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Appendix 1

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Questions answered by industry members

1. Total of how many superintendents and project managers were put into the Project?
2. Were there same supervisors in charge for the entire construction (including close out phase)?
3. How often did your company hold meetings while the project is in progress?
4. Who else was in the meeting except members from general contractor (architect, subcontractor, client, etc)?
5. Were there any meetings with building tenants, who will occupy the building after the completion) during the construction?
6. Was the closeout planning performed the way it was planned during preconstruction?
7. Why do you think that your company had planned the closeout planning like that?

Mr. Kenneth Catlow – Pentagon Renovation Group

1. “PENREN has one Project Manager assigned to the project and he has a staff of approximately 20 quality assurance and design managers. The design build contractor has a management staff of approximately 150. As this project will span 20 years from the beginning to the end, I am currently on my 4th Project Manager.”
2. The PM I assign to the project is specifically responsible for ALL phases of construction to include close out. Supervisors are normally assigned to specific sub-elements of the project and again are accountable for the entire delivery process, beginning to end.

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3. We hold many types of meetings on a daily basis. Over the next 10 months we will conduct 1100 tenant agency meetings alone. That does not include routine coordination, management review, scheduling and numerous other elements. I would estimate that the staff involved with the project average 10 to 20 meetings per day.

4. Depending on the specific type of meeting, we include building operators, safety representatives, tenants, designers, historic preservation interests, representatives from the disabled community, public affairs, local code authorities, and whoever else as necessary to assure we have all required decision makers.

5. Yes, 1100 over the next 10 months alone ... that is just for Wedge 3, multiply that by 5 for the entire building. We have meetings with the tenant after occupancy to assure their space has met their needs.

6. We close out each Wedge of the building as we complete it and it is occupied by the permanent tenant. We have a transition team assigned to assure this close out is accomplished efficiently. Yes, it was planned during preconstruction.

7. As the owner's representative we want to assure satisfaction of tenant and owner requirements. Constant and regular communication at all levels of the organization and with all critical stakeholders is the only way to succeed.

Ms. Marilyn Juban – Gilbane Building Company

1. 1 PM; 1 General Supt & 1 Asst or MEP Supt

2. Yes

3. Weekly with the Owner & Weekly (sometimes more) with the Subs

4. The two major progress meetings were separate - Meeting #1 - Client, Architect, CM/GC, & sometimes consultants

Meeting #2 - Subs, GC/CM, & sometimes the Architect, Fire Marshal or other appropriate party based on schedule

5. No -- we only saw them for "jobsite tours" & they were encouraged to take tours only after 3pm, when the subs work was complete for the day (to discourage them from giving

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direct orders to subs who should instead be getting that information thru the proper channels)

6. Yes, mostly.

7. Your last impression is sometimes the most important, so our preconstruction plan, reinforcement during construction, & follow through as planned is an important part of repeat work with that client.

The only suggestion I can share relative to our closeout process relates to the attention given by the team. It's necessary to keep the same team that built the job around for closeout to ensure proper follow through, but there is also a balance in keeping them confident they have a secure spot on a new project upcoming without distracting their attention to that new project too early!! Often, the resolution here is to have "newer" more "junior" employees assisting with the follow up during closeout while the PM & Superintendent manage closeout and consider start up for a new project.

Dr. Mark Konchar – Centex Construction

1. At a minimum we staff our projects with a full time PM and full time Super.

Both are stationed at the project site.

2. Yes - typically these people remain until closeout is complete.

3. This is a broad question - meetings are held constantly - also dependent upon the nature of the job, the phase you are in and issues at hand. At a minimum, the superintendent holds weekly sub meetings for the operations side. The PM does the same for all sub PM members.

4. All are invited. They are mandatory for the subcontractors. On our DB jobs, the A/Es are very active. Again, all are invited.

5. Typically no - although it depends on our terms and scope. Sometimes, like on our DB projects, we will need to have direct contact with the user group in order to properly establish the desired program and how they anticipate operating the facility. In these cases, we do engage the facility users.

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6. Another tough question. We'd love to be able to say all plans run smoothly and just as we anticipate things but that is never the case in our business. The commissioning and closeout process is custom each time. We have standards procedures as a guide but must customize for each client.

Mr. Mike Hartman – The Clark Construction Group, LLC

1. On a typical Wash DC office building there will be one lead PM and Supt with Assistant PM's and Supt's on the team.
2. Same supervisors were in charge for the entire project. Supt. is pulled from the job just after substantial completion.
3. Owner and subcontractor meetings held once a week.
4. Owner meetings - owner, architect (and other consultants as needed). Subcontractor meetings generally just the subs foreman and periodically the project managers. On an as needed basis the designers and subs would meet.
5. Building tenant was the same as owner.
6. Closeout planning was altered from original plan due to ownership issues.
7. Closeout planning has 2 primary goals - efficient closeout for the owner, subs, and tenant with the least expenditure of manpower.

