APPENDIX A - FIRE-RESISTANCE RATINGS WITH COMPOSITE STEEL JOISTS

The CJ-Series Composite Steel Joists can be easily incorporated into many fire resistance designs published by Underwriters Laboratories, Inc. (UL) latest edition of the UL Fire Resistance Directory.

The following information is from ANSI/UL 263 IV. BEAMS, 4. Beam Substitution,

Beam ratings depend upon the type of floor or roof the beam is supporting and the protection on the floor or roof units, as well as the type and thickness of protection material applied to the beam. The substitution of beams into a floor assembly (A--, D--, G--, or J—Design) or roof assembly (P—Design) should be limited to assemblies which have a similar or greater capacity for heat dissipation from the beam as compared to the capacity for heat dissipation of the floor or roof construction specified in the design from which the beam is being transferred.

Spray-applied Fire-resistive Materials
Application of N Series Designs

When it is the intent to only maintain the existing Assembly Rating, the beams, steel joists and steel trusses from N Series Designs may be substituted for the tested structural member provided the hourly Unrestrained Beam Rating of the structural member being transferred is at least equal to the Unrestrained Beam Rating of the structural member being replaced. Additionally, for steel joists and steel trusses the Restrained Beam Rating of the joist or truss being transferred is to be equal to or greater than the Restrained Assembly Rating of the floor-ceiling assembly into which the joist or truss is being transferred.

The CJ-Series joists shall be designed by the Joist Supplier to meet the minimum requirements of UL Beam Design Numbers. N736 and N825. The following tables give the fire rated floor-ceiling assemblies that can employ CJ-Series Composite Steel Joists.

Fire protection costs can be a significant portion of the overall system cost. Consequently, when spray applied protection is specified, the CJ-Series joists should be spaced as far apart as practical to reduce the number of joists receiving fire protection. Additionally, under certain conditions, CJ-Series joists can be designed without vertical webs and the bridging can be removed after the concrete has cured thereby further reducing the cost of fire protection.

FLOOR – CEILING ASSEMBLIES WITH MEMBRANE PROTECTION

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
1 Hr.	Exposed Grid System	N736	2.5	LW, NW	1, 1 1/2, 2, 3 Hr.	D216
						D219
1 1/2 Hr.	Exposed Grid System	N736	2.5	LW, NW	1, 1 1/2, 2, 3 Hr.	D216
						D219
	Gypsum Board	N825		NW	1 1/2. 2 Hr.	D502
2 Hr.	Exposed Grid System	N736	2.5	LW, NW	1, 1 1/2, 2, 3 Hr.	D216
						D219
	Gypsum Board	N825		NW	1 1/2, 2 Hr.	D502
	Gypsum Board	N736		NW	2, 3 Hr.	G547
3 Hr.	Exposed Grid System	N736	3.25	LW, NW	1, 1 1/2, 2, 3 Hr.	D216
						D219
	Gypsum Board	N736	3.0	NW	2, 3 Hr.	G547

Notes:

1. Minimum joist member sizes are governed by UL Design No. requirements. Maximum joist spacing is not limited.
2. Concrete thickness is thickness of slab above deck in inches.
3. Refer to the *UL Fire Resistance Directory* for the necessary construction details.

FLOOR – CEILING ASSEMBLIES WITH SPRAY APPLIED FIRE RESISTIVE MATERIALS

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
1 Hr.	SAFRM	N825	2.5	LW, NW	1 1/2 Hr.	D703
		N825	2.5	LW, NW	2 Hr.	D712
		N825	2.5	LW, NW	1, 1 1/2, 2 Hr.	D722
		N736	2.5	LW, NW	1, 1 1/2, 2, 3, 4 Hr.	D739
		N736	2.5	LW, NW	1, 1 1/2, 2, 3 Hr.	D759
		N736	2.5		1, 1 1/2, 2, 3, 4 Hr.	D779
		N736	2.5		1, 1 1/2, 2, 3 Hr.	D780
		N736	3.25	LW	1 1/2, 2, 3, 4 Hr.	D782
		N736	2.5	LW, NW	1, 1 1/2, 2, 3 Hr.	D832
		N736	2.5	LW, NW	1, 1 1/2, 3 Hr.	D847
		N736	2.5	LW, NW	1, 1 1/2, 2, 3, 4 Hr.	D858
		N736	2.0	LW, NW	1, 1 1/2, 2, 3 Hr.	D859
		N736	2.5	LW	1, 1 1/2, 2, 3 Hr.	D902
			3.5	NW		
		N825	2.5	LW	1 Hr.	D914
		N736	2.5	LW	1, 1 1/2, 2, 3 Hr.	D916
			3.5	NW		
		N825	2.5	LW	1, 1 1/2 Hr.	D918
			3.5	NW		
		N825	2.5	LW	1, 1 1/2 Hr.	D919
			3.5	NW		
		N736	2.5	LW	1, 1 1/2, 2, 3, 4 Hr.	D925
			3.5	NW		

FLOOR – CEILING ASSEMBLIES WITH SPRAY APPLIED FIRE RESISTIVE MATERIALS

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
1 Hr. (cont d)	SAFRM	N736	2.5	LW, NW	1, 1½, 2, 3 Hr.	G701
						G705
						G708
						G709
						G801

Notes:

1. Minimum joist member sizes are governed by UL Design No. requirements. Maximum joist spacing is not limited.
2. Concrete thickness is thickness of slab above deck in inches.
3. Refer to the *UL Fire Resistance Directory* for the necessary construction details.

