

ICC-ES Evaluation Report

ESR-1289

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DIVISION: 09 00 00—FINISHES
Section: 09 22 26—Suspension Systems

REPORT HOLDER:

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EVALUATION SUBJECT:

FIRE-RESISTANCE-RATED AND NONFIRE-RESISTANCE-RATED SUSPENDED CEILING SYSTEMS

ADDITIONAL LISTEE:

ARMSTRONG WORLD INDUSTRIES
POST OFFICE BOX 3001
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1.0 EVALUATION SCOPE

Compliance with the following code:

- 2015, 2012, 2009 and 2006 *International Building Code*® (IBC)
- * ■ ~~2013 *Abu Dhabi International Building Code* (ADIBC)†~~

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Properties evaluated:

- Exterior and interior finish
- Fire-resistance
- Structural

2.0 USES

The suspended ceiling systems described in this report are suspended or direct-hung, concealed framing, ceiling assemblies used in fire-resistance-rated and nonfire-resistance-rated construction for both exterior and interior applications.

3.0 DESCRIPTION

3.1 General:

The 8900 series ceiling system is designed for screw-attached wood panels (complying with DOC PS 1 or

PS 2) of nonfire-resistance-rated or screw-attached gypsum wall board (complying with ASTM C36 or ASTM C1396) ceiling panels of fire-resistance-rated, interior roof and/or floor-ceiling assemblies.

The XL 7936 series ceiling system is designed for interior or exterior nonfire-resistance-rated roof-ceiling and/or floor-ceiling assemblies. For exterior ceilings without weather-exposed surfaces, as defined in IBC Section 2502, the system is designed for screw-attached gypsum sheathing (complying with ASTM C79 or ASTM C1396). For exterior weather-exposed surfaces, the system is designed for screw-attached metal lath (complying with ASTM C847) with three coats of cement (Type I or II portland cement complying with ASTM C150) plaster finish.

3.2 Components:

3.2.1 Main Runners: Main runners used in both the 8900 series ceiling systems and XL 7936 series ceiling systems are the 8900 (Drywall Stucco and Plaster System) series main runners. All main runners are classified as heavy-duty in accordance with ASTM C635. The main runners have an inverted T-shape and double web. The double web section is rotary-stitched together with a knurled lower flange for screw penetration, and is reverse-folded over for screw retention along the entire length of the bottom flange. The runners are cold-formed from ASTM A653, CS Type B steel, and have a hot dipped, galvanized G-40 coating for interior ceilings or a G-90 coating for exterior ceilings. Table 1 and Figure 1 specify the dimensions, lengths and allowable transverse loads.

The HD 8906, HD8906IIC and HD890610 main runners for fire-resistance-rated systems have an added end-coupling for temperature expansion relief, and additional routs for added cross-runner spacing to accommodate field assembly of NEMA Type F lighting in nonfire-rated installations.

The SP-135 main runners for stucco systems are non-fire-resistance-rated systems. SP-135 main runner rout spacing is designed for cross-runner spacing of 13¹/₂ inches (343 mm) on center to accommodate stucco lathing.

The main runner has lengths and routing that allow the ceiling framing system to be assembled in the field without field-cutting or screw fastening.

3.2.2 Cross Runners: Cross runners include the XL 7936 (Stucco System) series and the 8900 (Drywall Stucco and Plaster System) series.

The XL 7936 (Stucco System) cross runners have an inverted T-shaped double web. The cross runners are cold-formed from 0.018-inch-thick (No. 26 MSG) steel that conforms to ASTM A653, CS Type B, and have a hot-dipped galvanized G-40 coating for interior ceilings or a G-90 coating for exterior ceiling. The double web section is rotary-stitched together with a knurled lower flange for screw penetration, and a reverse-folded over for screw retention along the entire length of the bottom flange.

The 8900 (Drywall Stucco and Plaster System) series cross runners have an inverted T-shape and a double web. The cross runners are cold-formed from 0.018-inch-thick (No. 26 MSG) and 0.015-inch-thick steel that conforms to ASTM A653, CS Type B, and have a hot-dipped galvanized G-40 coating for interior ceilings or a G-90 coating for exterior ceilings. The double web section is rotary-stitched together with a knurled lower flange for screw penetration, and a reverse-folded hem for screw retention along the entire length of the bottom flange. Table 2 and Figure 1 specify dimensions, lengths, and allowable transverse loads.