Ms. Katie Lynahan – Barton Malow

1. 1 General Superintendent, 1 Assistant Superintendent, 1 Project Manager, 1 Assistant Project Manager, 2 Engineers
2. Usually the PM stays consistent throughout, but in the case of the project references, the PM left the company, and a new PM was used for the last 20% of the project.
3. We would have a Bi-Weekly Progress Meeting every two weeks with the project level players from the CM, Owner and A/E. An Owner's meeting once a month for the higher ups (very general) and a Subcontractor's Meeting once a week. There would also be MEP Coordination Meetings and Commissioning Meetings on a regular basis depending on the point in the project.

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4. Project Architects and pertinent design engineers, the Project Manager from the Owner/ client for all of the Progress Meetings. The same team came to the Owner's meetings, along with basically everyone's superiors - the Owner's PM's boss, the Project Architects' boss, and the Project Executive or VP from our company.

The subcontractor meetings included all of the trades on site or those coming within the next two weeks. We require that it be someone who can make decisions for the company, so it is usually a sub's PM or Superintendent, or sometimes both.

5. Our Owner and our client are two different entities. The Owner is the state, and they procure the construction for the particular client we were building for. The client's PM was included at all of the Bi-Weekly and Progress Meetings. We did not meet with any of the actual tenants (mostly researchers) at any meetings.

6. Some was, some wasn't. During pre-con we were going to provide a certain level of commissioning services, which we integrate with the closeout documentation. The Owner was able to procure the funds to use an outside CA for particular systems, but not all of them (the CA is responsible for MEP, and we are responsible for all Lab and other equipment). We had to adjust our closeout procedures accordingly. This has created problems in the tracking and approval of some of our documentation.

7. See above - if we had known what we would be commissioning and what others would have been commissioning prior to the project starting, we would have had time to make a better close-out plan to include the times required for commissioning review of the submittals and close-out review. All of our internal paperwork for the closeout procedures is very easy to follow though, in regards to guarantees, and final payment. We really only have problems where we need to interface with another company's procedures.

Mr. Michael Arnold – Foreman Program and Construction

1. 1 pm and 1 sm
2. yes
3. every other week with the prime contractors + weekly foreman's meetings

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4. architects representative, usually 2 representatives from the owner, on occasion upper management from our firm, prime contractors (we use multiple prime method)
5. yes, separate coordination meetings were held as we approached turnover.
6. yes - we stuck to the plan we introduced in the early stages of the project
7. so that we satisfy the client and we get out as soon as possible to avoid loss profits

Mr. Brendan Baloh – The Whiting-Turner Contracting Co.

1. 2 Supers, 1 Field Engineer, 2 Project Engineers, 1 Project Manager (This is what I am currently running & is planned for the end of the project. This greatly depends on the size of the project and the complexity. The job I gave you this information is for a \$29 million dollar project.)
2. Yes
3. Foreman's Meeting Weekly, Project Manager's Meeting once a Month, OAC meetings every 2 weeks.
4. Foreman's Meeting-Foreman currently working on site and 2 weeks in advance of starting work. Project Manager's Meeting-Project Managers for all subcontractor's on the project. OAC Meeting-Owner, Architect, Owner's Rep, and us.
5. No. We are remotely involved with meetings that the Marketing Department have with the new residents of the apartment units for Upgrades & Customization.
6. On past projects it has as well as could be expected
7. The project manager is responsible for this planning with guidelines/Lessons Learned from past projects. This is very directly related to the type of work and schedule.

Mr. Brian Conner – Saddleback Development Corporation

1. 1 Super, 1 PM.
2. Yes.
3. 2 wks at beginning, then as structure went up, we went to weekly meetings.
4. Occasionally we added consultants and Operations teams as subject matter warranted their attendance.

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5. With people from the user's team who were going to operate the building (no tenants for our projects).

6. It was done pretty close to the anticipated method.

7. We try to establish a consistent approach to closeout. Kind of a check list mentality.

Things can get a little pushed at the end, when projects need to open, so sometimes close-out activities get a little re-arranged, or they get done incrementally as systems get completed (as opposed to one single close-out period)

I think close-out is extremely important and I don't like it when personnel changes at this critical time. Contractors should start to "pride themselves" and market themselves as close-out specialist (meaning they really care about it, have systems for it and do it better than anyone else). They may get more jobs out of it. Owners and Architects, who have gone through poor close-outs don't want to go through it again. The relationships can go bad in a hurry.

Mr. Bob Grottenthaler – Barton Malow

1. Four superintendents, two project managers, and three project engineers on a \$100 million Dental School for the University of Maryland in Baltimore.

2. The staff stayed the same up to when the project reached substantial completion. Then only one superintendent stayed on to complete punchlist work. One Project Manager stayed on to complete close-out. We brought on another Project Manager three months before close-out started to assist the original team get ready for close-out.

