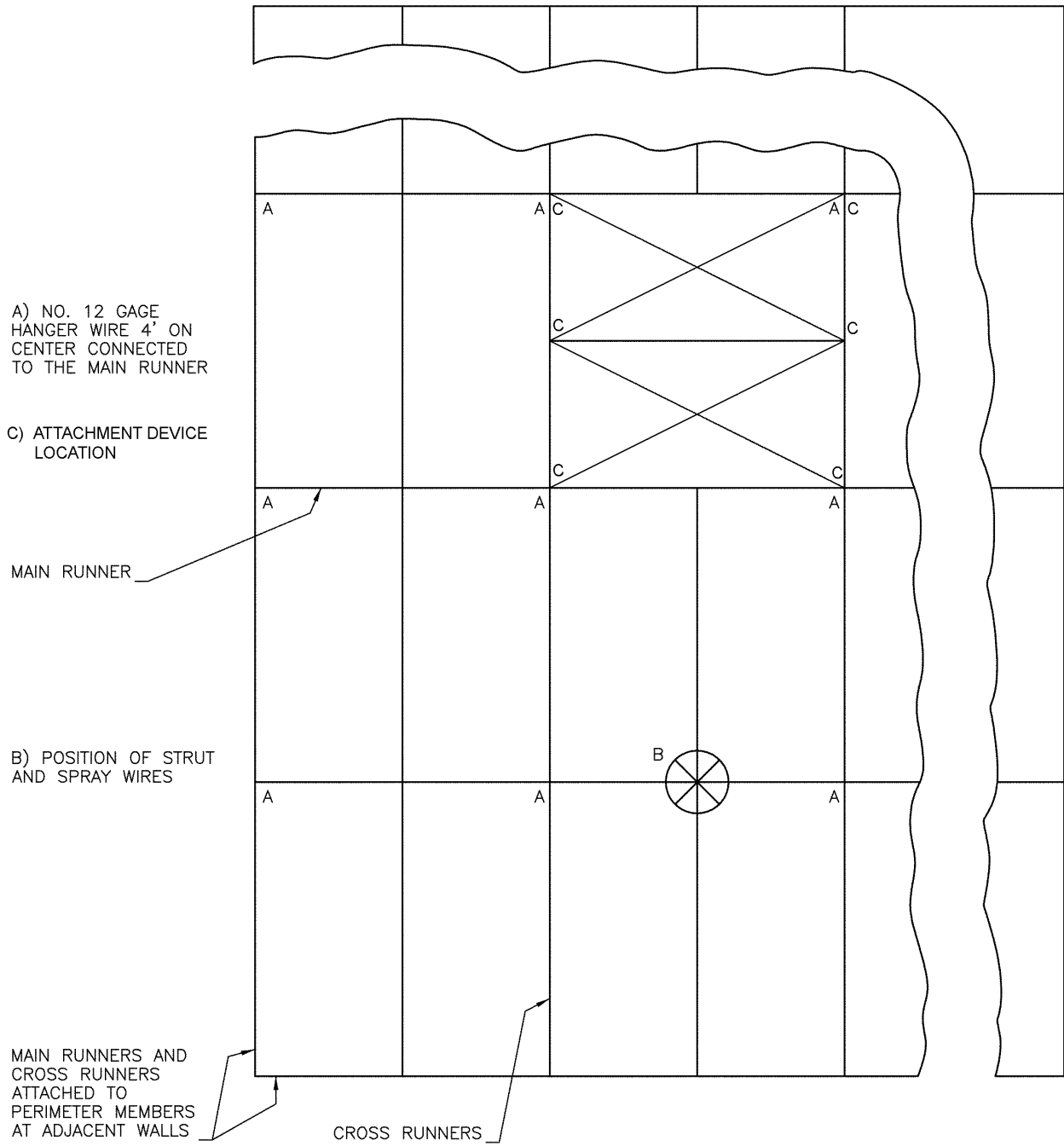
**FIGURE 5—TWO LIGHT FIXTURES (LUMINAIRES) PARALLEL TO MAIN RUNNERS, END TO END**

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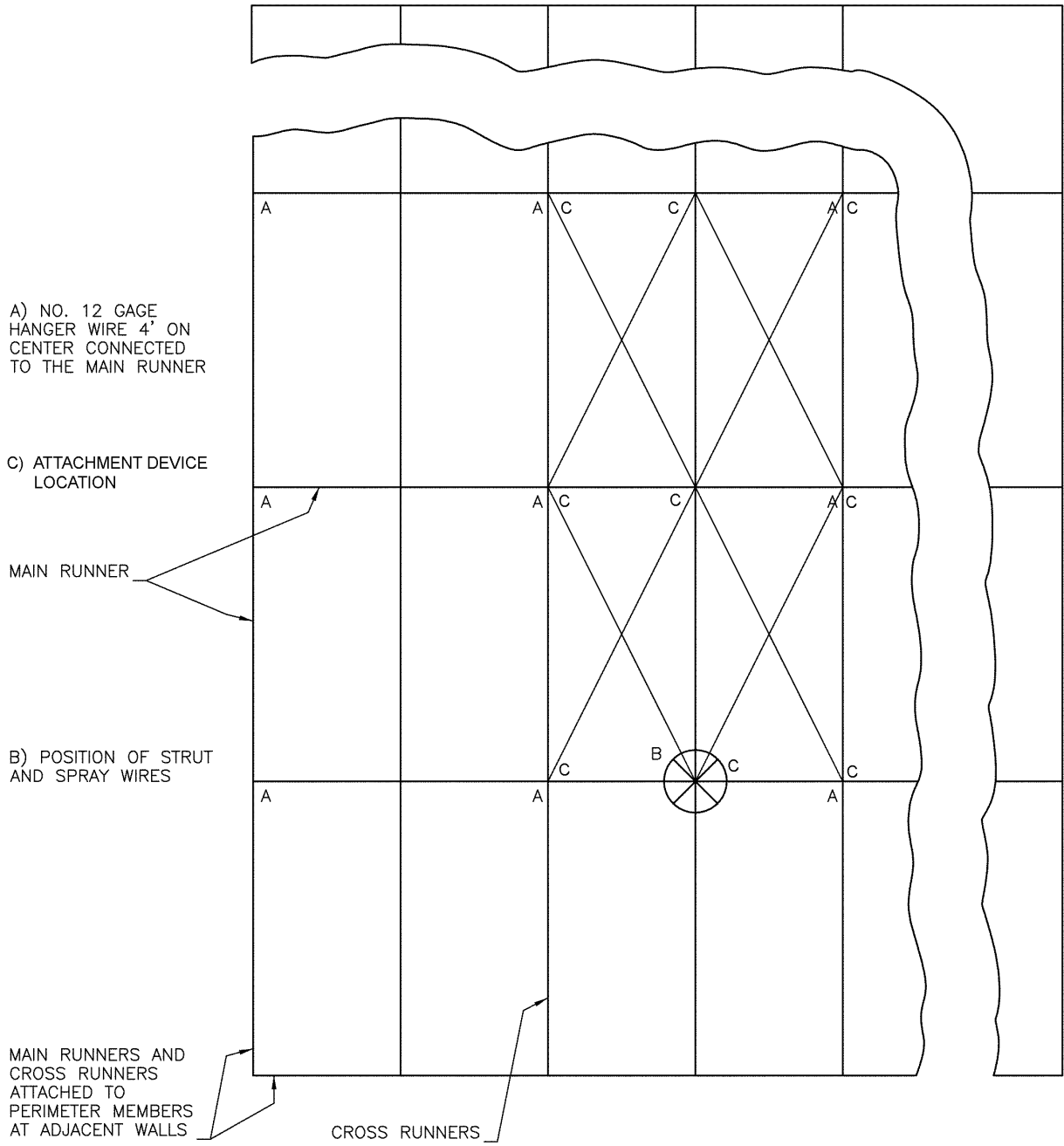
**FIGURE 6—TWO LIGHT FIXTURES (LUMINAIRES) PERPENDICULAR