The XL 8947, XL 8947P, XL 8925 and XL 7918 cross runners are used to accommodate NEMA Type F lighting fixtures. These cross runners have factory-knurled reverse hems at the lower flange to receive screws.

The 8900 (Drywall Stucco and Plaster System) series includes cross runners for both fire-resistance-rated and nonfire-resistance-rated drywall ceiling assemblies. XL 8965, XL 8947, XL 8947P, XL 8945, XL 8945P, XL 8341, XL 8925, XL 8926 and XL 7918 cross tees are used in fire-resistance-rated drywall assemblies, while XL 8947, XL 8947P, XL 8926, XL 8925 and XL 7918 cross tees are used in nonfire-resistance-rated assemblies. The cross tees have additional routs to accommodate a full flange opening for NEMA Type F lighting fixtures. The additional routs allow field assembly of the gypsum board ceiling framing without cutting or fastening.

3.2.3 Hanger Wire: Hanger wire for suspended ceilings other than plaster, and any fixtures, must comply with IBC Section 2506.2.1. Hanger wires for plaster ceiling framing systems must comply with ASTM C1063 for use under the IBC. For exterior applications, corrosion-resistant hanger wires, fasteners and accessories must be used.

3.2.4 Accessories: Each system has accessory items that include support angles and corner caps. Steel for accessory items complies with ASTM A568 designation 1008 or 1010, and has a G40, or G90 galvanization coating designation in accordance with ASTM A653.

3.3 The 8900 (Drywall System) Series Two-hour Fire-resistance-rated Suspended Ceiling System:

The 8900 series concealed grid system is part of a two-hour, fire-resistance-rated roof-ceiling or floor-ceiling assembly. The rating applies to restrained and unrestrained assemblies as described in IBC Section 703.2. Figure 2 shows assembly details. General requirements in IBC Section 711 must be observed.

4.0 INSTALLATION

4.1 General:

The suspended ceiling system must be installed in accordance with this report and the manufacturer's published installation instructions. Except for installations

with plaster ceilings, the suspended ceiling system must be installed in accordance with 2015, 2012 and 2009 IBC Section 808.1.1.1 (2006 IBC Section 803.9.1.1) for systems exceeding 4 psf and less than 10 psf, as applicable. The minimum tension and compression capacity of framing member connections is 180 pounds (800 N). For plaster ceilings, the suspended ceiling system must be installed in accordance with IBC Sections 2510 and 2512.

4.2 Main Runners:

Main runners must be installed and leveled to within $\frac{1}{4}$ inch in 10 feet (6.4 mm in 3048 mm), with the supporting wire taut. Vertical support hanger wire must be installed within 6 inches (152 mm) of the main runner fire expansion relief. The design loads for main runners must be less than or equal to the capacities allowed in Table 1 of this report. Supports for the main runners that consist of vertical hangers, perimeter hangers, and lateral force bracing must be installed in accordance with the applicable code.

4.3 Cross Runners:

Main runners, or other cross runners, must support cross runners to within $\frac{1}{32}$ inch (0.80 mm) of the required center-to-center spacing. This tolerance must be noncumulative beyond 12 feet (3658 mm). Intersecting runners must be installed to form a right angle to the supporting members.

The maximum design loads for cross runners must be less than or equal to the capacities allowed in Table 1 of this report. A cross runner that supports another cross member must have a minimum uniformly distributed load capacity of 12 pounds per linear foot (175 N/m).

4.4 Seismic Design:

4.4.1 Seismic Design Requirements under the 2015 and 2012 IBC: Suspended ceilings constructed of lath and plaster or gypsum boards, screw or nail attached to suspended members that are surrounded by and connected to walls or soffits that are laterally braced to the structure above, are **exempt** from the provisions found in Section 13.5.6 of ASCE 7-10 as referenced in IBC Section 1613, and must be designed and installed to support the lateral loads determined in accordance with Section 13.3 of ASCE 7-10.

4.4.2 Seismic Design Requirements under the 2009 and 2006 IBC: Seismic design and installation details of the ceiling system must be in accordance with Section 13.5.6 of ASCE 7-05 as referenced in IBC Section 1613. Suspended Ceilings constructed of lath and plaster or gypsum boards, screw or nail attached to suspended members that support a ceiling on one level extending from wall to wall, are **exempt** the lateral load design requirements of CISCA 3-4.