3. Weekly meetings with our superintendents and the subcontractors' foremen. Bi-weekly meetings with the subcontractors' project managers and Bi-weekly meetings with the Owner and Architect.

4. Our close-out meetings involved the Owner and they were held once a month towards the end of the project. We dealt with the subcontractors on an individual basis because they closed-out at different stages.

5-6. Yes, close-out is a very important phase of the project that must be planned early and conveyed to the subcontractors at the start of the project.

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7. Most projects involve different Owners and Architects who have different requirements for close-out. Meetings should be held during the preconstruction phase to discuss what the requirements are for close-out and these requirements need to be stated in the bidding documents with the subcontractors. These requirements need to be discussed at the Preconstruction conference with the subcontractors so that they know to start planning for close-out early in the project.

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Appendix 2

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Exterior Closure Take Off

Concrete Block			
<u>Split faced concrete block</u>		<u>Painted concrete block</u>	
Size	S.F.	Size	S.F.
12" x 8" x 16"	392	12" x 8" x 16"	1600
12" x 8" x 16"	128	12" x 8" x 16"	1260
12" x 8" x 16"	48	12" x 8" x 16"	384
12" x 8" x 16"	224	12" x 8" x 16"	320
12" x 8" x 16"	528	12" x 8" x 16"	400
12" x 8" x 16"	204	12" x 8" x 16"	640
12" x 8" x 16"	384	12" x 8" x 16"	608
12" x 8" x 16"	152	12" x 8" x 16"	352
12" x 8" x 16"	540	12" x 8" x 16"	720
12" x 8" x 16"	1080	12" x 8" x 16"	320
12" x 8" x 16"	100	12" x 8" x 16"	1600
12" x 8" x 16"	48	12" x 8" x 16"	2088
12" x 8" x 16"	280	12" x 8" x 16"	304
12" x 8" x 16"	280	12" x 8" x 16"	640
		12" x 8" x 16"	1008
		12" x 8" x 16"	960
		12" x 8" x 16"	736
		12" x 8" x 16"	5500
		12" x 8" x 16"	1464
		12" x 8" x 16"	1488
		12" x 8" x 16"	1920
Sum	4388		24312
		subtract doors	24(3'x7')
Total	8208		23808

Reinforcing bar weight

Bar No.	Nominal Weight (lb/ft)	Area (S.F.)	Side Length	At 48" on center	Linear Footage	Weight in lbs	Weight in ton
6	1.502	23808	154.2984122	38.57	5,952.00	8,939.90	4.47
4	0.668	23808	154.2984122	115.7238091	17,856.00	11,927.81	5.96

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Appendix 3

**STANDARD LOAD TABLE
OPEN WEB STEEL JOISTS, K-SERIES**

Based on a Maximum Allowable Tensile Stress of 30,000 psi

Adopted by the Steel Joist Institute November 4, 1985; Revised to May 2, 1994 - Effective September 1, 1994

The black figures in the following table give the TOTAL safe uniformly distributed load-carrying capacities, in pounds per linear foot, of K-Series Steel Joists. The weight of DEAD loads, including the joists, must be deducted to determine the LIVE load-carrying capacities of the joists. The load table may be used for parallel chord joists installed to a maximum slope of 1/2 inch per foot.

The figures shown in RED in this load table are the LIVE loads per linear foot of joist which will produce an approximate deflection of 1/360 of the span. LIVE loads which will produce a deflection of 1/240 of the span may be obtained by multiplying the figures in RED by 1.5. In no case shall the TOTAL load capacity of the joists be exceeded.

The approximate joist weights per linear foot shown in these tables do not include accessories.

The approximate moment of inertia of the joist, in 4 inches is: $I_j = 26.767(W_{LL})(L^3)(10^{-6})$, where W_{LL} = RED figure in the Load Table and L = (Span - .33) in feet.

For the proper handling of concentrated and/or varying loads, see Section 5.5 in the Recommended Code of Standard Practice.

Where the joist span is equal to or greater than the span corresponding to the RED shaded area shown in the load table, the row of bridging nearest the mid span of the joist shall be installed as bolted diagonal bridging. Hoisting cables shall not be released until this bolted diagonal bridging is completed installed.

