

Design No. P908

Restrained Assembly Ratings — 1, 1-1/2 or 2 Hr.

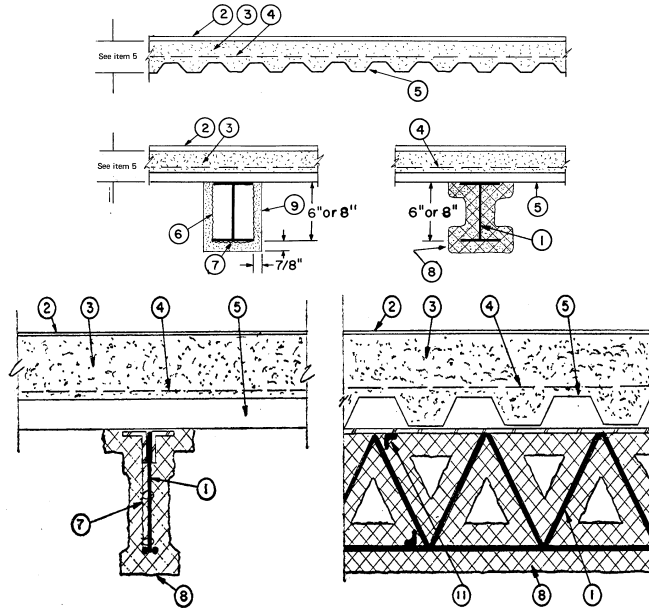
(See Items 1, 4, 5 and 8)

Unrestrained Assembly Rating — 0, 1-1/2, or 2 Hr. (See Item 5)

Unrestrained Beam Ratings — 1, 1-1/2 or 2 Hr.

(See Items 1, 4, 5, 7A and 8)

