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GRATING DEFLECTION TESTING JULY 2014

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Introduction

Intrepid is introducing a new concept for the toeboard protection of holes in gratings. Our new products are called T5-L (locking bar) and T5-J (J-bolt). The purpose of this report was to study grating deflection when using:

- Banding
- GPC's
- T5-L's
- T5-J's

Although over 800 data points were generated, this study was never intended to study all possible cases. Intrepid does not have a testing machine. To do this testing, we purchased fabricated grating with holes. To apply loads, 39 lb boxes were placed in specific positions. To determine deflection, measurements were taken before and after loading. The "**Test Method**" section gives particulars on grating, loads, and load locations.

This report has been organized as follows:

- Introduction
- Summary
- Test Method
- Data Organized By Increasing Load
- Data Organized By Hole Size and Hole Location
- Load Test Data: A. Uniform Load Test
- Load Test Data: B. Load Location Test
- Load Test Data: C. Point Load Test: 6" Hole Center
- Load Test Data: D. Point Load Test: 6" Hole Offset
- Load Test Data: E. Point Load Test: 14" Hole Center
- Load Test Data: F. Point Load Test: 14" Hole Offset
- Load Test Data: G. Special Point Load Test: 14" Hole Center
- Load Test Data: H. Special Point Load Test: 14" Hole Offset

The logo for Intrepid, featuring the word "INTREPID" in a bold, yellow, sans-serif font. The text is centered within a dark blue rectangular background that has two horizontal yellow bars above and below the text, creating a stylized banner effect.

GRATING DEFLECTION TEST

Summary

July 2014

Summary

Regarding grating deflection under load, banding, GPC's, T5-L's, and T5-J's perform similarly.

When a 234 lb (373 psf) load was applied, all deflections were less than 0.200".

The maximum deflection spread for banding, GPC's, T5-L's, and T5-J's was 0.066" (about 1/16").

When a 273 lb (436 psf) load was applied, all deflections were less than 0.220".

The maximum deflection spread for banding, GPC's, T5-L's, and T5-J's was 0.063" (about 1/16").

When loads of 468 lb, 546 lb, and 936 lb were applied, only then did the deflections exceed the 0.250" standard. It was exceeded in 2 out of 9 tests.

When uniform loads of 1,404 lb and 1,560 lb were applied, the 0.250" standard was exceeded once out of 4 tests.

When a load was centered (or slightly off center) on the cut bars, maximum deflection was produced.

When the load was on the side of the hole with no cut bars, minimal deflection was produced.

Test Method

Our testing was simple. The grating around the hole was measured before loading. Then a load (boxes containing steel hardware) was placed on the grating. The grating was measured again.

The test used split steel grating: 5' x 3' 1-1/4" Serrated.

1. Uncut grating --- no holes.
2. Centered 6" hole which was banded.
3. Centered 6" hole which was used for GPC, T5-L, and T5-J.
4. Offset 6" hole which was banded.
5. Offset 6" hole which was used for GPC, T5-L, and T5-J.
6. Centered 14" hole which was banded.
7. Centered 14" hole which was used for GPC, T5-L, and T5-J.
8. Offset 14" hole which was banded.
9. Offset 14" hole which was used for GPC, T5-L, and T5-J.

Box weight: 39 lbs.

Box area: 0.627 sq. ft.

Deflection Value At Load Point A:

- For 6" Hole, Average Of Points 4 & 5.
- For 14" Hole, Average Of Points 6 & 7.

Deflection Value At Load Point B:

- For 6" Hole, Average Of Points 3.

Deflection Value At Load Point C:

- For 6" Hole, Average Of Points 4.

Deflection Value At Load Point A':

- For 6" Hole, Average Of Points 1 & 2.
- For 14" Hole, Average Of Points 1 & 2.

Deflection Value At Load Point B':

- For 6" Hole, Average Of Points 6.

Deflection Value At Load Point C':

- For 6" Hole, Average Of Points 1.

Deflection Value For Uniform Load:

- For Center Hole, Uncut Grating At Grating Point 3.
- For Offset 6" Hole, Uncut Grating At Grating Point 5.
- For Offset 14" Hole, Uncut Grating At Grating Points 4 & 5.
- For Banding, GPC, T5-L, & T5-J, Average Of All Points.