JOIST DESIGNATION	8K1	10K1	12K1	12K3	12K5	14K1	14K3	14K4	14K6	16K2	16K3	16K4	16K5	16K6	16K7	16K9
DEPTH (IN.)	8	10	12	12	12	14	14	14	14	16	16	16	16	16	16	16
APPROX. WT. (lbs./ft.)	5.1	5.0	5.0	5.7	7.1	5.2	6.0	6.7	7.7	5.5	6.3	7.0	7.5	8.1	8.6	10.0
SPAN (ft.)																
8	550															
9	550															
10	550 480	550 550														
11	532 377 444	550 542 550														
12	288 377 225	455 479 363	550 550 510	550 550 510	550 550 510											
13	324 179 281	412 289 358	500 425 434	550 463 543	550 463 550	550 550 511	550 550 550	550 550 550	550 550 550							
14	145	234	344	428	434	475	507	507	507							
16	246 119	313 192	380 282	476 351	550 396	448 390	550 467	550 467	550 550	550 550	550 550	550 550	550 550	550 550	550 550	550 550
17		277 159	336 234	420 291	550 366	395 324	495 404	550 443	550 443	512 488	550 526	550 526	550 526	550 526	550 526	550 526
18		246 134	299 197	374 245	507 317	352 272	441 339	550 397	550 408	456 409	508 456	550 490	550 490	550 490	550 490	550 490
19		221 113	268 167	335 207	454 269	315 230	395 287	475 336	550 383	408 347	455 386	547 452	550 455	550 455	550 455	550 455
20		199 97	241 142	302 177	409 230	284 197	356 246	428 287	525 347	368 297	410 330	493 386	550 426	550 426	550 426	550 426
21			218 123	273 153	370 198	257 170	322 212	388 248	475 299	333 255	371 285	447 333	503 373	548 405	550 406	550 406
22			199 106	249 132	337 172	234 147	293 184	353 215	432 259	303 222	337 247	406 289	458 323	498 351	550 385	550 385
23			181 93	227 116	308 150	214 128	268 160	322 188	395 226	277 194	308 216	371 252	418 282	455 307	507 339	550 363
24			166 81	208 101	282 132	196 113	245 141	295 165	362 199	254 170	283 189	340 221	384 248	418 269	465 298	550 346
25						180 100	226 124	272 145	334 175	234 150	260 167	313 195	353 219	384 238	428 263	514 311
26						166 88	209 110	251 129	308 156	216 133	240 148	289 173	326 194	355 211	395 233	474 276
27						154 79	193 98	233 115	285 139	200 119	223 132	268 155	302 173	329 188	366 208	439 246
28						143 70	180 88	216 103	265 124	186 106	207 118	249 138	281 155	306 168	340 186	408 220
29										173 95	193 106	232 124	261 139	285 151	317 167	380 198
30										161 86	180 96	216 112	244 126	266 137	296 151	355 178
31										151 78	168 87	203 101	228 114	249 124	277 137	332 161
32										142 71	158 79	190 92	214 103	233 112	259 124	311 147



STANDARD LOAD TABLE / OPEN WEB STEEL JOISTS, K-SERIES

Based on a Maximum Allowable Tensile Stress of 30,000 psi

JOIST DESIGNATION	18K3	18K4	18K5	18K6	18K7	18K9	18K10	20K3	20K4	20K5	20K6	20K7	20K9	20K10	22K4	22K5	22K6	22K7	22K9	22K10	22K11
DEPTH (IN.)	18	18	18	18	18	18	18	20	20	20	20	20	20	20	22	22	22	22	22	22	22
APPROX. WT. (lbs./ft.)	6.6	7.2	7.7	8.5	9.0	10.2	11.7	6.7	7.6	8.2	8.9	9.3	10.8	12.2	8.0	8.8	9.2	9.7	11.3	12.6	13.8
SPAN (ft.)																					
18	550	550	550	550	550	550	550														
19	514	550	550	550	550	550	550														
20	463	550	550	550	550	550	550	517	550	550	550	550	550	550							
21	420	506	550	550	550	550	550	468	550	550	550	550	550	550							
22	382	460	518	550	550	550	550	426	514	550	550	550	550	550	550	550	550	550	550	550	550
23	349	420	473	516	550	550	550	389	469	529	550	550	550	550	518	550	550	550	550	550	550
24	320	385	434	473	526	550	550	357	430	485	528	550	550	550	475	536	550	550	550	550	550
25	294	355	400	435	485	550	550	329	396	446	486	541	550	550	438	493	537	550	550	550	550
26	272	328	369	402	448	538	550	304	366	412	449	500	550	550	404	455	496	550	550	550	550
27	252	303	342	372	415	498	550	281	339	382	416	463	550	550	374	422	459	512	550	550	550
28	234	282	318	346	385	463	548	261	315	355	386	430	517	550	348	392	427	475	550	550	550
29	218	263	296	322	359	431	511	243	293	330	360	401	482	550	324	365	398	443	532	550	550
30	203	245	276	301	335	402	477	227	274	308	336	374	450	533	302	341	371	413	497	550	550
31	190	229	258	281	313	376	446	212	256	289	314	350	421	499	283	319	347	387	465	550	550
32	178	215	242	264	294	353	418	199	240	271	295	328	395	468	265	299	326	363	436	517	549
33	168	202	228	248	276	332	393	187	226	254	277	309	371	440	249	281	306	341	410	486	532
34	158	190	214	233	260	312	370	176	212	239	261	290	349	414	235	265	288	321	386	458	516
35	149	179	202	220	245	294	349	166	200	226	246	274	329	390	221	249	272	303	364	432	494
36	141	169	191	208	232	278	330	157	189	213	232	259	311	369	209	236	257	286	344	408	467
37	131	159	181	198	222	268	319	148	179	202	220	245	294	349	198	223	243	271	325	386	442
38	121	149	171	188	212	258	317	141	170	191	208	232	279	331	187	211	230	256	308	366	419
39	111	139	161	178	202	248	305	133	161	181	198	220	265	314	178	200	218	243	292	347	397
40	101	129	151	168	192	238	296	127	153	172	188	209	251	298	169	190	207	231	278	330	377
41	91	119	141	158	182	228	286	117	145	164	180	201	243	289	161	181	197	220	264	314	359
42	81	109	131	148	172	218	276	107	135	154	169	190	231	277	153	173	188	209	252	299	342
43	71	99	121	138	162	208	266	97	125	144	159	179	219	265	146	165	179	200	240	285	326
44	61	89	111	128	152	198	256	87	115	134	149	169	209	255	139	157	171	191	229	272	311
	51	79	101	118	142	188	246	77	105	124	139	159	199	245	131	149	163	183	219	264	303
	41	69	91	108	132	178	234	67	95	114	129	149	189	235	123	141	155	175	211	256	295
	31	59	81	98	122	168	222	57	85	104	119	139	179	225	115	133	147	167	203	248	287
	21	49	71	88	112	158	212	47	75	94	109	129	169	215	107	125	139	159	195	240	279
	11	39	61	78	102	148	192	37	65	84	99	119	159	205	99	117	131	151	187	232	271
	1	29	51	68	92	138	182	27	55	74	89	109	149	195	91	109	123	143	179	224	263