Load Restricted for Canadian Applications — See Guide BXUV7



1. **Steel Beam** — W6x16, W8x10, W8x18 or W8x28, min size or Types 10K1, 12J4, 14K4 or 16K3 min size steel joists. See Item 8. As alternate to wide flange steel beams, joist girders-(Not shown)-20 in. min depth and 13 lb/lin ft min weight.
2. **Roof Covering*** — Consisting of hot mopped or cold application materials compatible with insulation(s) described herein which provide Class A, B or C coverings. See Roofing Materials and Systems Directory-Roof Covering Materials (TEVT).
- 2A. **In lieu of Item 2, roof covering consisting of single-ply Roofing Membrane*** — that is either ballasted, adhered or mechanically attached as permitted under the respective manufacturer's Classification. See Fire Resistance Directory-Roofing Membranes (CHCI).
3. **Insulating Concrete** — various types of insulating concrete prepared and applied in the thickness indicated below:
 - A. **Vermiculite Concrete** — 6 cu ft of vermiculite aggregate* to 94 lb of Portland cement and 0.11 lb of air entraining agent mixed with approx 25 gal of water. Min compressive strength shall be 125 psi when tested in accordance with ASTM C495. Vermiculite concrete shall be poured to a depth sufficient to provide a min thickness of 2-1/4 in. to the crests of steel roof deck units (Item 5) and to provide a min volume of 24.5 cu ft per 100 sq ft of roof deck area.
 MANDOVAL LTD
 MANDOVAL VERMICULITE PRODUCTS INC
 PALMETTO VERMICULITE CO
 SIPLAST INC
 THE STRONG CO INC
 VERMICULITE PRODUCTS INC
 - B. **Cellular Concrete — Roof Topping Mixture*** — Foam concentrate mixed with water and Portland cement per manufacturer's specifications. Cast dry density and 28-day compressive strength of min 190 psi as determined in accordance with ASTM C495-66. Thickness to be 2-3/4 in. min from the top plane of steel roof deck.
 CELCORE INC — Type Celcore with cast dry density of 31 (+ or - 3.0) pcf or Type Celcore MF with cast dry density of 29 (+ or - 3.0) pcf.
 CELLULAR CONCRETE L L C —Cast dry density 37 (+ or -) 3.0 pcf.
 CONCRECEL INTERNATIONAL INC — Cast dry density 38 (+ or -) 3.0 pcf.
 ELASTIZELL CORP OF AMERICA —Type II. Mix #1 of cast dry density 39 (+ or -) 3.0 pcf, Mix #2 of cast dry density 40 (+ or -) 3.0 pcf, Mix #3 of cast dry density 47 (+ or -) 3.0 pcf.
 LITE-CRETE INC —Cast dry density of 29 (+ or -) 3.0 pcf.
 SIPLAST INC —Mix #2. Cast dry density of 36 (+ or -) 3.0 pcf.
 - C. **Perlite Concrete** — 6 cu ft of perlite aggregate* to 94 lb of Portland cement and 1-1/2 pints of air entraining agent. Thickness of perlite concrete topping to be 2-1/4 in. min as measured to the top plane of the steel form units.
 See **Perlite Aggregate (CFFX)** in Fire Resistance Directory for names of manufacturers.
 - D. **Cellular Concrete — Roof Topping Mixture*** — Foam Concentrate mixed with water, Portland Cement and UL Classified Vermiculite Aggregate per manufacturer's application instructions. Cast dry density of 33 (+ or -) 3.0 pcf and 28-day compressive strength of min 250 psi as determined in accordance with ASTM C495-86. The cellular concrete topping thickness shall be 2-3/4 in. min from the top plane of steel roof deck.
 CELLULAR CONCRETE L L C —Mix #3.
 SIPLAST INC —Mix #3.
4. **Reinforcing Mesh** — No. 19 SWG galv steel wire twisted to form hexagons 2 in. wide in addition, straight 16 SWG galv steel wire woven into the mesh and spaced 3 in. apart for stiffness. Mesh installed without attachment and overlapped 6 in. at the sides. Stiffeners installed parallel with corrugations. As an alternate, 4x8, 12/14 SWG or 2x2, 14/14 SWG welded wire fabric may be used. The reinforcing mesh may be omitted for the 1 hr ratings when the steel roof deck (Item 5) is loaded not more than 75 percent of its bending capacity.
5. **Steel Roof Deck — (Unclassified)** — Noncomposite design, 9/16, 15/16 in., 1-5/16 in. or 1-1/2 in. deep galv units, min. Welded to supports with 3/8 in. puddle welds through weld washers spaced 15 in. OC. Adjacent units overlapped one corrugation. Steel thickness to be No. 24 MSG min when supports are spaced not more than 8 ft OC, No. 26 MSG min when supports are spaced not more than 6 ft O.C. No. 28 MSG min when supports are spaced not more than 4 ft OC. When 9/16 or 15/16 in. deep units are used, their loadings shall be limited to produce a 75 percent max bending stresses in the steel, and the Restrained Assembly Rating shall not exceed 1-1/2 H. H Classified Steel Floor and Form Units*, which conform to the same installation, steel thickness, and loading

requirements as described for unclassified units may be used. Joint cover shall be 2 in. wide cloth adhesive tape applied following the contour of the steel form units. The Unrestrained Assembly Rating is 2 Hr when 1-5/16 in. deep corrugated units with clear spans not more than 7 ft, 7 in. are supported by W6X16 or W8X18 min size steel beams. The Unrestrained Assembly Rating is 1, 1-1/2 Hr when the 1-5/16 in. deep corrugated units with clear spans not more than 7 ft, 7 in. are supported by Type 12J4 steel joists. The loading of the steel roof deck shall not product more than 75 percent of the allowable bending stress of the steel when the reinforcing mesh (Item 4) is not used for the 1 hr rating. Perforated cellular units 6 in. deep, 24 in. wide, 18/18 MSG galv steel, with 2-1/2 in. thickness of vermiculite concrete as measured to the crests of the units may be used with spray-applied fireproofing on beam under the following conditions and subject to above installation specifications: (1) Floor units covering only single spans. A steel plate, min 26 MSG, shall be placed between ends of units over beam to prevent flow of hot gases through cells of units over beam. (2) To provide anchoring for fireproofing a line of steel studs with discs must be welded to underside of floor units on each side of beam approx 9 in. from edge of beam flange and spaced 24 in. OC. The studs shall be 1-1/8 in. long, 12 SWG galv steel wire with 28 MSG, 1-3/16 in. diam galv steel disc spot-welded to one end. Other end of stud welded to floor units. (3) The applicable required thickness of sprayed material shall extend onto the floor units for a 12 in. width beyond edges of beam upper flange and/or joist upper chord. (See Items 8, 8A, 8B below)

ASC STEEL DECK, DIV OF ASC PROFILES

INC —24 through 36 in. wide, Types DGB Hi-Form, B Hi-Form, DGB, B, BMOD, DGN Hi-Form, N Hi-Form, DGN, and N; 32 in. wide Type CP32. All units may be galvanized or Prime Shield™.