4.5 Partitions:

The partitions must be laterally supported as required by Section 13.5.8 of ASCE 7 as referenced in IBC Section 1613.

4.6 Gypsum Wallboard Attachment:

Gypsum wallboard must be installed and fastened to the ceiling framing system in accordance with IBC Section 2508.

4.7 Plaster Attachment:

Metal plaster bases must be installed in accordance with ASTM C1063. To attach the lath, minimum 1-inch-long,

No. 8, Type S, oval head screws per ASTM C1002 must be used. These screws must secure the metal lath to the runners and perimeter members at 6 inches (305 mm) on center in accordance with IBC Section 2510.

4.8 Special Inspection:

Suspended ceilings in Seismic Design Categories D, E or F must be subjected to periodic special inspection during anchorage of suspended ceilings in accordance with the requirements of IBC Section 2506.2.1 and Section 11A.1.3.9, Item 2 of ASCE 7-10 for recognition under the 2015 and 2012 IBC (Section 13.5.6.2.2 (h) of ASCE 7-05 for recognition under the 2009 and 2006 IBC). The special inspector must verify that the ceiling system is as described in this report, and complies with the installation instructions in this report.

5.0 CONDITIONS OF USE

The suspended ceiling systems described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The ceiling suspension main and cross runners are fabricated and installed in accordance with this report and the manufacturer's published installation instructions. In the event of a conflict between the manufacturer's installation instructions and this report, this report governs.
- 5.2 Design loads and spans of main and cross runners must comply with Tables 1 and 2 of this report.
- 5.3 Suspended ceiling systems must be designed to resist the lateral loads determined in accordance with Section 13.3 of ASCE 7-10 for recognition under the 2015 and 2012 IBC (and in accordance with ASCE 7-05, Section 13.5.6, for recognition under the 2009 and 2006 IBC). The documents must be prepared by a registered design professional where required by statutes of the jurisdiction in which the project is to be constructed.
- 5.4 For Seismic Design Categories C, D, E or F, a quality assurance plan complying with ASCE 7, Section 11A, must be submitted to the code official.
- 5.5 Periodic special inspections must be provided in accordance with Section 4.8 of this report and ASCE 7-10 (for 2015 and 2012 IBC) and ASCE 7-05 (for 2009 and 2006 IBC), Section 11A.1.3.9, Item 2 of ASCE 7, Section 13.5.6.2.2, and item h of ASCE 7-05. A statement of special inspection must be provided as required in 2015 and 2012 IBC Section 1704.3 (2009 and 2006 IBC Section 1705.3, Item 4.3).
- 5.6 The ceiling framing systems must not be used to provide lateral support for walls or partitions, except as provided for in ASCE 7, Section 13.5.8.1.
- 5.7 The ceiling systems must be designed to resist seismic forces as determined from Section 1613 of the IBC.
- 5.8 The supporting construction of the ceiling system has not been evaluated and is outside the scope of this evaluation report. The code official must approve the roof or floor construction supporting the suspended ceiling system.
- 5.9 The ceiling systems are limited to ceilings not considered accessible in accordance with Item 28 of 2015 and 2012 IBC Table 1607.1 (Item 32 of 2009 and 2006 IBC Table 1607.1).
- 5.10 For exterior ceiling installations, the ceiling systems must be designed for wind loads.
- 5.11 Light fixtures must be positively attached to the suspended ceiling system with connectors having a minimum capacity, in any direction, of 100 percent of the lighting fixture weight. Lighting fixtures may also be attached to the grid with clips complying with the ICC-ES Acceptance Criteria for Attachment Devices for Recessed Light Fixtures (Luminaires) in Suspended Ceiling Systems (AC184).

6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with ICC-ES Acceptance Criteria for Suspended Ceiling Framing Systems (AC368), Approved July 2015.
- 6.2 Reports of fire-resistance tests in accordance with ASTM E119 (UL 263).

7.0 IDENTIFICATION

Cartons of all products are identified with the name and address of Armstrong World Industries, Inc., the evaluation report number (ESR-1289) and the word "WAVE."