TO MAIN RUNNERS, SIDE TO SIDE**

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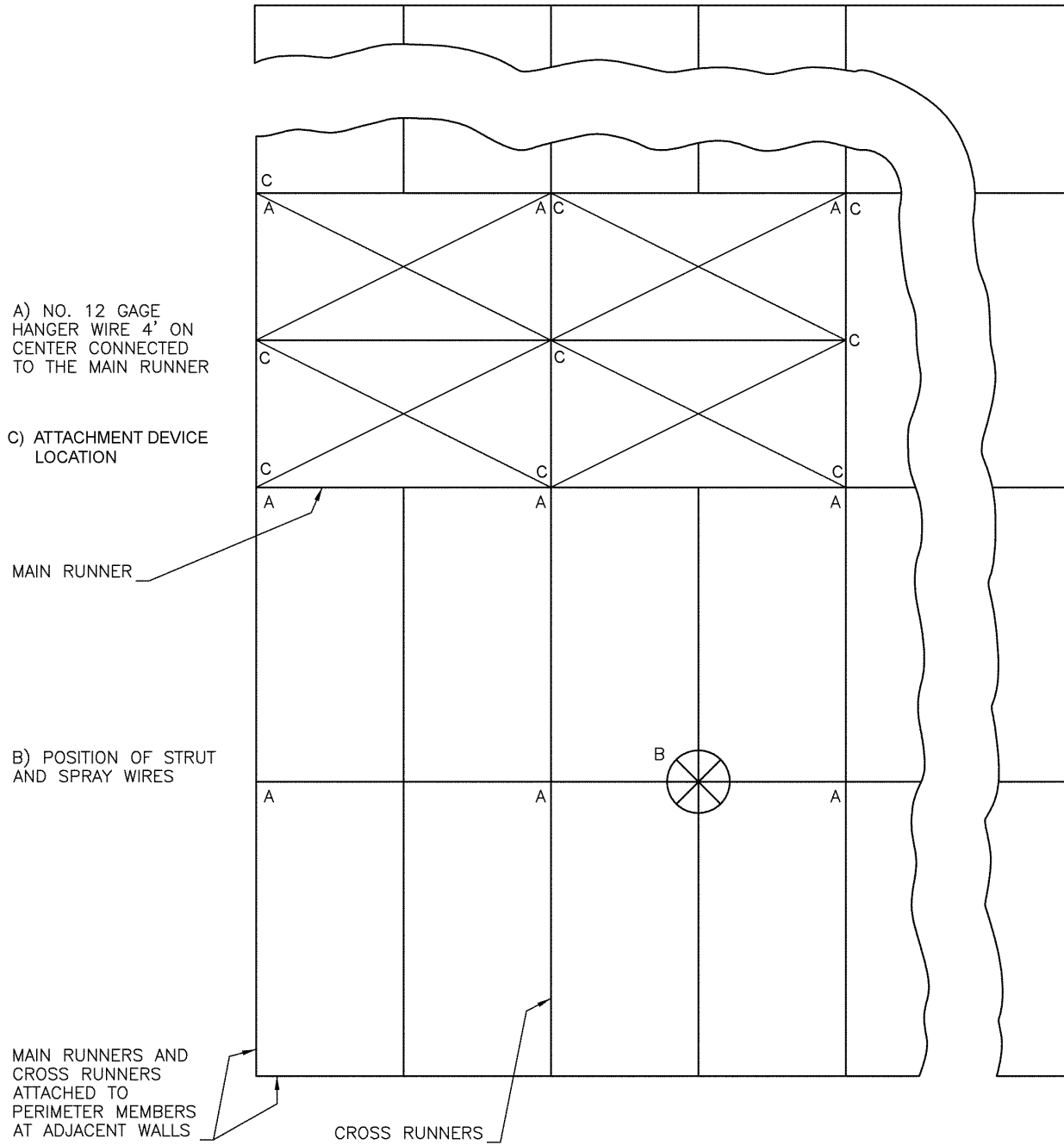
**FIGURE 7—TWO LIGHT FIXTURES (LUMINAIRES) PARALLEL TO MAIN RUNNERS, SIDE TO SIDE**

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**FIGURE 8—FOUR LIGHT FIXTURES (LUMINAIRES) PERPENDICULAR TO MAIN RUNNERS, SIDE TO SIDE AND END TO END**

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**FIGURE 9—FOUR LIGHT FIXTURES (LUMINAIRES) PARALLEL TO MAIN RUNNERS, SIDE TO SIDE AND END TO END**