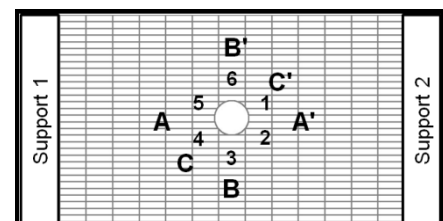
6" Hole, Centered



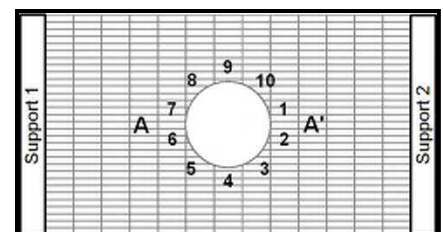
14" Hole, Offset



Steel Hardware Boxes



6" Hole Points



14" Hole Points



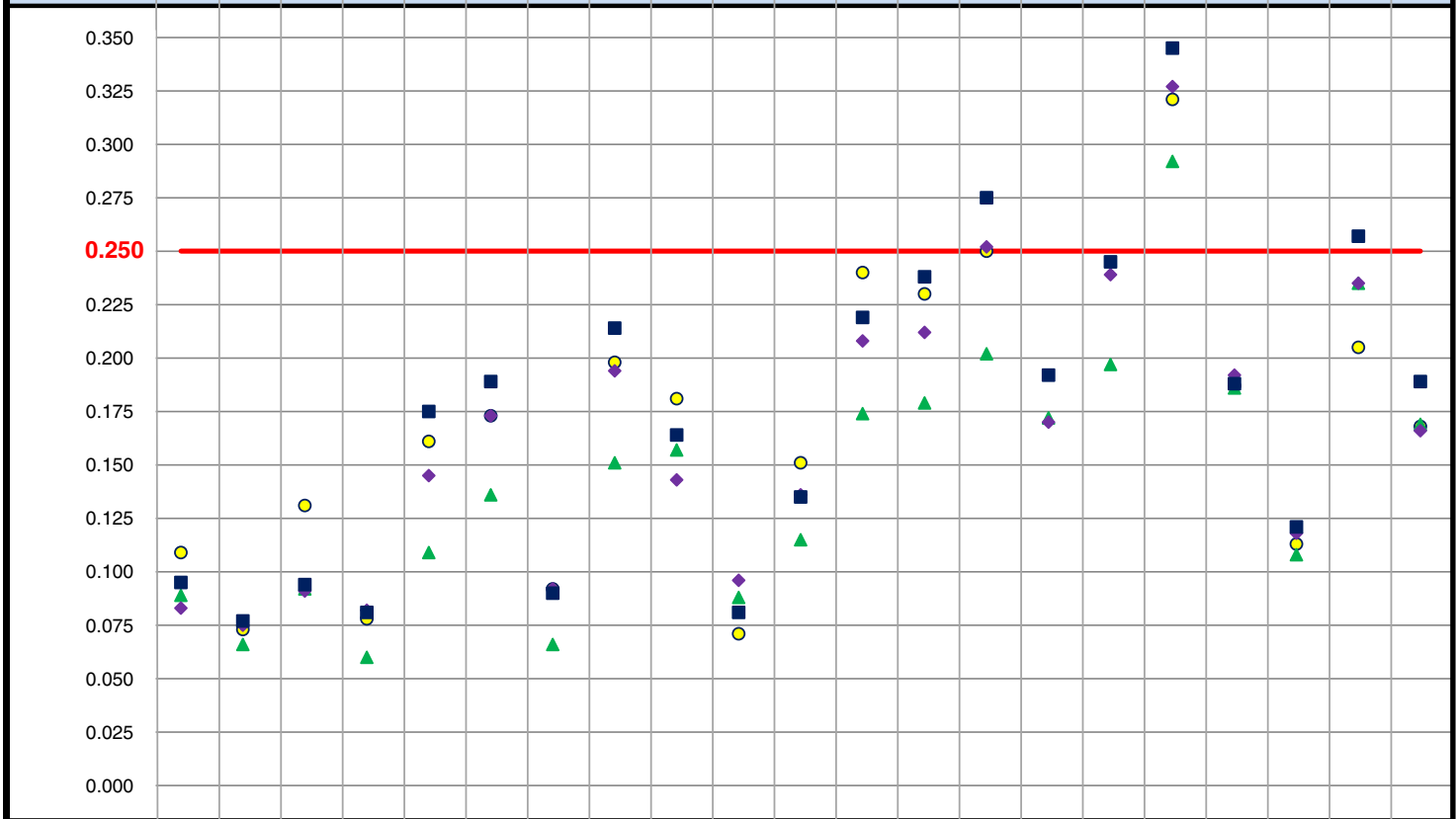
GRATING DEFLECTION TEST

Increasing Load

July 2014

Deflection: Average deflection at cut bars in lbs
Load: Lbs
Load Location: See test method drawings
Hole Size: 6" & 14"
Hole Location: Center & Offset

Load	234	234	234	234	234	234	273	273	468	468	468	468	468	468	546	546	936	1404	1404	1560	1560
Load Location	A	B	C						A-A'	B-B'	C-C'	A-A'	One	One	A-A'	A-A'	A-A'	U	U	U	U
Hole Size	6	6	6	6	14	14	6	14	6	6	6	14	14	14	6	14	14	6	6	14	14
Hole Location	C	C	C	O	C	O	O	O	C	C	C	C	C	O	C	C	C	C	O	C	O
Deflection																					
Bandings	0.109	0.073	0.131	0.078	0.161	0.173	0.092	0.198	0.181	0.071	0.151	0.240	0.230	0.250			0.321	0.187	0.113	0.205	0.168
GPC	0.089	0.066	0.092	0.060	0.109	0.136	0.066	0.151	0.157	0.088	0.115	0.174	0.179	0.202	0.172	0.197	0.292	0.186	0.108	0.235	0.169
T5-L	0.083	0.075	0.091	0.082	0.145	0.173	0.092	0.194	0.143	0.096	0.136	0.208	0.212	0.252	0.170	0.239	0.327	0.192	0.118	0.235	0.166
T5-J	0.095	0.077	0.094	0.081	0.175	0.189	0.090	0.214	0.164	0.081	0.135	0.219	0.238	0.275	0.192	0.245	0.345	0.188	0.121	0.257	0.189



Deflection Spread	0.026	0.011	0.040	0.022	0.066	0.053	0.026	0.063	0.038	0.025	0.036	0.066	0.059	0.073	0.022	0.048	0.053	0.006	0.013	0.052	0.023
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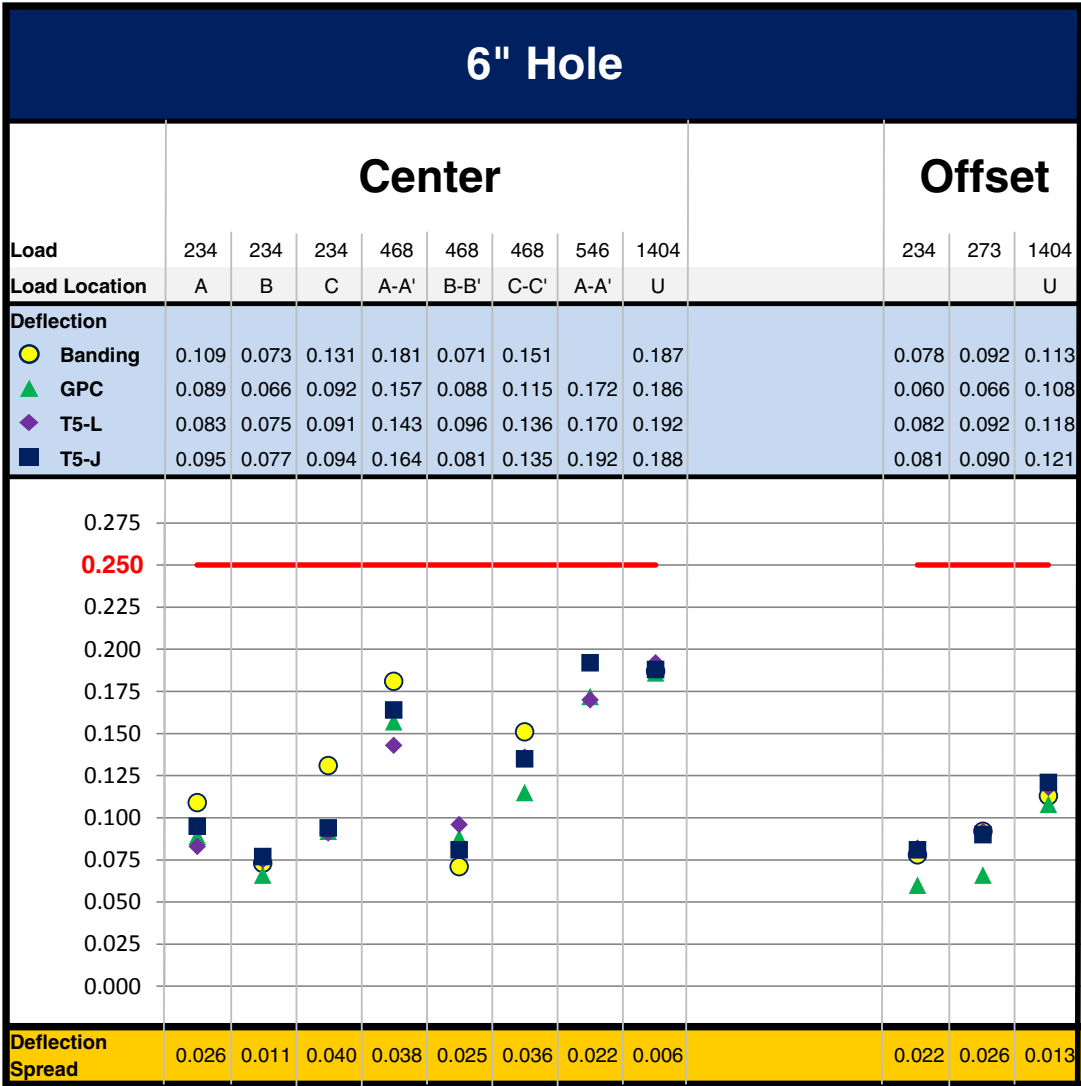
GRATING DEFLECTION TEST

Hole Size & Location (6")

July 2014

Deflection: Average deflection at cut bars in lbs
Load: Lbs
Load Location: See test method drawings