TABLE 1—DIMENSIONS AND ALLOWABLE LOADS FOR MAIN RUNNERS¹

CATALOG NUMBER	TYPE	LENGTH (inches)	BASE-METAL THICKNESS (inch)	MAXIMUM SPAN (feet)	ALLOWABLE LOADS
					Simple Span Uniform Load (lb./lin. ft.)
HD 8901	A	144	0.018	4	16.5
HD 8906	O	144	0.018	4	18.66
HD8906 IIC	O	144	0.018	4	18.56
HD890610	O	120	0.018	4	18.66
SP 135	O	135	0.018	4	18.66

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 plf = 14.59 N/m, 1 lbf = 4.448 N.

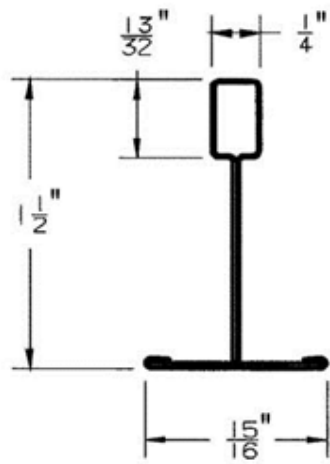
¹Runner web is stitched.

TABLE 2—DIMENSIONS AND ALLOWABLE LOADS FOR CROSS RUNNERS

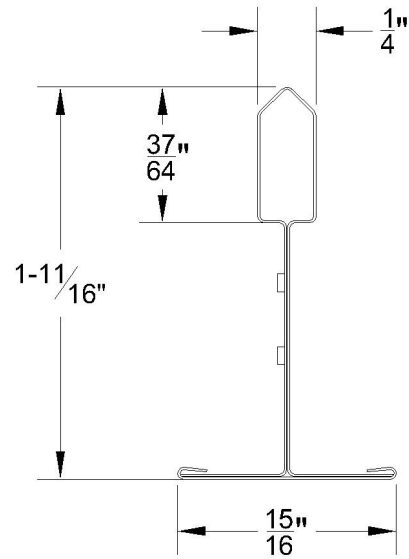
CATALOG NUMBER	TYPE	LENGTH (inches)	BASE-METAL THICKNESS (inch)	MAXIMUM SPAN (feet)	ALLOWABLE LOADS
					Simple Span Uniform Load (lb./lin. ft.)
XL 8947	O	49.75	0.018	4.14	16.35
XL 8947P	P	49.75	0.018	4.14	12.79
XL 8945	O	48	0.018	4	17.83
XL 8945P ¹	P	48	0.018	4	14.27
XL 7936	P	36	0.018	3	31.33
XL 8925	P	25.75	0.018	2.14	76.07
XL 8926	P	24	0.018	2	90.25
XL 7918	P	13.75	0.018	1.14	31.33
XL 8341	B	48	0.015	4	16.06
XL 8965 ¹	P	72	0.018	6	4.58

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 plf = 14.59 N/m, 1 lbf = 4.448 N.

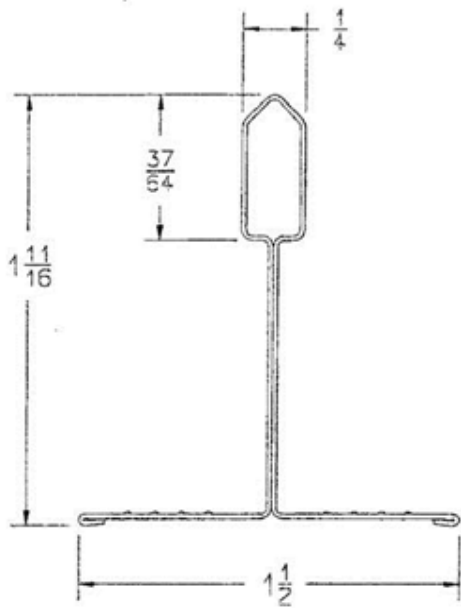
¹Cross tee recognized for used in the fire-resistance-rated assembly described in Figure 2 of this report.