*IT IS VERY IMPORTANT FOR JOIST SPECIFIERS AND ERECTORS TO KNOW THAT OSHA IS INTERPRETING 29CFR-1926.751(c)2 TO MEAN ALL JOIST FORTY (40) FEET (12192MM) AND LONGER TO REQUIRE A ROW OF BOLTED BRIDGING TO BE IN PLACE BEFORE SLACKENING OF HOIST LINES.



STANDARD LOAD TABLE / OPEN WEB STEEL JOISTS, K-SERIES

Based on a Maximum Allowable Tensile Stress of 30,000 psi

JOIST DESIGNATION	24K4	24K5	24K6	24K7	24K8	24K9	24K10	24K12	26K5	26K6	26K7	26K8	26K9	26K10	26K12
DEPTH (IN.)	24	24	24	24	24	24	24	24	26	26	26	26	26	26	26
APPROX. WT. (lbs./ft.)	8.4	9.3	9.7	10.1	11.5	12.0	13.1	16.0	9.8	10.6	10.9	12.1	12.2	13.8	16.6
SPAN (ft.)															
24	520	550	550	550	550	550	550	550							
	516	544	544	544	544	544	544	544							
25	479	540	550	550	550	550	550	550							
	456	511	520	520	520	520	520	520							
26	442	499	543	550	550	550	550	550	542	550	550	550	550	550	550
	405	453	493	499	499	499	499	499	535	541	541	541	541	541	541
27	410	462	503	550	550	550	550	550	502	547	550	550	550	550	550
	361	404	439	479	479	479	479	479	477	519	522	522	522	522	522
28	381	429	467	521	550	550	550	550	466	508	550	550	550	550	550
	323	362	393	436	456	456	456	456	427	464	501	501	501	501	501
29	354	400	435	485	536	550	550	550	434	473	527	550	550	550	550
	290	325	354	392	429	436	436	436	384	417	463	479	479	479	479
30	331	373	406	453	500	544	550	550	405	441	492	544	550	550	550
	262	293	319	353	387	419	422	422	346	377	417	457	459	459	459
31	310	349	380	424	468	510	550	550	379	413	460	509	550	550	550
	237	266	289	320	350	379	410	410	314	341	378	413	444	444	444
32	290	327	357	397	439	478	549	549	356	387	432	477	519	549	549
	215	241	262	290	318	344	393	393	285	309	343	375	407	431	431
33	273	308	335	373	413	449	532	532	334	364	406	448	488	532	532
	196	220	239	265	289	313	368	368	259	282	312	342	370	404	404
34	257	290	315	351	388	423	502	516	315	343	382	422	459	516	516
	179	201	218	242	264	286	337	344	237	257	285	312	338	378	378
35	242	273	297	331	366	399	473	501	297	323	360	398	433	501	501
	164	184	200	221	242	262	308	324	217	236	261	286	310	356	356
36	229	258	281	313	346	377	447	487	280	305	340	376	409	486	487
	150	169	183	203	222	241	283	306	199	216	240	263	284	334	334
37	216	244	266	296	327	356	423	474	265	289	322	356	387	460	474
	138	155	169	187	205	222	260	290	183	199	221	242	262	308	315
38	205	231	252	281	310	338	401	461	251	274	305	337	367	436	461
	128	143	156	172	189	204	240	275	169	184	204	223	241	284	299
39	195	219	239	266	294	320	380	449	238	260	289	320	348	413	449
	118	132	144	159	174	189	222	261	156	170	188	206	223	262	283
* 40	185	208	227	253	280	304	361	438	227	247	275	304	331	393	438
	109	122	133	148	161	175	206	247	145	157	174	191	207	243	269
41	176	198	216	241	266	290	344	427	215	235	262	289	315	374	427
	101	114	124	137	150	162	191	235	134	146	162	177	192	225	256
42	168	189	206	229	253	276	327	417	205	224	249	275	300	356	417
	94	106	115	127	139	151	177	224	125	136	150	164	178	210	244
43	160	180	196	219	242	263	312	406	196	213	238	263	286	339	407
	88	98	107	118	130	140	165	213	116	126	140	153	166	195	232
44	153	172	187	209	231	251	298	387	187	204	227	251	273	324	398
	82	92	100	110	121	131	154	199	108	118	131	143	155	182	222
45	146	164	179	199	220	240	285	370	179	194	217	240	261	310	389
	76	86	93	103	113	122	144	185	101	110	122	133	145	170	212
46	139	157	171	191	211	230	272	354	171	186	207	229	250	296	380
	71	80	87	97	106	114	135	174	95	103	114	125	135	159	203
47	133	150	164	183	202	220	261	339	164	178	199	219	239	284	369
	67	75	82	90	99	107	126	163	89	96	107	117	127	149	192
48	128	144	157	175	194	211	250	325	157	171	190	210	229	272	353
	63	70	77	85	93	101	118	153	83	90	100	110	119	140	180
49									150	164	183	202	220	261	339
									78	85	94	103	112	131	169
50									144	157	175	194	211	250	325
									73	80	89	97	105	124	159
51									139	151	168	186	203	241	313
									69	75	83	91	99	116	150
52									133	145	162	179	195	231	301
									65	71	79	86	93	110	142

