

Comparison of Snap Track Tray and Conduit

Analysis of Fill Capacity

Snap Track ventilated channel tray is manufactured in nominal widths of 2", 4", and 6" and a nominal depth of 2". The appropriate size and number of channels depends on the type, number and size of the conductors required, and the fill area allowed under NEC Article 392.22

Consideration should also be given to cable spacing and the ampacity allowed under NEC Article 392.80.

Allowable cable fill area for ventilated channel cable trays

Article 392.22 Number of Conductors or Cables

(A) The number of multi-conductor cables, rated 2000 volts or less, permitted in a single cable tray shall not exceed the requirements of this section. The conductor sizes apply to both aluminum and copper conductors.

392.22 (5) Ventilating Channel Containing Multiple Conductors Cables of ANY type. Where ventilated channel trays contain multi-conductor cables of any type, the following shall apply:

- (a) Where only one multi-conductor cable is installed, the cross sectional area shall not exceed the value specified in Column 1 of table 392.22 (A) (5).
- (b) Where more than one multi-conductor cable is installed, the sum of the cross sectional area of all cables shall not exceed the value specified in Column 2 of table 392.22 (A) (5).

Table 392.22(A) (5) **Allowable Cable Fill Area for Multi-conductor Cables in Ventilating Channel Cable Trays for Cables Rated 2000 Volts or Less.**

Inside Width of Cable Tray		Maximum Allowable Fill Area for Multi-conductor Cables			
		Column 1 One Cable		Column 2 More Than One Cable	
mm	in.	mm ²	in. ²	mm ²	in. ²
75	3	1500	2.3	850	1.3
100	4	2900	4.5	1600	2.5
150	6	4500	7.0	2450	3.8

Techline Mfg. recommends the guidelines set forth in NEC Table 392.22 (A) (5), for multi-conductor cables when considering the fill capacity of Snap Track 4" and 6" width channels.

However, note that the NEC Table 392.22 (A) (5) does not provide guidance for multi-conductor cables in two inch 2" width trays. Therefore, **Techline mfg. recommends and refers to the NEC Table 392.22 (A) (6) for Snap Track 2" tray.** Although NEC Table 392.22 (A) (6) clearly is intended for solid bottom tray it is the only guidance provided for multi-conductor cable when installed in 2" channel. Further the capacities listed in the NEC Table 392.22 (A) (6) are more conservative than those listed in NEC Table 392.22 (A) (5) for ventilated bottom channel tray.

Table 392.22 (A) (6) Allowable Cable Fill Area for Multi-conductor Cables in Solid Channel Cable Trays for Cables Rated 2000 Volts or Less.

Inside Width of Cable Tray		Maximum Allowable Fill Area for Multi-conductor Cables			
		Column 1 One Cable		Column 2 More Than One Cable	
mm	in.	mm ²	in. ²	mm ²	in. ²
50	2	850	1.3	500	0.8
75	3	1500	2.0	850	1.1
100	4	2900	3.7	1600	2.1
150	6	4500	5.5	2450	3.2

Notes:

1. To determine the multi-conductor cable fill capacity of Snap Track, designers should compare the sum of the diameters or corresponding total cross sectional area of all the multi-conductor cables utilized, to the tables provided.
2. In some instances the allowable fill area for multi-conductor cables may result in cable circumferences exceeding the 2" side wall of Snap Track trays. In these circumstances, should covers be desired, contact Techline with specific requirements.

NEC Section 392.22 Number of Conductors or Cables

(B) Number of Single-Conductor Cables, Rated 2000 volts or less, in Cable Trays. (2) Ventiladed Channel Cable Trays. The number of single conductor cables, rated 2000 volts or less, permitted in single cable tray sections shall not exceed the requirements of this section. The single conductors, or conductor assemblies, shall be evenly distributed across the cable tray. The conductor sizes apply to both aluminum and copper conductors.

(2) Where 50 mm (2 in.), 75 mm (3 in.), 100 mm (4 in.), or 150 mm (6 in.) wide ventiladed channel cable trays contain single conductor cables, the sum of the diameters of all single conductors shall not exceed the inside width of the channel.

NEC Section 392.22 Number of Conductors or Cables

(C) Number of Type MV and Type MC Cables (2001 Volts or Over) in Cable Trays. The number of cables rated 2001 volts or over permitted in a single cable tray shall not exceed the requirements of this section.

The sum of the diameters of single- conductor and multiconductor cables shall not exceed the cable tray width, and cables shall be installed in a single layer. Where single-conductor cables are triplexed, quadruplexed, or bound together in circuit groups, the sum of the diameters of the single-conductors shall not exceed the cable tray width, and these groups shall be installed in single layer arrangements.