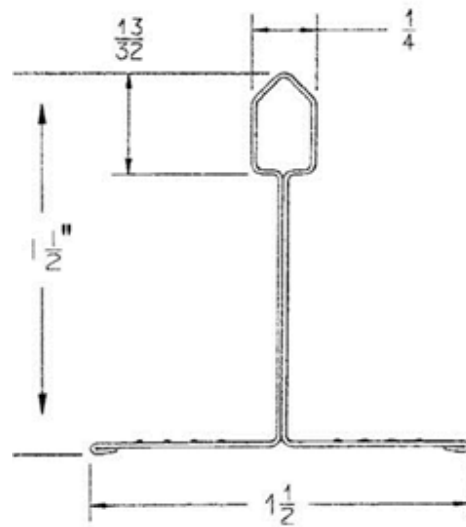
TYPE A



TYPE B



TYPE O



TYPE P

FIGURE 1

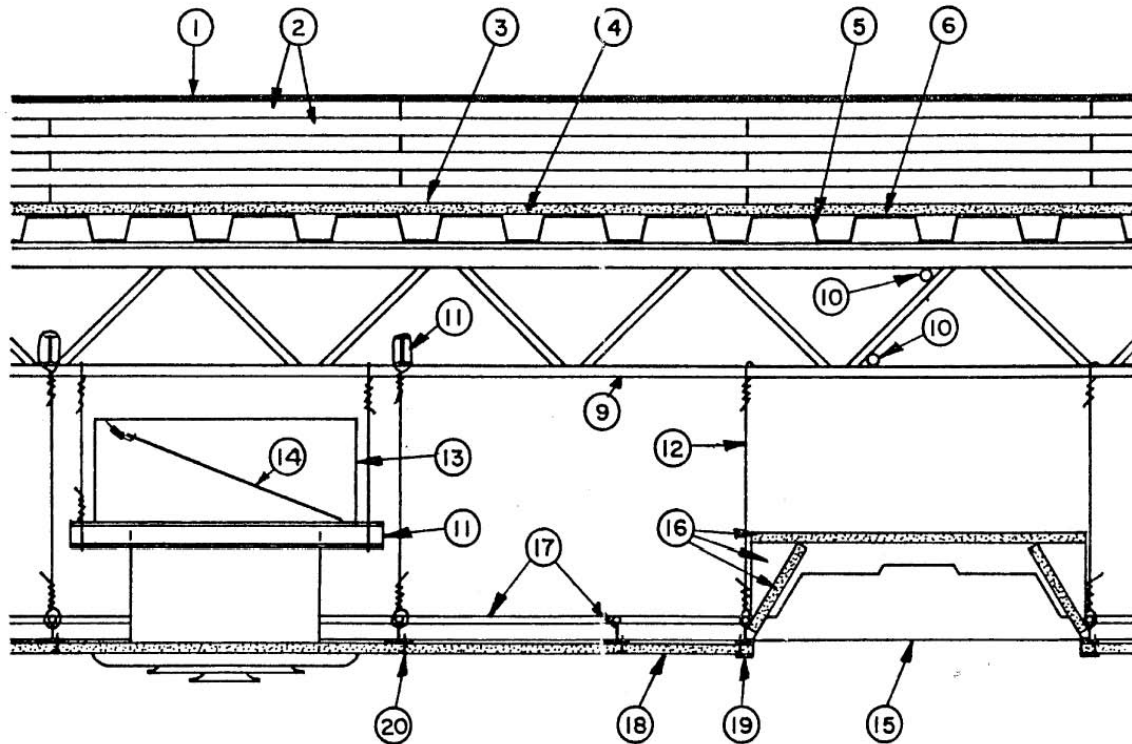


FIGURE 2—SERIES 8900 TWO-HOUR-FIRE-RESISTANCE-RATED ASSEMBLY

For **SI**: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 4.88 kg/m², 1 gallon = 3.8 L, 1 sq. ft. = 0.0929 m², 1 psi = 6.89 kPa, 1 lbm = 0.45 kg, 1 sq. in. = 645.16 mm².

1. **Roof Covering:** Roof covering consisting of hot-mopped or cold-application materials compatible with insulation(s) described in Item 2 that provide Class A, B or C coverings.
2. **Roof Insulation—Mineral and Fiber Boards:** The boards must comply with ASTM C612, Type IA or IB. Nominal 1-inch-thick minimum, 24-inch-by-48-inch or larger. To be applied in six layers as follows:
 - A. May be loosely laid on top of gypsum sheathing (Item 4).
 - B. May be fastened to steel roof deck (through gypsum sheathing) with mechanical fasteners (Item 7).
 - C. May be bonded to gypsum sheathing with adhesive.
 - D. Individual layers of mineral and fiber boards above the mechanical fasteners, if used, may be bonded to the bottom layer and to each other with adhesive or hot asphalt.