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STANDARD LOAD TABLE / OPEN WEB STEEL JOISTS, K-SERIES

Based on a Maximum Allowable Tensile Stress of 30,000 psi

JOIST DESIGNATION	28K6	28K7	28K8	28K9	28K10	28K12	30K7	30K8	30K9	30K10	30K11	30K12
DEPTH (IN.)	28	28	28	28	28	28	30	30	30	30	30	30
APPROX. WT. (lbs./ft.)	11.4	11.8	12.7	13.0	14.3	17.1	12.3	13.2	13.4	15.0	16.4	17.6
SPAN (ft.)												
28	548	550	550	550	550	550						
	541	543	543	543	543	543						
29	511	550	550	550	550	550						
	486	522	522	522	522	522						
30	477	531	550	550	550	550	550	550	550	550	550	550
	439	486	500	500	500	500	543	543	543	543	543	543
31	446	497	550	550	550	550	534	550	550	550	550	550
	397	440	480	480	480	480	508	520	520	520	520	520
32	418	466	515	549	549	549	501	549	549	549	549	549
	397	440	438	463	463	463	461	500	500	500	500	500
33	393	438	484	527	532	532	471	520	532	532	532	532
	329	364	399	432	435	435	420	460	468	468	468	468
34	370	412	456	496	516	516	443	490	516	516	516	516
	300	333	364	395	410	410	384	420	441	441	441	441
35	349	389	430	468	501	501	418	462	501	501	501	501
	275	305	333	361	389	389	351	384	415	415	415	415
36	330	367	406	442	487	487	395	436	475	487	487	487
	352	280	306	332	366	366	323	353	383	392	392	392
37	312	348	384	418	474	474	373	413	449	474	474	474
	232	257	282	305	344	344	297	325	352	374	374	374
38	296	329	364	396	461	461	354	391	426	461	461	461
	214	237	260	282	325	325	274	300	325	353	353	353
39	280	313	346	376	447	449	336	371	404	449	449	449
	198	219	240	260	306	308	253	277	300	333	333	333
* 40	266	297	328	357	424	438	319	353	384	438	438	438
	183	203	222	241	284	291	234	256	278	315	315	315
41	253	283	312	340	404	427	303	335	365	427	427	427
	170	189	206	224	263	277	217	238	258	300	300	300
42	241	269	297	324	384	417	289	320	348	413	417	417
	158	175	192	208	245	264	202	221	240	282	284	284
43	230	257	284	309	367	407	276	305	332	394	407	407
	147	163	179	194	228	252	188	206	223	263	270	270
44	220	245	271	295	350	398	263	291	317	376	398	398
	137	152	167	181	212	240	176	192	208	245	258	258
45	210	234	259	282	334	389	251	278	303	359	389	389
	128	142	156	169	198	229	164	179	195	229	246	246
46	201	224	248	270	320	380	241	266	290	344	380	380
	120	133	146	158	186	219	153	168	182	214	236	236
47	192	214	237	258	306	372	230	255	277	329	372	372
	112	125	136	148	174	210	144	157	171	201	226	226
48	184	206	227	247	294	365	221	244	266	315	362	365
	105	117	128	139	163	201	135	148	160	188	215	216
49	177	197	218	237	282	357	212	234	255	303	347	357
	99	110	120	130	153	193	127	139	150	177	202	207
50	170	189	209	228	270	350	203	225	245	291	333	350
	93	103	113	123	144	185	119	130	141	166	190	199
51	163	182	201	219	260	338	195	216	235	279	320	343
	88	97	106	115	136	175	112	123	133	157	179	192
52	157	175	193	210	250	325	188	208	226	268	308	336
	83	92	100	109	128	165	106	116	126	148	169	184
53	151	168	186	203	240	313	181	200	218	258	296	330
	78	87	95	103	121	156	100	109	119	140	159	177
54	145	162	179	195	232	301	174	192	209	249	285	324
	74	82	89	97	114	147	94	103	112	132	150	170
55	140	156	173	188	223	290	168	185	202	240	275	312
	70	77	85	92	108	139	89	98	106	125	142	161
56	135	151	166	181	215	280	162	179	195	231	265	301
	66	73	80	87	102	132	84	92	100	118	135	153
57							156	173	188	223	256	290
							80	88	95	112	128	145
58							151	167	181	215	247	280
							76	83	90	106	121	137
59							146	161	175	208	239	271
							72	79	86	101	115	130
60							141	156	169	201	231	262
							69	75	81	96	109	124