CANAM STEEL CORP — Type P-3606, P-3615, or P-3012

CENTRIA —Types 3, 21, 2" QL-99, 3" QL-99, 6" ADC.

CANAM STEEL CORP —Types B, N, UFS, UFX, UFX-36.

CONSOLIDATED SYSTEMS INC —Consoliform Types EHD, HD, S, SD.

DECK WEST INC —36 in. wide Type B-DW, BA-DW, 2-DW or 3-DW.

EPIC METALS CORP —Types "Metricform", MFB40, ER2R, ER3.5, ECA, ECA3.5, E324, E450, E600, E750, EP324, EP450, EP600, EP750, ED324, ED450, ED600, ED750, EDP324, EDP450, EDP600, EDP750, W450, W600, W750, WP450, WP600, WP750, Toris C, Toris CA, Toris 4, Toris 4CA.

MARLYN STEEL DECKS INC —Types B, EF, F, HE, N, NV, SF.

ROOF DECK INC —Types A, B-1, B-2, EHD Multi-Rib, F, LOK-2, LOK-3.

MORIN CORP —24, 30 or 36 in. wide Types LXR-B; 30 in. wide Types LXR-B-N-30 and LXR-B-N-30-I; 35 in. wide Types LXR-B-35 and LXR-B-35-I.

NEW MILLENNIUM BUILDING SYSTEMS L L C —Type 0.6 FD, 1.0FD, 1.5FD, 1.5FDR, 1.5FDI, 2.0FD, 3.0FD, B, BI, F, N Units may be phos/painted or galvanized.

VERCO DECKING INC - A NUCOR CO —Type "Vercor."

VULCRAFT, DIV OF NUCOR CORP —Types 0.6C, 0.6CPR, 1.0C, 1.3C, 1.5C, 2C, 3C, 1.5B, 1.5BI, 3N, 3NI.

6. **Hanger Wire** — No. 6 SWG galv steel wire, spaced 16 in. OC.

7. **Metal Lath** — (Optional) — Metal lath is used to facilitate the spray application of protection material on steel bar joists and trusses. The diamond mesh, 3/8 in. expanded steel lath, 1.7 to 3.4 lb per sq yd is secured to one side of each steel joist with 18 SWG galv steel wire at joist web and bottom chord members, spaced 15 in. OC max. When used, the metal lath is to be fully covered with protection material with no min thickness requirements, unless specified.

7A. **Non-Metallic Fabric Mesh** — (Optional, Not Shown) — As an alternate to metal lath, glass fiber fabric mesh, weighing approximately 2.5 oz per sq yd, polypropylene fabric mesh, weighing approximately 1.25 oz per sq yd or equivalent, is used to facilitate the spray application. The mesh is secured to one side of each joist web member. The method of attaching the mesh must be sufficient to hold the mesh and the spray-applied protection material in place during application until it has cured. An acceptable method to attach the mesh is by embedding the mesh in minimum 1/4 in. long beads of hot melted glue. The beads of glue shall be spaced a maximum of 12 in. OC along the top chord of the bar joist. Another method to secure the mesh is by 1-1/4 in. long by 1/2 in. wide hairpin clips formed from No. 18 SWG or heavier steel wire.