Hole Size: 6"
Hole Location: Center & Offset





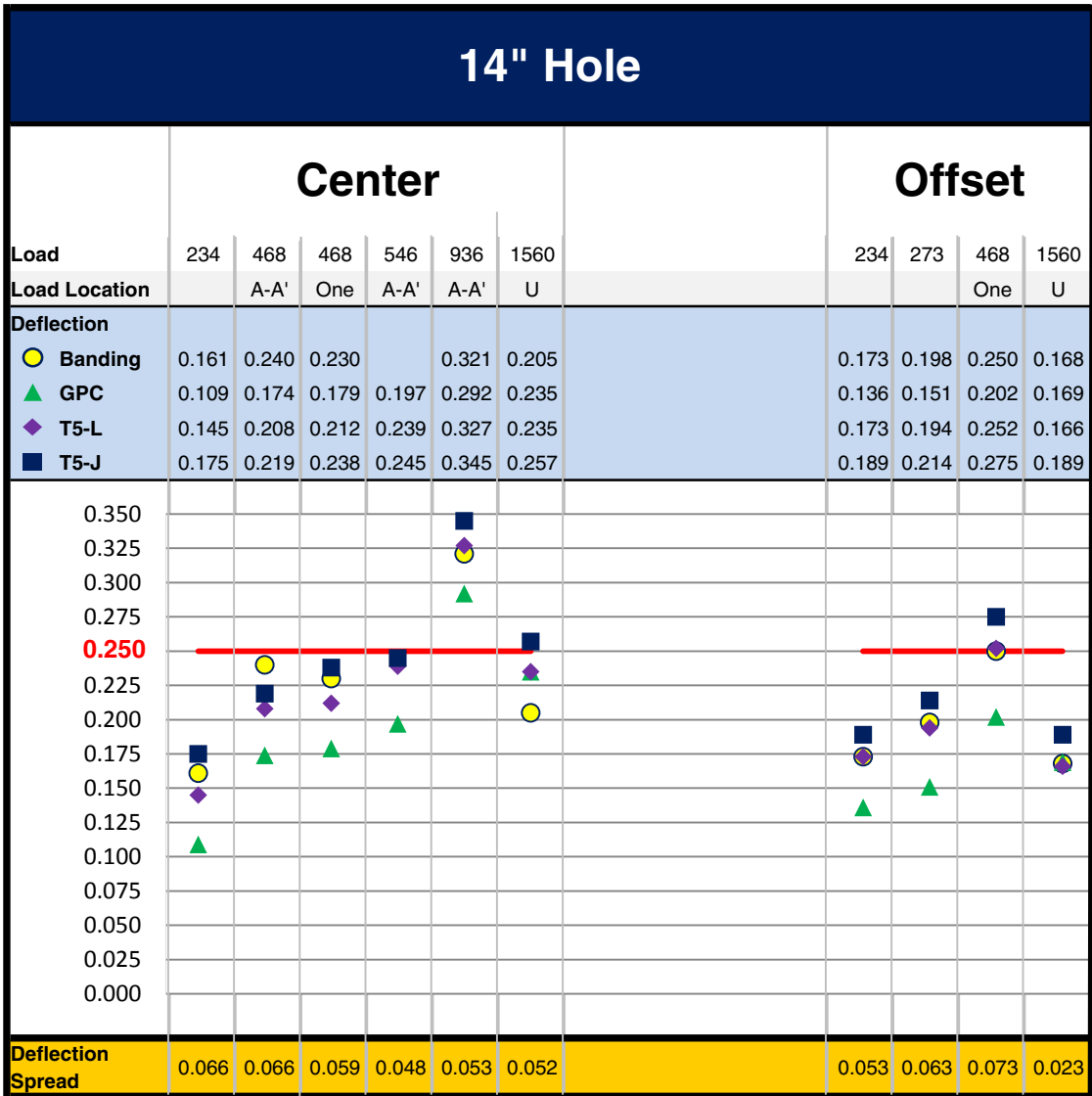
GRATING DEFLECTION TEST

Hole Size & Location (14")

July 2014

Deflection: Average deflection at cut bars in lbs
Load: Lbs
Load Location: See test method drawings

Hole Size: 14"
Hole Location: Center & Offset



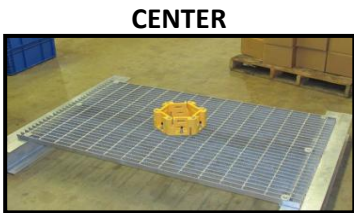


GRATING DEFLECTION TEST

A. Uniform Load Test

July 2014

Split Steel Grating 5' x 3' x 1 1/4" Serrated

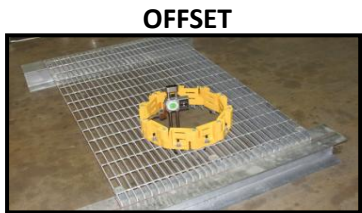
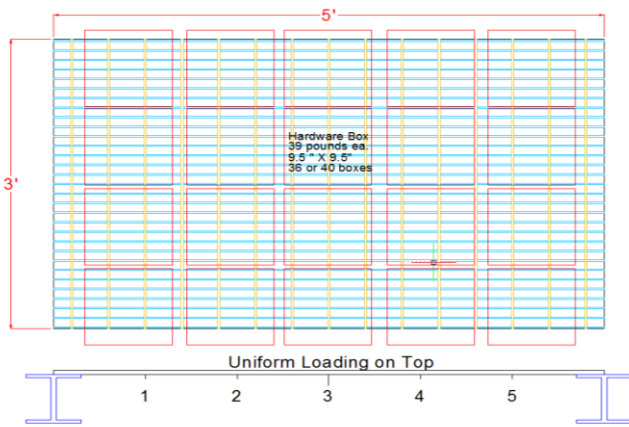


CENTER

24" From Support For 6"
20" From Support For 14"



1404 lb Load For 6"
1560 lb Load For 14"



OFFSET

45" From Support For 6"
40" From Support For 14"



1404 lb Load For 6"
1560 lb Load For 14"

6" Hole

Center		Offset
-0.187	Banding	-0.113
-0.186	GPC-6	-0.108
-0.192	T5-L	-0.118
-0.188	T5-J	-0.121

14" Hole

Center		Offset
-0.205	Banding	-0.168
-0.235	GPC-14	-0.169
-0.235	T5-L	-0.166
-0.257	T5-J	-0.189

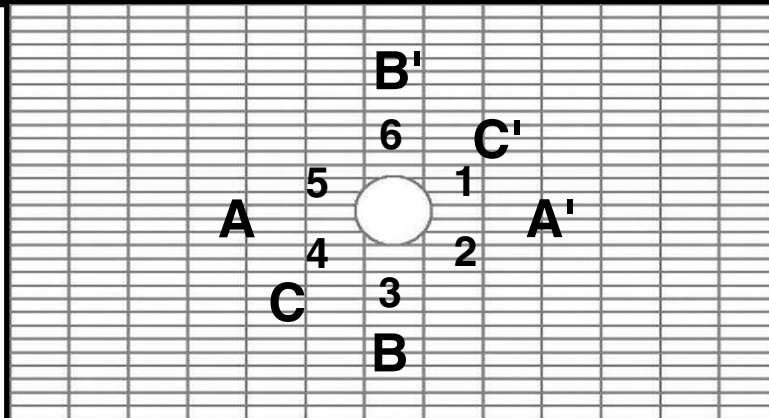
The spread of all deflection for the GPC-6, GPC-14, T5-L, and T5-J was .050 inches.

Split Steel Grating

5' x 3' x 1 1/4" Serrated

Location Of Load Points

Support 1



Support 2

6" Hole In Center

24" From Center

234 lb



A		A-A'
-0.109	Banding	-0.181
-0.089	GPC-6	-0.157
-0.083	T5-L	-0.143
-0.095	T5-J	-0.164



B		B-B'
-0.073	Banding	-0.071
-0.066	GPC-6	-0.088
-0.075	T5-L	-0.096
-0.077	T5-J	-0.086



C		C-C'
-0.131	Banding	-0.151
-0.092	GPC-6	-0.115
-0.091	T5-L	-0.136
-0.094	T5-J	-0.135



Summary

Single experiment to determine significance of location of point loading.

A and A-A' = Most cut bars --- most deflection

B and B-B' = Least cut bars --- least deflection

C and C-C' = Similar to A and A-A'

All further testing utilized A and A-A' locations for point loads.