First layer to be installed perpendicular to gypsum sheathing direction, with end joints staggered 2 feet in adjacent rows. Each layer of boards must be offset, in both directions, from layer below a minimum of 12 inches in order to lap all joints.
3. **Sheathing Material (Optional):** Vinyl film or paper scrim vapor barrier, applied with adhesive to the gypsum sheathing. Adjacent sheets overlapped 2 inches.
4. **Gypsum Sheathing:** Water-resistant core gypsum sheathing complying with ASTM C79. Supplied in sheets nominally 2 by 4 feet to 4 by 12 feet, by nominal ⁵/₈ inch thick. Minimum weight is 2.0 psf. Applied perpendicular to the steel roof deck direction, with or without adhesive or mechanical fasteners through the insulation. End joints to occur over crests of steel roof deck, with end joints staggered 1 foot or more in adjacent rows.
5. **Steel Roof Deck:** Minimum 1½-inch-deep, nominal 36-inch-wide fluted units, minimum 0.029-inch-thick (No. 22 gage) galvanized steel. Welded to supports with ½-inch puddle welds, through welding washers. Side lap joints of adjacent units are welded or secured together with No. 8 by ¾-inch-long, self-drilling, self-tapping steel screws midway between steel joists.
6. **Adhesive (Optional):** Applied to the crest of the steel roof deck in ½-inch-wide ribbons at a rate of 0.4 gallon per 100 square feet (approximately 6 inches on center). Applied in ½-inch-wide ribbons at 0.4 gallon per 100 square feet between the vapor barrier and the gypsum sheathing, and between the sheathing and the first layer of roof insulation.
7. **Mechanical Fasteners (Optional):** (Not shown) Insulation clips with discs may be used to secure roof insulation to the steel roof deck (through gypsum sheathing). Clips are 3¼ inches long, having a shank diameter of 0.203 inch. Clips designed so that their tips "lock" against the underside of the steel roof deck. Steel discs are 2⅞ inches in diameter, and 0.030 inch thick. Fastener spacing is per manufacturer's specifications.
8. **Hot Asphalt or Coal Tar Pitch (Optional):** (Not shown) May be applied between layers of roof insulation when applied at a rate not exceeding 25 lbs. /100 sq. ft.
9. **Steel Joists:** Type 8H3 or 10K1, minimum size; spaced 48 inches on center, welded to end supports. NOTE: Design load must stress 8H3 joists to maximum bending stress of 22,000 psi.
10. **Bridging:** Minimum ½-inch-diameter steel rods are welded to top and bottom chords of each joist.

FIGURE 2—SERIES 8900 TWO-HOUR FIRE-RESISTANCE-RATED ASSEMBLY (Continued)