FLOOR – CEILING ASSEMBLIES WITH SPRAY APPLIED FIRE RESISTIVE MATERIALS

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
1 1/2 Hr.	SAFRM	N825	2.5	LW, NW	1 1/2 Hr.	D703
		N825	2.5	LW, NW	2 Hr.	D712
		N825	2.5	LW, NW	1, 1 1/2, 2 Hr.	D722
		N736	2.5	LW, NW	1, 1 1/2, 2, 3, 4 Hr.	D739
		N736	2.5	LW, NW	1, 1 1/2, 2, 3 Hr.	D759
		N736	2.5		1, 1 1/2, 2, 3, 4 Hr.	D779
		N736	2.5		1, 1 1/2, 2, 3 Hr.	D780
		N736	3.25	LW	1 1/2, 2, 3, 4 Hr.	D782
		N736	2.5	LW, NW	1, 1 1/2, 2, 3 Hr.	D832
		N736	2.5	LW, NW	1, 1 1/2, 3 Hr.	D847
		N736	2.5	LW, NW	1, 1 1/2, 2, 3, 4 Hr.	D858
		N736	2.0	LW, NW	1, 1 1/2, 2, 3 Hr.	D859
		N736	3.0	LW	1, 1 1/2, 2, 3 Hr.	D902
			4.0	NW		
		N736	3.0	LW	1, 1 1/2, 2, 3 Hr.	D916
			4.0	NW		
		N825	3.0		1, 1 1/2 Hr.	D918
			4.0			
		N825	3.0		1, 1 1/2 Hr.	D919
			4.0			
		N736	3.0	LW	1, 1 1/2, 2, 3, 4 Hr.	D925
			4.0	NW		

FLOOR – CEILING ASSEMBLIES WITH SPRAY APPLIED FIRE RESISTIVE MATERIALS

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
1 1/2 Hr. (cont d)	SAFRM	N736	2.5	LW, NW	1, 1½, 2, 3 Hr.	G701
						G705
						G708
						G709
						G801

Notes:

1. Minimum joist member sizes are governed by UL Design No. requirements. Maximum joist spacing is not limited.
2. Concrete thickness is thickness of slab above deck in inches.
3. Refer to the *UL Fire Resistance Directory* for the necessary construction details.

FLOOR – CEILING ASSEMBLIES WITH SPRAY APPLIED FIRE RESISTIVE MATERIALS

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
2 Hr.	SAFRM	N825	2.5	LW, NW	1½ Hr.	D703
		N825	2.5	LW, NW	2 Hr.	D712
		N825	2.5	LW, NW	1½, 2 Hr.	D716
		N825	2.5	LW, NW	1, 1½, 2 Hr.	D722
		N736	2.5	LW, NW	1, 1½, 2, 3, 4 Hr.	D739
		N825	2.5	NW	1, 1½ Hr.	D742
		N825	2.5	LW, NW	1, 1½, 2 Hr.	D745
		N736	2.5	LW	1, 1½, 2, 3 Hr.	D746
		N825	2.5	LW, NW	1½, 2 Hr.	D750
		N825	2.5	LW	1, 1½, 2 Hr.	D752
		N736	2.5	LW, NW	1, 1½, 2, 3 Hr.	D755
		N736	2.5	LW, NW	1, 1½, 2, 3 Hr.	D759
		N736	2.5		1, 1½, 2, 3, 4 Hr.	D760
		N736	2.5		1, 1½, 2, 3, 4 Hr.	D779
		N736	2.5		1, 1½, 2, 3 Hr.	D780
		N736	3.25	LW	1½, 2, 3, 4 Hr.	D782
		N825	2.5	LW, NW	1 Hr.	D822
		N825	2.5	LW, NW	1, 1½, 2 Hr.	D825
		N825	3.25	LW	1, 1½, 2 Hr.	D826
		N825	2.5	LW, NW	1, 1½, 2 Hr.	D831
		N736	2.5	LW, NW	1, 1½, 2, 3 Hr.	D832
		N825	2.5	LW, NW	1½ Hr.	D833
		N825	3.25	LW	1, 1½ Hr.	D840
		N736	2.5	LW, NW	1, 1½, 3 Hr.	D847
		N736	2.5	LW, NW	1, 1½, 2, 3, 4 Hr.	D858
		N736	2.0	LW, NW	1, 1½, 2, 3 Hr.	D859
		N825	3.25	LW	1, 1½, 2 Hr.	D860
		N825	2.5	LW, NW	1, 1½ Hr.	D861
		N825	2.5	LW	1 Hr.	D862