GRATING DEFLECTION TEST

A. Uniform Load Test

July 2014

Uniform Load Test 6" Hole In Center 24" From Support

	Height Gauge Zeroed At Point 1				Height Gauge Zeroed at Point 3		Uncut Grating	
	No Load						1404 lb Load	
Point #	Banding	GPC-6	T5-L	T5-J	Uncut Grating	Reading	Actual Deflection	
1	0.000	0.000	0.000	0.000	-0.004	-0.124	-0.120	
2	-0.031	-0.055	-0.082	-0.098	0.031	-0.130	-0.161	
3	0.004	-0.062	-0.066	-0.099	0.000	-0.205	-0.205	
4	0.021	-0.053	-0.071	-0.101	0.004	-0.138	-0.142	
5	0.031	0.005	0.031	0.017	-0.033	-0.112	-0.079	
6	0.028	0.051	0.069	0.048	*Measured every 10"			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support 1 to the edge of the 6" hole: 24"

Uniform Load Deflection Test

1404 lb Load was equally distributed across all of the grating.
 The average deflection is comparable to point 3 on the uncut grating.

Point #	Banding 1404 lb load		GPC-6 1404 lb load		T5-L 1404 lb load		T5-J 1404 lb load	
	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.208	-0.208	-0.184	-0.184	-0.194	-0.194	-0.183	-0.183
2	-0.219	-0.188	-0.236	-0.181	-0.268	-0.186	-0.287	-0.189
3	-0.172	-0.176	-0.244	-0.182	-0.260	-0.194	-0.292	-0.193
4	-0.162	-0.183	-0.238	-0.185	-0.256	-0.185	-0.288	-0.187
5	-0.185	-0.216	-0.178	-0.183	-0.149	-0.180	-0.174	-0.191
6	-0.121	-0.149	-0.151	-0.202	-0.142	-0.211	-0.134	-0.182

Average Deflection	-0.187	-0.186	-0.192	-0.188
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All deflection readings measured in inches



GRATING DEFLECTION TEST

A. Uniform Load Test

July 2014

Uniform Load Test 6" Hole Offset 46" From Support

	Height Gauge Zeroed At Point 1				Height Gauge Zeroed at Point 3		Uncut Grating	
	No Load						1404 lb Load	
Point #	Banding	GPC-6	T5-L	T5-J	Uncut Grating	Reading	Actual Deflection	
1	0.000	0.000	0.000	0.000	-0.004	-0.124	-0.120	
2	-0.049	0.030	0.044	0.078	0.031	-0.130	-0.161	
3	0.003	0.106	0.145	0.195	0.000	-0.205	-0.205	
4	0.047	0.092	0.136	0.184	0.004	-0.138	-0.142	
5	0.127	0.045	0.097	0.087	-0.033	-0.112	-0.079	
6	0.091	0.039	0.044	0.042	*Measured every 10"			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was located near support 2.
 Distance from support 1 to the edge of the 6" hole: 46"

Uniform Load Deflection Test

1404 lb Load was equally distributed across all of the grating.
 The average deflection is comparable to point 5 on the uncut grating.

Point #	Banding 1404 lb load		GPC-6 1404 lb load		T5-L 1404 lb load		T5-J 1404 lb load	
	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.088	-0.088	-0.083	-0.083	-0.082	-0.082	-0.093	-0.093
2	-0.137	-0.088	-0.056	-0.086	-0.038	-0.082	-0.026	-0.104
3	-0.106	-0.109	0.006	-0.100	0.016	-0.129	0.053	-0.142
4	-0.078	-0.125	-0.042	-0.134	-0.018	-0.154	0.019	-0.165
5	-0.024	-0.151	-0.091	-0.136	-0.048	-0.145	-0.058	-0.145
6	-0.028	-0.119	-0.069	-0.108	-0.072	-0.116	-0.037	-0.079

Average Deflection	-0.113	-0.108	-0.118	-0.121
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All deflection readings measured in inches



GRATING DEFLECTION TEST

A. Uniform Load Test

July 2014

Uniform Load Test 14" Hole In Center 20" From Support

	Height Gauge Zeroed At Point 1				Height Gauge Zeroed at Point 3	Uncut Grating	
	No Load					1560 lb Load	
Point #	Banding	GPC-14	T5-L	T5-J	Uncut Grating	Reading	Actual Deflection
1	0.000	0.000	0.000	0.000	-0.004	-0.139	-0.135
2	0.021	-0.007	0.009	0.017	0.031	-0.166	-0.197
3	-0.112	0.008	0.012	0.039	0.000	-0.224	-0.224
4	-0.123	0.076	-0.029	-0.009	0.004	-0.168	-0.172
5	-0.081	0.043	0.007	0.023	-0.033	-0.123	-0.090
6	-0.086	-0.011	0.029	0.046	*Measured every 10"		
7	0.008	-0.015	0.005	0.019			
8	0.021	0.017	-0.017	-0.023			
9	0.016	0.062	-0.014	-0.040			
10	0.043	0.020	-0.022	-0.021			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 14" hole was centered.
 Distance from support 1 to the edge of the 14" hole: 20"

Uniform Load Deflection Test

1560 lb Load was equally distributed across all of the grating.
 The average deflection is comparable to point 3 on the uncut grating.

Point #	Banding 1560 lb load		GPC-14 1560 lb load		T5-L 1560 lb load		T5-J 1560 lb load	
	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.199	-0.199	-0.243	-0.243	-0.248	-0.248	-0.266	-0.266
2	-0.201	-0.222	-0.245	-0.238	-0.223	-0.232	-0.223	-0.240
3	-0.316	-0.204	-0.215	-0.223	-0.218	-0.230	-0.202	-0.241
4	-0.323	-0.200	-0.148	-0.224	-0.253	-0.224	-0.247	-0.238
5	-0.287	-0.206	-0.174	-0.217	-0.211	-0.218	-0.217	-0.240
6	-0.308	-0.222	-0.226	-0.215	-0.202	-0.231	-0.212	-0.258
7	-0.192	-0.200	-0.249	-0.234	-0.228	-0.233	-0.247	-0.266
8	-0.174	-0.195	-0.230	-0.247	-0.267	-0.250	-0.295	-0.272
9	-0.181	-0.197	-0.195	-0.257	-0.253	-0.239	-0.311	-0.271
10	-0.157	-0.200	-0.234	-0.254	-0.262	-0.240	-0.297	-0.276

Average Deflection	-0.205	-0.235	-0.235	-0.257
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All deflection readings measured in inches



GRATING DEFLECTION TEST

A. Uniform Load Test

July 2014

Uniform Load Test 14" Hole Offset 38" From Support

	Height Gauge Zeroed At Point 1				Height Gauge Zeroed at Point 3	Uncut Grating	
	No Load					1560 lb Load	
Point #	Banding	GPC-14	T5-L	T5-J	Uncut Grating	Reading	Actual Deflection
1	0.000	0.000	0.000	0.000	-0.004	-0.139	-0.135
2	-0.087	0.011	0.016	-0.019	0.031	-0.166	-0.197
3	-0.066	0.065	0.078	0.029	0.000	-0.224	-0.224
4	-0.021	0.144	0.091	0.048	0.004	-0.168	-0.172
5	0.023	0.113	0.098	0.108	-0.033	-0.123	-0.090
6	0.031	0.055	0.094	0.110	*Measured every 10"		
7	-0.005	0.036	0.080	0.097			
8	-0.056	0.052	0.061	0.052			
9	-0.108	0.068	0.038	0.019			
10	-0.126	0.009	-0.008	-0.024			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 14" hole was located near support 2.
 Distance from support 1 to the edge of the 14" hole: 38"

Uniform Load Deflection Test

1560 lb Load was equally distributed across all of the grating.
 The average deflection is comparable to points 4-5 on the uncut grating.