8. **Spray-Applied Fire Resistive Materials*** — Spray applied to beam or joist in 6 ne or more coat to the final thicknesses shown in the following table. Crest areas of steel roof units shall be filled with Spray-Applied Fire Resistive Materials above the beam or joist. Beam or joist surfaces must be clean and free of dirt, loose scale and oil. Min avg and min ind density of 15/14 pcf respectively. Min avg and min ind density of 19/18 pcf respectively for Types 7GP and 7HD. For method of density determination, refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Thkns In.		Min Thkns on 12J4,14K4 or 16K3 Joist (No. Lath) *	Min Thkns on 12J4,14K4 or 16K3 Joist (with Lath)
		Min Thkns on Beam W6x16	W8x10		
1	1	1	1-3/8	1-1/2+	1-1/2+
1-1/2	1-1/2	1-1/4	1-3/4	2-1/4	1-3/4
2	1-1/2	1-3/8	1-7/8	2-1/4	1-3/4
2	2	1-5/8	2-1/4	2-7/16	1-7/8

+For 1 hr Ratings, the min joist size shall be 14J7.

*Thickness applied to both sides of lath and joist. All surfaces of lath on both sides to be protected with the min required thickness of protection material.

ARABIAN VERMICULITE INDUSTRIES —Type MK-5.

W R GRACE & CO - CONN —Types MK-4, MK-5, MK-6/HY, MK-6S, RG, Monokote Acoustic 1.

GRACE KOREA INC —Types MK-6/CBF, MK-6/ED, MK-6/HY, MK-6S, Monokote Acoustic 1.

PYROK INC —Type LD.

SOUTHWEST FIREPROOFING PRODUCTS CO —Types 4, 5, 5EF, 5GP, 5MD, 7GP, 7HD, 8EF, 8GP, 8MD, 9EF, 9GP, 9MD.

For Type 12J4 steel joists, the joist protection shall consist of the above Spray-Applied Fire Resistive Materials applied in a manner and at the thicknesses shown below. When metal lath (Item 7) is used, lath secured to one side of joist with 18 SWG galv steel wire at joist web and bottom chord members spaced 15 in. OC.

Thk of Spray Applied Fire Resistive Mtl In.	Type of Application	Unrestrained Beam Rating Hr	Restrained Assembly Rating Hr
1-7/8	Applied to lath wrapped on one side of joist.*	1, 1-1/2, 2	1, 1-1/2, 2
2-1/4	Applied directly to joist in a contour manner.	1, 1-1/2	1, 2
2-7/16	Applied directly to joist in a contour manner.	2	—

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*Thickness applied to both sides of lath and joist. All surfaces of lath on both sides to be protected with the min required thickness of protection material.

8A. **Spray-Applied Fire Resistive Materials*** — As an alternate to Items 8 - Applied by mixing with water and spraying in one or more coats to the beam or joist surfaces which are free of oil, dirt or loose scale to the thicknesses shown in the table below. All areas between the steel deck and top flange of beam or joist shall be sprayed. Min average density of 15 and min individual value of 14, respectively. For method of density determination, see Design Information Section, Sprayed Material.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Min Thkns on Beam In. W6x16	Min Thkns * on 10K1 Joist In.
1	1	7/16	15/16 (1-1/16)
1-1/2 or 2	1-1/2	3/4	1-1/2
2	2	1-1/16	1-13/16

*Spray-Applied Fire Resistive Materials directly applied to joist contours. As an alternate, metal lath or nonmetallic fabric mesh secured to one side of joist to catch overspray when spraying following joist contours. Metal lath to be fully covered with Spray-Applied Fire Resistive Materials but with no min thickness requirements.

BERLIN CO LTD — Types 300, 300ES, 300N or SB.
ISOLATEK INTERNATIONAL —Types 300, 300AC, 300ES, 300HS, 300N, or SB
LUCKY CORE INSULATING MATERIALS
MANUFACTURING L L C —Types 300, 300ES, 300N, or SB.
NEWKEM PRODUCTS CORP —Types 300, 300ES, 300N, or SB.