Allowable cable fill area for Rigid Metal Conduit: Type RMC

The appropriate size and number of conduits depends on the number and size of the conductors required, and the fill area allowed under NEC Article 344.22

Article 344.22 Number of Conductors or Cables

The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9

Cables shall be permitted to be installed were such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Chapter 9 Tables

Table 1 Percentage of Cross Section of Conduit and Tubing for Conductors and Cables

Number of Conductors And / or Cables	Cross-Sectional Area %
1	53
2	31
Over 2	40

Table 4 Dimensions and Percent Area of Conduit and Tubing (Areas of Conduit or Tubing for the Combinations of wires Permitted in Table 1, Chapter 9)

Article 344 – Rigid Metal Conduit (RMC)

Trade Size	Over 2 Wires 40%		60%		1 Wire 53%		2 Wires 31%		Nominal Internal Diameter		Total Area 100%	
	mm ²	in. ²	mm ²	in. ²	mm ²	in. ²	mm ²	in. ²	mm ²	in. ²	mm ²	in. ²
1/2	81	0.125	122	0.188	108	0.166	63	0.097	16.1	0.632	204	0.314
3/4	141	0.220	212	0.329	187	0.291	109	0.170	21.2	0.836	353	0.549
1	229	0.355	344	0.532	303	0.470	177	0.275	27.0	1.063	573	0.887
1 ¼	394	0.610	591	0.916	522	0.809	305	0.473	35.4	1.394	984	1.526
1 ½	533	0.829	800	1.243	707	1.098	413	0.642	41.2	1.624	1333	2.071
2	879	1.363	1319	2.045	1165	1.806	681	1.056	52.9	2.083	2198	3.408
2 ½	1255	1.946	1882	2.919	1663	2.579	972	1.508	63.2	2.489	3137	4.866
3	1936	3.000	2904	4.449	2565	3.974	1500	2.325	78.5	3.090	4840	7.499
3 ½	2584	4.004	3877	6.006	3424	5.305	2003	3.103	90.7	3.570	6461	10.010
4	3326	5.153	4990	7.729	4408	6.828	2578	3.994	102.9	4.050	8316	12.882
5	5220	8.085	7830	12.127	6916	10.713	4045	6.266	128.9	5.073	13050	20.212
6	7528	11.663	11292	17.495	9975	15.454	5834	9.039	154.8	6.093	18821	29.158

Using the allowable fill areas permitted by NEC Articles 392 and 344 the following comparison can be derived between RMC conduits, where more than two wires are installed, and Snap Track ventilated channel trays, where more than one multiconductor cable rated less than 2000 volts are installed.

Fill capacity comparison of RMC conduit and Snap Track ventilated channel tray

Trade Size	RMC Over 2 Wires 40%	RMC Total Area 100%	ST Tray Size for More than One Multiconductor Less than 2000V	ST Tray Allowable Fill	ST Tray Total Area 100%
	in. ²	in. ²	Width (No.)	in. ²	in. ²
1/2	0.125	0.314	2	1.100	4.000
3/4	0.220	0.549	2	1.100	4.000
1	0.355	0.887	2	1.100	4.000
1 ¼	0.610	1.526	2	1.100	4.000
1 ½	0.829	2.071	2	1.100	4.000
2	1.363	3.408	4	2.500	8.000
2 ½	1.946	4.886	4	2.500	8.000
3	3.000	7.499	6	3.200	12.000
3 ½	4.004	10.010	6(1) & 4(1)	6.700	20.000
4	5.153	12.882	6(1) & 4 (1)	6.700	20.000
5	8.005	20.212	6(2) & 4(1)	8.900	32.000
6	11.663	29.158	6 (4)	12.800	48.000

Note: When single conductor cables or cables rated over 2000 volts are utilized channel trays channel trays are restricted to a single layer of cable, and limited by the width of the tray. The sum of the diameter of single conductor cables or the sum of the diameters of multiconductor cables rated over 2000 volts shall not exceed the width of the tray, when installed in a single layer. Designers should consider the cost of pulling multiple single conductor cables in conduit and the cost of commonly available multiconductor tray rated cables.

Analysis of Material Cost

Conduit Size	Conduit Raw Material Unit Rate	Conduit Labor Unit Rate	Conduit Total Cost LF	Snap Track Size & No.	Snap Track Raw Material Unit Rate	Snap Track Unit Labor Rate	Snap Track Total Cost LF
3/4	\$5.27	0.348	\$5.62	2	\$6.30	0.180	\$6.48
1	\$7.82	0.450	\$8.27	2	\$6.30	0.180	\$6.48
1 1/2	\$12.85	0.509	\$13.36	2	\$7.37	0.180	\$7.55
2	\$11.79	0.535	\$12.33	4	\$9.42	0.250	\$9.67
3	\$23.47	0.614	\$24.08	6	\$10.77	0.350	\$11.12
4	\$37.62	0.669	\$38.29	6 (1) 4(1)	\$20.19	0.500	\$20.69
5	\$72.48	0.944	\$73.42	6 (2) 4 (1)	\$30.96	0.700	\$31.66
6	\$100.05	0.944	\$100.99	6 (4)	\$43.08	0.700	\$43.78

Note: Raw Material Rates include associated fittings and supports. Unit labor rates were provided by a major contractor who has completed several projects with Snap Track.

Conclusion

Base on the cost data provided Snap Track trays 2" -6" are very cost effective alternative to conduit sizes 1" -3" with savings ranging from ranging from 24 to 46%. Within this range overall size and fill capacities directly correlate. Where single and / or smaller diameter cables are utilized in 3/4" conduit, conduit can be a more cost effective solution. However, consideration should be given to the multiple advantages of tray as compared to conduit, including support spans. Noting that per Article 344 3/4" conduit must be supported every 10 feet, while the load capacity of Snap Track can allow for spans up to 16 feet. For conduit sizes above 3" the use of Snap Track can provide savings in excess of 40%. However, multiple trays are required and consequently could cause space issues. Therefore, when comparing tray to larger conduits (4"-6") designers should also consider a smaller width ladder tray.