Point #	Banding 1560 lb load		GPC-14 1560 lb load		T5-L 1560 lb load		T5-J 1560 lb load	
	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.089	-0.089	-0.105	-0.105	-0.090	-0.090	-0.111	-0.111
2	-0.184	-0.097	-0.079	-0.090	-0.069	-0.085	-0.116	-0.097
3	-0.201	-0.135	-0.051	-0.116	-0.039	-0.117	-0.102	-0.131
4	-0.202	-0.181	-0.018	-0.162	-0.066	-0.157	-0.112	-0.160
5	-0.191	-0.214	-0.094	-0.207	-0.104	-0.202	-0.121	-0.229
6	-0.236	-0.267	-0.183	-0.238	-0.159	-0.253	-0.170	-0.280
7	-0.236	-0.231	-0.208	-0.244	-0.174	-0.254	-0.197	-0.294
8	-0.246	-0.190	-0.167	-0.219	-0.157	-0.218	-0.202	-0.254
9	-0.265	-0.157	-0.109	-0.177	-0.132	-0.170	-0.178	-0.197
10	-0.247	-0.121	-0.119	-0.128	-0.126	-0.118	-0.161	-0.137

Average Deflection	-0.168	-0.169	-0.166	-0.189
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All deflection readings measured in inches



GRATING DEFLECTION TEST

B. Load Location Test

July 2014

Load Location Test 6" Hole In Center 24" From Center

Height Gauge Zeroed At Point 1		Support 1													Support 2
No Load															
Point #	Reading														
1	0.000														
2	-0.031														
3	0.004														
4	0.021														
5	0.031														
6	0.028														

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

Banding

Load: 234 lb on 0.627 Sq. ft. --- 373 psf

	Location A Load: 234 lb Total: 234 lb		Location A & A' Load: 234 lb Total: 468 lb		Location B Load: 234 lb Total: 234 lb		Location B & B' Load: 234 lb Total: 468 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.096	-0.096	-0.183	-0.183	-0.018	-0.018	-0.086	-0.086
2	-0.111	-0.080	-0.214	-0.183	-0.103	-0.072	-0.118	-0.087
3	-0.078	-0.082	-0.158	-0.162	-0.069	-0.073	-0.078	-0.082
4	-0.092	-0.113	-0.154	-0.175	-0.057	-0.078	-0.054	-0.075
5	-0.073	-0.104	-0.153	-0.184	0.004	-0.027	-0.056	-0.087
6	-0.019	-0.047	-0.089	-0.117	0.009	-0.019	-0.032	-0.060

Average Deflection	-0.109	-0.181	-0.073	-0.071
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All deflection readings measured in inches



GRATING DEFLECTION TEST

B. Load Location Test

July 2014

Load Location Test 6" Hole In Center 24" From Center

Height Gauge Zeroed At Point 1		Support 1																	Support 2
No Load																			
Point #	Reading																		
1	0.000																		
2	-0.031																		
6	0.028																		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

Banding

Load: 234 lb on 0.627 Sq. ft. --- 373 psf

	Location A Load: 234 lb Total: 234 lb		Location A & A' Load: 234 lb Total: 468 lb		Location C Load: 234 lb Total: 234 lb		Location C & C' Load: 234 lb Total: 468 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.096	-0.096	-0.183	-0.183	-0.029	-0.029	-0.178	-0.178
2	-0.111	-0.080	-0.214	-0.183	-0.164	-0.133	-0.204	-0.173
3	-0.078	-0.082	-0.158	-0.162	-0.115	-0.119	-0.138	-0.142
4	-0.092	-0.113	-0.154	-0.175	-0.122	-0.143	-0.152	-0.173
5	-0.073	-0.104	-0.153	-0.184	0.004	-0.027	-0.126	-0.157
6	-0.019	-0.047	-0.089	-0.117	0.033	0.005	-0.081	-0.109

Average Deflection	-0.109	-0.181	-0.131	-0.151
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All deflection readings measured in inches



GRATING DEFLECTION TEST

B. Load Location Test

July 2014

Load Location Test 6" Hole In Center 24" From Center

Height Gauge Zeroed At Point 1		Support 1													Support 2
No Load															
Point #	Reading														
1	0.000														
2	-0.055														
3	-0.062														
4	-0.053														
5	0.005														
6	-0.051														

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

GPC - 6

Load: 234 lb on 0.627 Sq. ft. --- 373 psf

	Location A Load: 234 lb Total: 234 lb		Location A & A' Load: 234 lb Total: 468 lb		Location B Load: 234 lb Total: 234 lb		Location B & B' Load: 234 lb Total: 468 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.078	-0.078	-0.157	-0.157	-0.036	-0.036	-0.085	-0.085
2	-0.131	-0.076	-0.209	-0.154	-0.106	-0.051	-0.133	-0.078
3	-0.137	-0.075	-0.212	-0.150	-0.128	-0.066	-0.149	-0.087
4	-0.144	-0.091	-0.211	-0.158	-0.112	-0.059	-0.132	-0.079
5	-0.082	-0.087	-0.154	-0.159	-0.024	-0.029	-0.093	-0.098
6	-0.033	0.018	-0.105	-0.054	-0.014	0.037	-0.140	-0.089

Average Deflection	-0.089	-0.157	-0.066	-0.088
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All deflection readings measured in inches

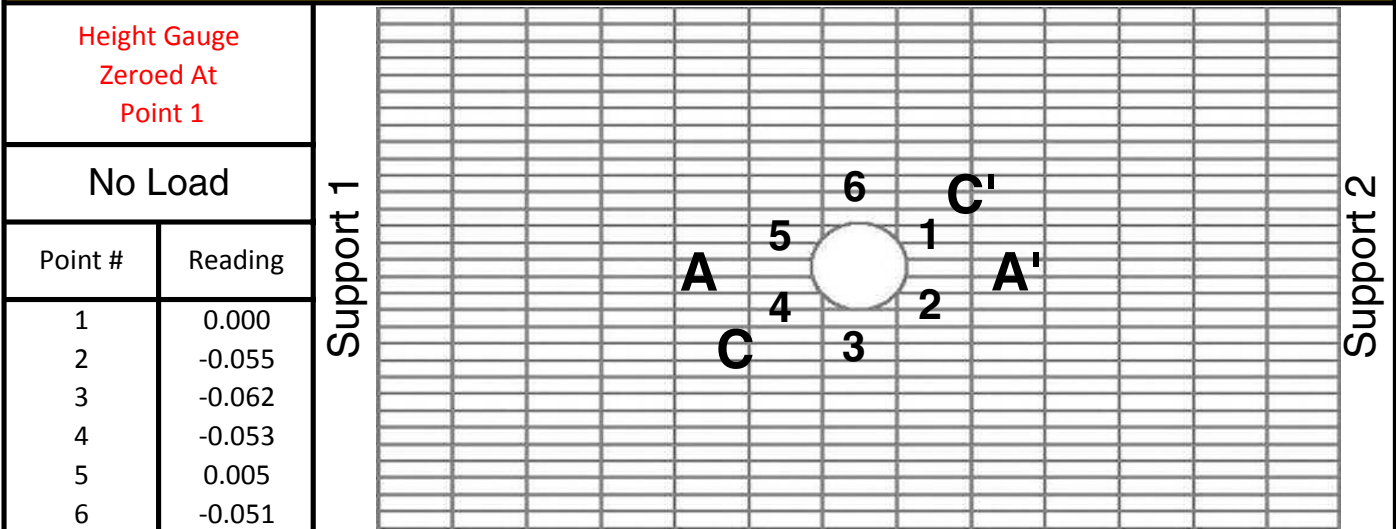


GRATING DEFLECTION TEST

B. Load Location Test

July 2014

Load Location Test 6" Hole In Center 24" From Center



Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

GPC - 6

Load: 234 lb on 0.627 Sq. ft. --- 373 psf

	Location A Load: 234 lb Total: 234 lb		Location A & A' Load: 234 lb Total: 468 lb		Location C Load: 234 lb Total: 234 lb		Location C & C' Load: 234 lb Total: 468 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.078	-0.078	-0.157	-0.157	-0.064	-0.064	-0.144	-0.144
2	-0.131	-0.076	-0.209	-0.154	-0.129	-0.074	-0.189	-0.134
3	-0.137	-0.075	-0.212	-0.150	-0.153	-0.091	-0.192	-0.130
4	-0.144	-0.091	-0.211	-0.158	-0.146	-0.093	-0.197	-0.144
5	-0.082	-0.087	-0.154	-0.159	-0.063	-0.068	-0.144	-0.149
6	-0.033	0.018	-0.105	-0.054	-0.011	0.040	-0.094	-0.043