8B. **Spray-Applied Fire Resistive Materials*** — As an alternate to Items 8 and, 8A - Applied by mixing with water and spraying in one or more coats to the beam or joist surfaces which are free of oil, dirt or loose scale to the thicknesses shown in the table below. All areas between the steel deck and top flange of beam or joist shall be sprayed. Min avg density of 17.5 pcf with min ind value of 17.0 pcf for Type 280. Min average density of 17.5 and min individual value of 16 for Type 300TW Min average and min individual density of 22 and 19 pcf, respectively, for Type 400. For method of density determination, see Design Information Section, Sprayed Material.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Min Thkns on Beam In. W6x16	Min Thkns * on 10K1 Joist In.
1	1	7/16	15/16 (1-1/16)
1-1/2 or 2	1-1/2	3/4	1-1/2
2	2	1-1/16	1-13/16

*Spray-Applied Fire Resistive Materials directly applied to joist contours. As an alternate, metal lath or nonmetallic fabric mesh secured to one side of joist to catch overspray when spraying following joist contours. Metal lath to be fully covered with Spray-Applied Fire Resistive Materials but with no min thickness requirements. When Type 280 is used for the 1 Hr. Rating, the thickness must be increased from 15/16 in. to 1-1/16 in.

ISOLATEK INTERNATIONAL — Types 280, 300TWor 400.
LUCKY CORE INSULATING MATERIALS
MANUFACTURING L L C —Type 400.
NEWKEM PRODUCTS CORP —Type 400.

8C. **Spray-Applied Fire Resistive Materials*** — As an alternate to Items 8, 8A and 8B - Applied by spraying with water, in one or more coats, to a final thickness as listed below. Crest areas of steel roof units shall be filled with protection material above the beam or joist. Beam and Joist surface must be clean and free of dirt, loose scale and oil. For method of density determination, refer to Design Information Section. Min thicknesses are shown in the table below.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Min Mtl Thkns on 8x28 Beam In.
1	1	1/2
1-1/2 or 2	1-1/2	13/16
2	2	1-1/4

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Min Thkns on 10K1 Joist In.*
1	1	15/16
1-1/2 or 2	1-1/2	1-1/2
2	2	2-5/16

*Protection material directly applied to joist following joist contours. As an option, metal lath (Item 7) or glass fiber mesh (Item 7A) secured to one side of joist to catch overspray when spraying following joist contours. Metal lath to be fully covered with material but with no min thickness requirements.

ISOLATEK INTERNATIONAL —Type D-C/F, HP or II. Use of Type EBS or Type X adhesive/sealer optional. Min avg density of 13 pcf with min ind density of 11 pcf for Types II, or DC/F. Min avg and min ind untamped densities of 22 and 19 pcf, respectively, for Type HP.

8D. **Spray-Applied Fire Resistive Materials*** — As an alternate to Items 8, 8A, 8B and 8C - Spray applied to beam or joist in one or more coat to the final thicknesses shown in the following table. Crest areas of steel roof units shall be filled with Spray-Applied Fire Resistive Materials above the beam or joist. Beam or joist surfaces must be clean and free of dirt, loose scale and oil. Min avg and min ind density of 22/19 pcf respectively. For method of density determination, refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Thkns In. Min Thkns on Beam W6x16	Thkns In. Min Thkns on W8x10	Min Thkns on 14K4 or 16K3 Joist (With Lath)*	Min Thkns on 14K4 or 16K3 Joist (With Lath)
1	1	1	1-3/8	1-1/2+	1-1/2+
1-1/2	1-1/2	1-1/4	1-3/4	2-1/4	1-3/4
2	1-1/2	1-3/8	1-7/8	2-1/4	1-3/4
2	2	1-5/8	2-1/4	2-7/16	1-7/8

+For 1 hr Ratings, the min joist size shall be 14J7.

*Thickness applied to both sides of lath and joist. All surfaces of lath on both sides to be protected with the min required thickness of protection material.

W R GRACE & CO - CONN —Types Monokote Acoustic 5, Z-106, Z-106/G, Z-106/HY.

GRACE KOREA INC —Types Monokote Acoustic 5, Z-106, Z-106/G, Z-106/HY.