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R157-100 Sheet Metal Calculator (Weight in Lb./Ft. of Length)

Gauge	26	24	22	20	18	16	Gauge	26	24	22	20	18	16
Wt.-Lb./S.F.	.906	1.156	1.406	1.656	2.156	2.656	Wt.-Lb./S.F.	.906	1.156	1.406	1.656	2.156	2.656
SMACNA Max. Dimension - Long Side		30"	54"	84"	85" Up		SMACNA Max. Dimension - Long Side		30"	54"	84"	85" Up	
Sum-2 sides							Sum-2 Sides						
2	.3	.40	.50	.60	.80	.90	56	9.3	12.0	14.0	16.2	21.3	25.2
3	.5	.65	.80	.90	1.1	1.4	57	9.5	12.3	14.3	16.5	21.7	25.7
4	.7	.85	1.0	1.2	1.5	1.8	58	9.7	12.5	14.5	16.8	22.0	26.1
5	.8	1.1	1.3	1.5	1.9	2.3	59	9.8	12.7	14.8	17.1	22.4	26.6
6	1.0	1.3	1.5	1.7	2.3	2.7	60	10.0	12.9	15.0	17.4	22.8	27.0
7	1.2	1.5	1.8	2.0	2.7	3.2	61	10.2	13.1	15.3	17.7	23.2	27.5
8	1.3	1.7	2.0	2.3	3.0	3.6	62	10.3	13.3	15.5	18.0	23.6	27.9
9	1.5	1.9	2.3	2.6	3.4	4.1	63	10.5	13.5	15.8	18.3	24.0	28.4
10	1.7	2.2	2.5	2.9	3.8	4.5	64	10.7	13.7	16.0	18.6	24.3	28.8
11	1.8	2.4	2.8	3.2	4.2	5.0	65	10.8	13.9	16.3	18.9	24.7	29.3
12	2.0	2.6	3.0	3.5	4.6	5.4	66	11.0	14.1	16.5	19.1	25.1	29.7
13	2.2	2.8	3.3	3.8	4.9	5.9	67	11.2	14.3	16.8	19.4	25.5	30.2
14	2.3	3.0	3.5	4.1	5.3	6.3	68	11.3	14.6	17.0	19.7	25.8	30.6
15	2.5	3.2	3.8	4.4	5.7	6.8	69	11.5	14.8	17.3	20.0	26.2	31.1
16	2.7	3.4	4.0	4.6	6.1	7.2	70	11.7	15.0	17.5	20.3	26.6	31.5
17	2.8	3.7	4.3	4.9	6.5	7.7	71	11.8	15.2	17.8	20.6	27.0	32.0
18	3.0	3.9	4.5	5.2	6.8	8.1	72	12.0	15.4	18.0	20.9	27.4	32.4
19	3.2	4.1	4.8	5.5	7.2	8.6	73	12.2	15.6	18.3	21.2	27.7	32.9
20	3.3	4.3	5.0	5.8	7.6	9.0	74	12.3	15.8	18.5	21.5	28.1	33.3
21	3.5	4.5	5.3	6.1	8.0	9.5	75	12.5	16.1	18.8	21.8	28.5	33.8
22	3.7	4.7	5.5	6.4	8.4	9.9	76	12.7	16.3	19.0	22.0	28.9	34.2
23	3.8	5.0	5.8	6.7	8.7	10.4	77	12.8	16.5	19.3	22.3	29.3	34.7
24	4.0	5.2	6.0	7.0	9.1	10.8	78	13.0	16.7	19.5	22.6	29.6	35.1
25	4.2	5.4	6.3	7.3	9.5	11.3	79	13.2	16.9	19.8	22.9	30.0	35.6
26	4.3	5.6	6.5	7.5	9.9	11.7	80	13.3	17.1	20.0	23.2	30.4	36.0
27	4.5	5.8	6.8	7.8	10.3	12.2	81	13.5	17.3	20.3	23.5	30.8	36.5
28	4.7	6.0	7.0	8.1	10.6	12.6	82	13.7	17.5	20.5	23.8	31.2	36.9