Average Deflection	-0.089	-0.157	-0.092	-0.115
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All deflection readings measured in inches



GRATING DEFLECTION TEST

B. Load Location Test

July 2014

Load Location Test 6" Hole In Center 24" From Center

Height Gauge Zeroed At Point 1		Support 1													Support 2
No Load															
Point #	Reading														
1	0.000														
2	-0.082														
3	-0.066														
4	-0.071														
5	0.031														
6	0.069														

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

T5 - L

Load: 234 lb on 0.627 Sq. ft. --- 373 psf

	Location A Load: 234 lb Total: 234 lb		Location A & A' Load: 234 lb Total: 468 lb		Location B Load: 234 lb Total: 234 lb		Location B & B' Load: 234 lb Total: 468 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.076	-0.076	-0.147	-0.147	-0.034	-0.034	-0.095	-0.095
2	-0.161	-0.079	-0.218	-0.136	-0.145	-0.063	-0.162	-0.080
3	-0.141	-0.075	-0.211	-0.145	-0.141	-0.075	-0.161	-0.095
4	-0.148	-0.077	-0.218	-0.147	-0.126	-0.055	-0.154	-0.083
5	-0.057	-0.088	-0.112	-0.143	0.003	-0.028	-0.053	-0.084
6	-0.013	-0.082	-0.080	-0.149	0.028	-0.041	-0.027	-0.096

Average Deflection	-0.083	-0.143	-0.075	-0.096
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All deflection readings measured in inches



GRATING DEFLECTION TEST

B. Load Location Test

July 2014

Load Location Test 6" Hole In Center 24" From Center

Height Gauge Zeroed At Point 1		Support 1																	Support 2
No Load																			
Point #	Reading																		
1	0.000																		
2	-0.082																		
6	0.069																		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

T5 - L

Load: 234 lb on 0.627 Sq. ft. --- 373 psf

	Location A Load: 234 lb Total: 234 lb		Location A & A' Load: 234 lb Total: 468 lb		Location C Load: 234 lb Total: 234 lb		Location C & C' Load: 234 lb Total: 468 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.076	-0.076	-0.147	-0.147	-0.059	-0.059	-0.148	-0.148
2	-0.161	-0.079	-0.218	-0.136	-0.164	-0.082	-0.194	-0.112
3	-0.141	-0.075	-0.211	-0.145	-0.156	-0.090	-0.190	-0.124
4	-0.148	-0.077	-0.218	-0.147	-0.162	-0.091	-0.203	-0.132
5	-0.057	-0.088	-0.112	-0.143	-0.024	-0.055	-0.107	-0.138
6	-0.013	-0.082	-0.080	-0.149	0.014	-0.055	-0.069	-0.138

Average Deflection	-0.083	-0.143	-0.091	-0.136
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All deflection readings measured in inches



GRATING DEFLECTION TEST

B. Load Location Test

July 2014

Load Location Test 6" Hole In Center 24" From Center

Height Gauge Zeroed At Point 1		Support 1													Support 2
No Load															
Point #	Reading														
1	0.000														
2	-0.098														
3	-0.099														
4	-0.101														
5	0.017														
6	0.048														

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

T5 - J

Load: 234 lb on 0.627 Sq. ft. --- 373 psf

	Location A Load: 234 lb Total: 234 lb		Location A & A' Load: 234 lb Total: 468 lb		Location B Load: 234 lb Total: 234 lb		Location B & B' Load: 234 lb Total: 468 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.076	-0.076	-0.159	-0.159	-0.024	-0.024	-0.084	-0.084
2	-0.180	-0.082	-0.263	-0.165	-0.151	-0.053	-0.178	-0.080
3	-0.183	-0.084	-0.253	-0.154	-0.176	-0.077	-0.194	-0.095
4	-0.197	-0.096	-0.270	-0.169	-0.156	-0.055	-0.182	-0.081
5	-0.076	-0.093	-0.144	-0.161	-0.008	-0.025	-0.068	-0.085
6	-0.008	-0.056	-0.086	-0.134	0.035	-0.013	-0.028	-0.076

Average Deflection	-0.095	-0.164	-0.077	-0.086
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All deflection readings measured in inches



GRATING DEFLECTION TEST

B. Load Location Test

July 2014

Load Location Test 6" Hole In Center 24" From Center

Height Gauge Zeroed At Point 1		Support 1													Support 2
No Load															
Point #	Reading														
1	0.000														
2	-0.098														
6	0.048														

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

T5 - J

Load: 234 lb on 0.627 Sq. ft. --- 373 psf

	Location A Load: 234 lb Total: 234 lb		Location A & A' Load: 234 lb Total: 468 lb		Location C Load: 234 lb Total: 234 lb		Location C & C' Load: 234 lb Total: 468 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.076	-0.076	-0.159	-0.159	-0.059	-0.059	-0.140	-0.140
2	-0.180	-0.082	-0.263	-0.165	-0.193	-0.095	-0.234	-0.136
3	-0.183	-0.084	-0.253	-0.154	-0.196	-0.097	-0.236	-0.137
4	-0.197	-0.096	-0.270	-0.169	-0.191	-0.090	-0.246	-0.145
5	-0.076	-0.093	-0.144	-0.161	-0.048	-0.065	-0.128	-0.145
6	-0.008	-0.056	-0.086	-0.134	0.026	-0.022	-0.071	-0.119

Average Deflection	-0.095	-0.164	-0.094	-0.135
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All deflection readings measured in inches



GRATING DEFLECTION TEST

C. Point Load: 6" Hole Center

July 2014

Banding 6" Hole In Center 24" From Support

Height Gauge Zeroed At Point 1		Support 1																	Support 2
No Load																			
Point #	Reading																		
1	0.000																		
2	-0.031																		
6	0.028																		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

Point Load: Banding

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Load: 273 lb		Location A & A' Load: 234 lb Total: 468 lb		Load: 273 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.096	-0.096			-0.183	-0.183		
2	-0.111	-0.080			-0.214	-0.183		
3	-0.078	-0.082			-0.158	-0.162		
4	-0.092	-0.113			-0.154	-0.175		
5	-0.073	-0.104			-0.153	-0.184		
6	-0.019	-0.047			-0.089	-0.117		

Average Deflection	-0.109		-0.181	
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All deflection readings measured in inches



GRATING DEFLECTION TEST

C. Point Load: 6" Hole Center

July 2014

GPC-6 6" Hole In Center 24" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	-0.055			
3	-0.062			
4	-0.053			
5	0.005			
6	0.051			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