- 8E. **Spray-Applied Fire Resistive Materials*** — As an alternate to Items 8, 8A, 8B, 8C and 8D - Spray applied to beam or joist in one or more coat to the final thicknesses shown in the following table. Crest areas of steel roof units shall be filled with Spray-Applied Fire Resistive Materials above the beam or joist. Beam or joist surfaces must be clean and free of dirt, loose scale and oil. Min avg and min ind density of 40/36 pcf respectively. Min avg and min ind density of 40/36 pcf respectively for Types Z-146, Z-146PC and Z-146T cementitious mixture. Min avg and min ind density of 50/45 pcf respectively for Types Z-156, Z-156T and Z-156PC. For method of density determination, refer to Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Thkns In. Min Thkns on Beam		Thkns In. Min Thkns on 14K4 or 16K3 Joist (No Lath)*		Min Thkns on 14K4 or 16K3 Joist (With Lath)
		W6x16	W8x10	14K4 or 16K3 Joist (No Lath)*	14K4 or 16K3 Joist (No Lath)*	
1	1	1	1-3/8	1-1/2+	1-1/2+	1-1/2+
1-1/2	1-1/2	1-1/4	1-3/4	2-1/4	2-1/4	1-3/4
2	1-1/2	1-3/8	1-7/8	2-1/4	2-1/4	1-3/4
2	2	1-5/8	2-1/4	2-7/16	2-7/16	1-7/8

+For 1 hr Ratings, the min joist size shall be 14J7.

*Thickness applied to both sides of lath and joist. All surfaces of lath on both sides to be protected with the min required thickness of protection material.

GRACE KOREA INC —Type Z-146

W R GRACE & CO - CONN — Types Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC

- 8F. **Spray-Applied Fire Resistive Materials*** — As an alternate to Items 8, 8A, 8B, 8C, 8D and 8E - Applied by mixing with water and spraying or troweling in one or more coats to a final thickness as shown in the table below, to steel surfaces which must be clean and free of dirt, loose scale and oil. Min avg density of 44 pcf with min ind value of 40 pcf for Type M-II. Min avg density of 44 pcf with min ind value of 42 pcf for Type TG. For method of density determination, see Design Information Section.

Restrained Assembly Rating Hr	Unrestrained Beam Rating Hr	Min Mtl Thkns on 8x28 Beam In.
1	1	9/16
1-1/2 or 2	1-1/2	13/16
2	2	1-1/4

ISOLATEK INTERNATIONAL —Types M-II or TG. Types M-II and TG investigated for exterior use.

NEWKEM PRODUCTS CORP —Types M-II or TG. Types M-II and TG investigated for exterior use.

9. **Vermiculite Gypsum Plaster** — Hand applied. Scratch and brown coat 2 cu ft of **Vermiculite Aggregate*** to 100 lb of fibered gypsum plaster.

PALMETTO VERMICULITE CO
SPECIALTY VERMICULITE CORP

10. **Foamed Plastic*** — (Not shown) — Optional — Rigid foamed plastic insulation, 2 by 4 ft boards. May be bonded to the membrane or installed without adhesion after final asphalt glaze coat has cooled. When applying more than one layer, successive layers shall be installed over preceding layer without attachment.

OC CELFORTEC INC —Max thickness 8 in. covered with crushed stone or concrete pavers at a rate of 10 psf, min.

OWENS CORNING SPECIALTY & FOAM

PRODUCTS —Max thickness 8 in. The boards shall be covered with crushed stone or concrete pavers, at a rate of 10 psf, min.

T CLEAR CORP —4-3/8 in. thick, concrete mortar faced extruded polystyrene Lightguard Boards.

THE DOW CHEMICAL CO —Max thickness 8 in., extruded polystyrene foamed plastic boards. The unfaced boards shall be covered with crushed stone or concrete pavers, at a rate of 10 psf, min.

11. **Steel Bridging** — Number, size and spacing in accordance with current Steel Joist Institute specifications. Continuous steel angle welded to top and bottom chords. Bridging coated with same thickness of protection material as required on joist.
12. **Metal Lath** — (Not Shown) — (Required on both sides of joists with Z-146, Z-146T, Z146PC, Z-156, Z-156T and Z-156PC, otherwise optional) - Metal lath may be used to facilitate the spray application of Spray-Applied Fire Resistive Materials on steel bar joist and trusses. The diamond mesh, 3/8 in. expanded steel lath, 1.7 to 3.4 lb per sq yd is secured to one side of each steel joist with No. 18 SWG galv steel wire at joist web and bottom chord members spaced 15 in. OC max. When used, the metal lath is to be fully covered with Spray-Applied Fire Resistive

*Bearing the UL Classification Mark