29	4.8	6.2	7.3	8.4	11.0	13.1	83	13.8	17.8	20.8	24.1	31.5	37.4
30	5.0	6.5	7.5	8.7	11.4	13.5	84	14.0	18.0	21.0	24.4	31.9	37.8
31	5.2	6.7	7.8	9.0	11.8	14.0	85	14.2	18.2	21.3	24.7	32.3	38.3
32	5.3	6.9	8.0	9.3	12.2	14.4	86	14.3	18.4	21.5	24.9	32.7	38.7
33	5.5	7.1	8.3	9.6	12.5	14.9	87	14.5	18.6	21.8	25.2	33.1	39.2
34	5.7	7.3	8.5	9.9	12.9	15.3	88	14.7	18.8	22.0	25.5	33.4	39.6
35	5.8	7.5	8.8	10.2	13.3	15.8	89	14.8	19.0	22.3	25.8	33.8	40.1
36	6.0	7.8	9.0	10.4	13.7	16.2	90	15.0	19.3	22.5	26.1	34.2	40.5
37	6.2	8.0	9.3	10.7	14.1	16.7	91	15.2	19.5	22.8	26.4	34.6	41.0
38	6.3	8.2	9.5	11.0	14.4	17.1	92	15.3	19.7	23.0	26.7	35.0	41.4
39	6.5	8.4	9.8	11.3	14.8	17.6	93	15.5	19.9	23.3	27.0	35.3	41.9
40	6.7	8.6	10.0	11.6	15.2	18.0	94	15.7	20.1	23.5	27.3	35.7	42.3
41	6.8	8.8	10.3	11.9	15.6	18.5	95	15.8	20.3	23.8	27.6	36.1	42.8
42	7.0	9.0	10.5	12.2	16.0	18.9	96	16.0	20.5	24.0	27.8	36.5	43.2
43	7.2	9.2	10.8	12.5	16.3	19.4	97	16.2	20.8	24.3	28.1	36.9	43.7
44	7.3	9.5	11.0	12.8	16.7	19.8	98	16.3	21.0	24.5	28.4	37.2	44.1
45	7.5	9.7	11.3	13.1	17.1	20.3	99	16.5	21.2	24.8	28.7	37.6	44.6
46	7.7	9.9	11.5	13.3	17.5	20.7	100	16.7	21.4	25.0	29.0	38.0	45.0
47	7.8	10.1	11.8	13.6	17.9	21.2	101	16.8	21.6	25.3	29.3	38.4	45.5
48	8.0	10.3	12.0	13.9	18.2	21.6	102	17.0	21.8	25.5	29.6	38.8	45.9
49	8.2	10.5	12.3	14.2	18.6	22.1	103	17.2	22.0	25.8	29.9	39.1	46.4
50	8.3	10.7	12.5	14.5	19.0	22.5	104	17.3	22.3	26.0	30.2	39.5	46.8
51	8.5	11.0	12.8	14.8	19.4	23.0	105	17.5	22.5	26.3	30.5	39.9	47.3
52	8.7	11.2	13.0	15.1	19.8	23.4	106	17.7	22.7	26.5	30.7	40.3	47.7
53	8.8	11.4	13.3	15.4	20.1	23.9	107	17.8	22.9	26.8	31.0	40.7	48.2
54	9.0	11.6	13.5	15.7	20.5	24.3	108	18.0	23.1	27.0	31.3	41.0	48.6
55	9.2	11.8	13.8	16.0	20.9	24.8	109	18.2	23.3	27.3	31.6	41.4	49.1
							110	18.3	23.5	27.5	31.9	41.8	49.5

REFERENCE NUMBERS

Example: If duct is 34" x 20" x 15' long, 34" is greater than 30" maximum, for 24 ga. so must be 22 ga. 34" + 20" = 54" going across from 54" find 13.5 lb. per foot. 13.5 x 15' = 202.5 lbs. For

S.F. of surface area 202.5 ÷ 1.406 = 144 S.F.
Note: Figures include an allowance for scrap.