Point Load: GPC-6

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Location A Load: 273 lb Total: 273 lb		Location A & A' Load: 234 lb Total: 468 lb		Location A & A' Load: 273 lb Total: 546 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.078	-0.078	-0.090	-0.090	-0.157	-0.157	-0.173	-0.173
2	-0.131	-0.076	-0.135	-0.080	-0.209	-0.154	-0.225	-0.170
3	-0.137	-0.075	-0.160	-0.098	-0.212	-0.150	-0.234	-0.172
4	-0.144	-0.091	-0.150	-0.097	-0.211	-0.158	-0.225	-0.172
5	-0.082	-0.087	-0.093	-0.098	-0.154	-0.159	-0.168	-0.173
6	-0.033	-0.084	-0.037	-0.088	-0.105	-0.156	-0.101	-0.152

Average Deflection	-0.089	-0.098	-0.157	-0.172
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All deflection readings measured in inches



GRATING DEFLECTION TEST

C. Point Load: 6" Hole Center

July 2014

T5-L 6" Hole In Center 24" From Support

Height Gauge Zeroed At Point 1		Support 1																	Support 2
No Load																			
Point #	Reading																		
1	0.000																		
2	-0.082																		
6	0.069																		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

Point Load: T5-L

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Load: 273 lb		Location A & A' Load: 234 lb Total: 468 lb		Location A & A' Load: 273 lb Total: 546 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.076	-0.076			-0.147	-0.147	-0.175	-0.175
2	-0.161	-0.079			-0.218	-0.136	-0.249	-0.167
3	-0.141	-0.075			-0.211	-0.145	-0.221	-0.155
4	-0.148	-0.077			-0.218	-0.147	-0.236	-0.165
5	-0.057	-0.088			-0.112	-0.143	-0.143	-0.174
6	-0.013	-0.082			-0.080	-0.149	-0.108	-0.177

Average Deflection	-0.083		-0.143	-0.170
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All deflection readings measured in inches



GRATING DEFLECTION TEST

C. Point Load: 6" Hole Center

July 2014

T5-J 6" Hole In Center 24" From Support

Height Gauge Zeroed At Point 1		Support 1																	Support 2
No Load																			
Point #	Reading																		
1	0.000																		
2	-0.098																		
3	-0.099																		
4	-0.101																		
5	0.017																		
6	0.048																		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was centered.
 Distance from support to the edge of the 6" hole: 24"

Point Load: T5-J

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Load: 273 lb		Location A & A' Load: 234 lb Total: 468 lb		Location A & A' Load: 273 lb Total: 546 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.076	-0.076			-0.159	-0.159	-0.189	-0.189
2	-0.180	-0.082			-0.263	-0.165	-0.298	-0.200
3	-0.183	-0.084			-0.253	-0.154	-0.279	-0.180
4	-0.197	-0.096			-0.270	-0.169	-0.295	-0.194
5	-0.076	-0.093			-0.144	-0.161	-0.166	-0.183
6	-0.008	-0.056			-0.086	-0.134	-0.105	-0.153

Average Deflection	-0.095		-0.164	-0.192
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All deflection readings measured in inches



GRATING DEFLECTION TEST

D. Point Load: 6" Hole Offset

July 2014

Banding 6" Hole Offset 46" From Support

Height Gauge Zeroed At Point 1		Support 1	A		Support 2
No Load					
Point #	Reading				
1	0.000				
2	-0.049				
3	0.003				
4	0.047				
5	0.127				
6	0.091				

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was located near support 2.
 Distance from support 1 to the edge of the 6" hole: 46"

Point Load: Banding

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Location A Load: 273 lb Total: 273 lb					
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.043	-0.043	-0.051	-0.051				
2	-0.091	-0.042	-0.098	-0.049				
3	-0.053	-0.056	-0.063	-0.066				
4	-0.022	-0.069	-0.031	-0.078				
5	0.04	-0.087	0.022	-0.105				
6	0.027	-0.064	0.028	-0.063				

Average Deflection	-0.078	-0.092		
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All deflection readings measured in inches



GRATING DEFLECTION TEST

D. Point Load: 6" Hole Offset

July 2014

GPC-6 6" Hole Offset 46" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	0.030			
3	0.106			
4	0.092			
5	0.045			
6	0.039			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was located near support 1.
 Distance from support 1 to the edge of the 6" hole: 46"

Point Load: GPC-6

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Location A Load: 273 lb Total: 273 lb					
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.036	-0.036	-0.043	-0.043				
2	-0.003	-0.033	-0.003	-0.033				
3	0.064	-0.042	0.059	-0.047				
4	0.034	-0.058	0.028	-0.064				
5	-0.017	-0.062	-0.022	-0.067				
6	-0.014	-0.053	-0.02	-0.059				

Average Deflection	-0.060	-0.066		
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All deflection readings measured in inches



GRATING DEFLECTION TEST

D. Point Load: 6" Hole Offset

July 2014

T5-L 6" Hole Offset 46" From Support

Height Gauge Zeroed At Point 1		Support 1	Support 2
No Load			
Point #	Reading		
1	0.000		
2	0.044		
3	0.145		
4	0.136		
5	0.097		
6	0.044		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was located near support 1.
 Distance from support 1 to the edge of the 6" hole: 46"

Point Load: T5-L

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

Point #	Location A Load: 234 lb Total: 234 lb		Location A Load: 273 lb Total: 273 lb		Reading	Actual Deflection	Reading	Actual Deflection
	Reading	Actual Deflection	Reading	Actual Deflection				
1	-0.046	-0.046	-0.049	-0.049				
2	0.002	-0.042	0.004	-0.040				
3	0.077	-0.068	0.076	-0.069				
4	0.056	-0.080	0.044	-0.092				
5	0.014	-0.083	0.005	-0.092				
6	-0.017	-0.061	-0.023	-0.067				

Average Deflection	-0.082	-0.092		
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All deflection readings measured in inches



GRATING DEFLECTION TEST

D. Point Load: 6" Hole Offset

July 2014

T5-J 6" Hole Offset 46" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	0.078			
3	0.195			
4	0.184			
5	0.087			
6	0.042			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 6" hole was located near support 1.
 Distance from support 1 to the edge of the 6" hole: 46"

Point Load: T5-J

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

Point #	Location A Load: 234 lb Total: 234 lb		Location A Load: 273 lb Total: 273 lb		Reading	Actual Deflection	Reading	Actual Deflection
	Reading	Actual Deflection	Reading	Actual Deflection				
1	-0.032	-0.032	-0.063	-0.063				
2	0.017	-0.061	0.018	-0.060				
3	0.126	-0.069	0.115	-0.080				
4	0.101	-0.083	0.093	-0.091				
5	0.009	-0.078	-0.001	-0.088				
6	-0.019	-0.061	-0.073	-0.115				

Average Deflection	-0.081	-0.090		
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All deflection readings measured in inches



GRATING DEFLECTION TEST

E. Point Load: 14" Hole Center

July 2014

Banding 14" Hole In Center 20" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	0.021			
3	-0.112			
4	-0.123			
5	-0.081			
6	-0.086			
7	0.008			
8	0.021			
9	0.016			
10	0.043			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 14" hole was centered.
 Distance from support to the edge of the 14" hole: 20"

Point Load: Banding

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Load: 273 lb		Location A & A' Load: 234 lb Total: 468 lb		Load: 273 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.118	-0.118			-0.227	-0.227		
2	-0.093	-0.114			-0.217	-0.238		
3	-0.198	-0.086			-0.284	-0.172		
4	-0.206	-0.083			-0.272	-0.149		
5	-0.183	-0.102			-0.244	-0.163		
6	-0.259	-0.173			-0.341	-0.255		
7	-0.140	-0.148			-0.232	-0.240		
8	-0.072	-0.093			-0.140	-0.161		
9	-0.051	-0.067			-0.128	-0.144		
10	-0.035	-0.078			-0.114	-0.157		

Average Deflection	-0.161		-0.240	
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All deflection readings measured in inches



GRATING DEFLECTION TEST

E. Point Load: 14" Hole Center

July 2014

GPC-14 14" Hole In Center 20" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	-0.007			
3	0.008			
4	0.076			
5	0.043			
6	-0.011			
7	-0.015			
8	0.017			
9	0.062			
10	0.020			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.