FLOOR – CEILING ASSEMBLIES WITH SPRAY APPLIED FIRE RESISTIVE MATERIALS

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
2 Hr. (cont d)	SAFRM	N736	3.25	LW	1, 1½, 2, 3 Hr.	D902
			4.5	NW		
		N825	3.25	LW	1, 2 Hr.	D907
		N825	3.25	LW	1 Hr.	D913
		N736	3.25	LW	1, 1½, 2, 3 Hr.	D916
			4.5	NW		
		N825	3.25	LW	1, 1½ Hr.	D918
			4.5	NW		
		N825	3.25	LW	1, 1½ Hr.	D919
			4.5	NW		
		N825	3.25	LW	1½ Hr.	D920
		N736	3.25	LW	1, 1½, 2, 3, 4 Hr.	D925
			4.5	NW		
		N736	2.5	LW, NW	1, 1½, 2, 3 Hr.	G701
						G705
						G708
						G709
						G801

Notes:

1. Minimum joist member sizes are governed by UL Design No. requirements. Maximum joist spacing is not limited.
2. Concrete thickness is thickness of slab above deck in inches.
3. Refer to the *UL Fire Resistance Directory* for the necessary construction details.

FLOOR – CEILING ASSEMBLIES WITH SPRAY APPLIED FIRE RESISTIVE MATERIALS

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
3 Hr.	SAFRM	N825	2.5	LW, NW	1½ Hr.	D703
		N736	2.5	LW, NW	1½, 3 Hr.	D708
		N736	2.5	LW, NW	1, 1½, 2, 3, 4 Hr.	D739
		N825	3.5	NW	1, 1½ Hr.	D742
		N736	2.5	LW	1, 1½, 2, 3 Hr.	D746
		N825	3.25	LW	1½, 2 Hr.	D754
		N736	2.5	LW, NW	1, 1½, 2, 3 Hr.	D755
		N736	2.5	LW, NW	1, 1½, 2, 3 Hr.	D759
		N736	2.5		1, 1½, 2, 3, 4 Hr.	D760
		N736	2.5		1, 1½, 2, 3, 4 Hr.	D779
		N736	2.5		1, 1½, 2, 3 Hr.	D780
		N736	3.25	LW	1½, 2, 3, 4 Hr.	D782
		N825	2.5	LW, NW	1½, 2 Hr.	D816
		N825	2.5	LW, NW	1, 1½, 2 Hr.	D831
		N736	2.5	LW, NW	1, 1½, 2, 3 Hr.	D832
		N825	2.5	LW, NW	1½ Hr.	D833
		N736	2.5	LW, NW	1, 1½, 2, 3, 4 Hr.	D858
		N736	2.0	LW, NW	1, 1½, 2, 3 Hr.	D859
		N825	3.25	LW	1, 1½, 2 Hr.	D860
		N736	4.19	LW	1, 1½, 2, 3 Hr.	D902
			5.25	NW		
		N736	4.19	LW	1, 1½, 2, 3 Hr.	D916
			5.25	NW		
		N825	4.19	LW	1, 1½ Hr.	D918
			5.25	NW		
		N825	4.19	LW	1, 1½ Hr.	D919
			5.25	NW		
		N736	4.19	LW	1, 1½, 2, 3, 4 Hr.	D925
			5.25	NW		

FLOOR – CEILING ASSEMBLIES WITH SPRAY APPLIED FIRE RESISTIVE MATERIALS

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
3 Hr. (cont d)	SAFRM	N736	2.75	LW, NW	1, 1½, 2, 3 Hr.	G701
						G705
						G708
						G709
						G801

FLOOR – CEILING ASSEMBLIES WITH SPRAY APPLIED FIRE RESISTIVE MATERIALS

Restrained Assembly Rating	Protection Material	Minimum Joist Size[1]	Concrete		Unrestrained Beam Rating	UL Design Number[3]
			Minimum Thickness[2] (in.)	Type		
4 Hr.	SAFRM	N736	2.5	LW, NW	1, 1½, 2, 3, 4 Hr.	D739
		N825	3.25	LW	1½, 2 Hr.	D754
		N736	2.5	LW, NW	1, 1½, 2, 3, 4 Hr.	D760
		N736	2.5	LW, NW	1, 1½, 2, 3, 4 Hr.	D779
		N736	3.25	LW	1½, 2, 3, 4 Hr.	D782
		N736	2.5	LW, NW	1, 1½, 2, 3, 4 Hr.	D858
		N825	3.25	LW	1, 1½, 2 Hr.	D860

Notes:

1. Minimum joist member sizes are governed by UL Design No. requirements. Maximum joist spacing is not limited.
2. Concrete thickness is thickness of slab above deck in inches.
3. Refer to the *UL Fire Resistance Directory* for the necessary construction details.