11. **Cold-rolled Channels:** Minimum 0.060-inch-thick (No. 16 gage) cold-rolled steel channels, 1¹/₂ inches deep with ⁹/₁₆-inch flanges. Two channels are tied together back-to-back with 16 SWG galvanized steel wire and are then wire-tied to top of joist lower chord with minimum 16 SWG galvanized steel wire, spaced as required to provide attachment provision for ceiling hanger wires between steel joists.
12. **Hanger Wire:** Number 12 SWG galvanized steel wire, twist-tied to bottom chord of joists or cold-rolled steel channels. Hanger wires are spaced 48 inches on center along main runners (at every other main runner/cross tee intersection). Hanger wires also to occur at all four corners of light fixtures, at midspan of cross tees adjacent to light fixtures and air-duct outlets, and adjacent to each main runner splice.
13. **Air Duct:** Number 22 MSG (minimum) galvanized steel. Total area of duct opening not to exceed 225 square inches per 100 square feet of ceiling area. Total area of individual duct openings is not to exceed 225 square inches. Maximum opening dimension is 18 inches. Inside and outside faces of duct throat must be protected with ¹/₁₆-inch-thick ceramic fiber paper, laminated to the metal. Duct supported by 1¹/₂-inch-deep, No. 16 MSG cold-rolled steel channels spaced not over 48 inches on center, suspended by No. 12 SWG galvanized steel wire.
14. **Damper:** Number 16 MSG minimum galvanized steel, sized to overlap duct opening 2 inches, minimum. Protected on both sides with ¹/₁₆-inch-thick ceramic fiber paper, laminated to the metal and held open with a fusible link.
15. **Fixtures, Recessed Light:** Fluorescent-lamp-type steel housing, 2-by-4-foot size. Fixtures must be spaced so their total area does not exceed 24 square feet per each 100 square feet of ceiling area, and wired in conformance with the National Electrical Code.
16. **Fixture Protection—Gypsum Wallboard:** Same as Item 18. Cut to form a five-sided enclosure, trapezoidal in cross section, at least 1¹/₄ inches higher than the light fixture housing. The fixture protection consists of a 23³/₄-inch-by-49-inch top piece, two 47³/₄-inch-long side pieces and two 23³/₄-inch-long end pieces. The top edge of each fixture protection side piece may be notched 1 inch deep by 10 inches long near its midpoint.
17. **Steel Framing Members—Armstrong World Industries, Inc.:** Type 8900 Drywall stucco and plaster system main runners are nominally 12 feet long, and are spaced 48 or 72 inches on center. Ends of main runners at walls to rest on wall angle, and screw-attached to wall angle. Primary cross tees (1¹/₂ inches wide across flange) or cross channels, nominally 4 or 6 feet long, are installed perpendicular to main runners and spaced 24 inches on center. Additional primary cross tees or cross channels are required at each wallboard end joint, 8 inches from, and on each side of, the wallboard end joint, and 8 inches from each side of light fixtures. When light fixtures are used in combination with 6 foot long cross tees to create modules to accommodate nominal 1 foot by 2 foot, 1 foot by 4 foot, 2 foot by 2 foot and 2 foot by 4 foot light fixtures, additional lengths of cross tee to be installed between the 6 foot long cross tees at each end of each nominal 14 inch, 26 inch or 50 inch long cross tee forming a light fixture module. Ends of these additional lengths of cross tee are to engage cross tee routs at end of fixture and are to be screwed or riveted to nominal 6 foot long cross tee at opposite end. Additional short lengths of cross tee to be installed perpendicular to main runners near center of nominal 50 inch long cross tee on each side of 1 foot by 4 foot or 2 foot by 4 foot light fixture which is installed with its long dimension parallel with the main runners. Ends of these additional short lengths of cross tee are to engage rout of main runner at one end and are to be screwed or riveted to nominal 50 inch long cross tee at opposite end.
18. **Wallboard, Gypsum:** Five-eighths-inch-thick, Certainteed Gypsum Inc. Type C, 4-foot-wide gypsum wallboard is installed with the long dimension perpendicular to the cross tees, with side joints beneath or between main runners and end joints staggered minimum 4 feet and centered between cross tees which must be spaced 8 inches on center. Prior to installation of the gypsum wallboard sheets, backer strips consisting of nominal 7.75-inch-wide pieces of gypsum wallboard are to be laid atop the cross tee flanges and centered over each butted end joint location. The backer strips must be secured to the flanges of the cross tees at opposite corners of board sheets. Gypsum wallboard is fastened to each cross tee with 1-inch long Type S drywall screws spaced 1 inch and 4 inch from the side joints and maximum 8 inches on center in the field of the board when 6 foot long cross tees are used or 12 inches on center in the field of the board when 4 foot long cross tees are used. The butted end joints must be secured to the backer strip with No. 10 by 1.5-inch long type G laminating screws located 1 inch from each side of the butted end joint and spaced 1 inch and 4 inches from the side joints and spaced maximum 8 inches on center in the field of the board. End joints of adjacent wallboard sheets must be staggered not less than 4 feet on center. Gypsum wallboard is fastened to leg of wall angle with 1-inch long Type S drywall screws spaced 12 inches on center. Joints to be covered with paper tape and joint compound.
19. **Metal Trim Molding:** Number 25 MSG galvanized steel, measuring ⁵/₈ inch deep, with ¹/₂- and 1-inch-long legs. Placed over and against wallboard edges around light fixtures, with the 1-inch leg facing down and fastened to the cross tees and main runners with 1⁵/₁₆-inch-long screws. Spacing of screws approximately 8 inches on center along 4-foot side, and 10 inches on center along 2-foot side, of light fixtures.
20. **Screw, Wallboard:** Number 6, Type S, 1- and 1⁵/₁₆-inch-long, self-drilling and self-tapping screws.
21. **Finishing System:** (Not shown) Paper tape embedded in joint compound over joints, and covered with additional compound with edges feathered out. Wallboard screw heads covered with two layers of compound.
22. **Wall Angle:** (Not shown) Number 24 MSG painted steel with 1⁷/₁₆-inch legs. Nailed to walls around perimeter of ceiling to support steel framing member ends and to permit screw attachment of the gypsum wallboard.