The grating was split and a 14" hole was centered.

Distance from support to the edge of the 14" hole: 20"

Point Load: GPC-14

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Load: 273 lb		Location A & A' Load: 234 lb Total: 468 lb		Location A & A' Load: 273 lb Total: 546 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.084	-0.084			-0.179	-0.179	-0.202	-0.202
2	-0.094	-0.087			-0.186	-0.179	-0.208	-0.201
3	-0.072	-0.080			-0.144	-0.152	-0.167	-0.175
4	-0.008	-0.084			-0.070	-0.146	-0.089	-0.165
5	-0.054	-0.097			-0.103	-0.146	-0.129	-0.172
6	-0.118	-0.107			-0.172	-0.161	-0.198	-0.187
7	-0.126	-0.111			-0.192	-0.177	-0.211	-0.196
8	-0.087	-0.104			-0.146	-0.163	-0.178	-0.195
9	-0.033	-0.095			-0.104	-0.166	-0.131	-0.193
10	-0.070	-0.090			-0.157	-0.177	-0.181	-0.201

Average Deflection	-0.109		-0.174	-0.197
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All deflection readings measured in inches



GRATING DEFLECTION TEST

E. Point Load: 14" Hole Center

July 2014

T5-L 14" Hole In Center 20" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	0.009			
3	0.012			
4	-0.029			
5	0.007			
6	0.029			
7	0.005			
8	-0.017			
9	-0.014			
10	-0.022			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.

The grating was split and a 14" hole was centered.

Distance from support to the edge of the 14" hole: 20"

Point Load: T5-L

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Load: 273 lb		Location A & A' Load: 234 lb Total: 468 lb		Location A & A' Load: 273 lb Total: 546 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.109	-0.109			-0.213	-0.213	-0.241	-0.241
2	-0.097	-0.106			-0.203	-0.212	-0.228	-0.237
3	-0.091	-0.103			-0.175	-0.187	-0.204	-0.216
4	-0.118	-0.089			-0.200	-0.171	-0.215	-0.186
5	-0.104	-0.111			-0.173	-0.180	-0.202	-0.209
6	-0.118	-0.147			-0.176	-0.205	-0.216	-0.245
7	-0.138	-0.143			-0.197	-0.202	-0.226	-0.231
8	-0.147	-0.130			-0.210	-0.193	-0.240	-0.223
9	-0.129	-0.115			-0.206	-0.192	-0.219	-0.205
10	-0.112	-0.090			-0.208	-0.186	-0.236	-0.214

Average Deflection	-0.145		-0.208	-0.239
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All deflection readings measured in inches



GRATING DEFLECTION TEST

E. Point Load: 14" Hole Center

July 2014

T5-J 14" Hole In Center 20" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	0.017			
3	0.039			
4	-0.009			
5	0.023			
6	0.046			
7	0.019			
8	-0.023			
9	-0.040			
10	-0.021			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.

The grating was split and a 14" hole was centered.

Distance from support to the edge of the 14" hole: 20"

Point Load: T5-J

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Load: 273 lb		Location A & A' Load: 234 lb Total: 468 lb		Location A & A' Load: 273 lb Total: 546 lb	
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.126	-0.126			-0.227	-0.227	-0.259	-0.259
2	-0.084	-0.101			-0.176	-0.193	-0.198	-0.215
3	-0.063	-0.102			-0.132	-0.171	-0.153	-0.192
4	-0.108	-0.099			-0.159	-0.150	-0.174	-0.165
5	-0.097	-0.120			-0.148	-0.171	-0.173	-0.196
6	-0.112	-0.158			-0.167	-0.213	-0.188	-0.234
7	-0.173	-0.192			-0.223	-0.242	-0.253	-0.272
8	-0.172	-0.149			-0.236	-0.213	-0.268	-0.245
9	-0.162	-0.122			-0.234	-0.194	-0.259	-0.219
10	-0.151	-0.130			-0.236	-0.215	-0.264	-0.243

Average Deflection	-0.175		-0.219	-0.245
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All deflection readings measured in inches



GRATING DEFLECTION TEST

F. Point Load: 14" Hole Offset

July 2014

Banding 14" Hole Offset 38" From Support

Height Gauge Zeroed At Point 1		Support 1	Support 2
No Load			
Point #	Reading		
1	0.000		
2	-0.087		
3	-0.066		
4	-0.021		
5	0.023		
6	0.031		
7	-0.005		
8	-0.056		
9	-0.108		
10	-0.126		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 14" hole was located near support 2.
 Distance from support 1 to the edge of the 14" hole: 38"

Point Load: Banding

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Location A Load: 273 lb Total: 273 lb			
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.049	-0.049	-0.055	-0.055		
2	-0.128	-0.041	-0.136	-0.049		
3	-0.121	-0.055	-0.128	-0.062		
4	-0.088	-0.067	-0.103	-0.082		
5	-0.076	-0.099	-0.089	-0.112		
6	-0.136	-0.167	-0.161	-0.192		
7	-0.183	-0.178	-0.208	-0.203		
8	-0.162	-0.106	-0.174	-0.118		
9	-0.184	-0.076	-0.194	-0.086		
10	-0.179	-0.053	-0.188	-0.062		

Average Deflection	-0.173	-0.198		
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All deflection readings measured in inches



GRATING DEFLECTION TEST

F. Point Load: 14" Hole Offset

July 2014

GPC-14 14" Hole Offset 38" From Support

Height Gauge Zeroed At Point 1		Support 1	Support 2
No Load			
Point #	Reading		
1	0.000		
2	0.011		
3	0.065		
4	0.144		
5	0.113		
6	0.055		
7	0.036		
8	0.052		
9	0.068		
10	0.009		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 14" hole was located near support 2.
 Distance from support 1 to the edge of the 14" hole: 38"

Point Load: GPC-14

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Location A Load: 273 lb Total: 273 lb					
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.053	-0.053	-0.049	-0.049				
2	-0.029	-0.040	-0.032	-0.043				
3	0.017	-0.048	0.009	-0.056				
4	0.076	-0.068	0.066	-0.078				
5	0.011	-0.102	0.003	-0.110				
6	-0.078	-0.133	-0.092	-0.147				
7	-0.102	-0.138	-0.119	-0.155				
8	-0.068	-0.120	-0.079	-0.131				
9	-0.021	-0.089	-0.032	-0.100				
10	-0.051	-0.060	-0.039	-0.048				

Average Deflection	-0.136	-0.151		
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All deflection readings measured in inches



GRATING DEFLECTION TEST

F. Point Load: 14" Hole Offset

July 2014

T5-L 14" Hole Offset 38" From Support

Height Gauge Zeroed At Point 1		Support 1	Support 2
No Load			
Point #	Reading		
1	0.000		
2	0.016		
3	0.078		
4	0.091		
5	0.098		
6	0.094		
7	0.080		
8	0.061		
9	0.038		
10	-0.008		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 14" hole was located near support 2.
 Distance from support 1 to the edge of the 14" hole: 38"

Point Load: T5-L

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Location A Load: 273 lb Total: 273 lb			
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.049	-0.049	-0.057	-0.057		
2	-0.019	-0.035	-0.030	-0.046		
3	0.022	-0.056	-0.014	-0.092		
4	0.003	-0.088	0.004	-0.087		
5	-0.014	-0.112	-0.032	-0.130		
6	-0.081	-0.175	-0.101	-0.195		
7	-0.091	-0.171	-0.112	-0.192		
8	-0.054	-0.115	-0.073	-0.134		
9	-0.048	-0.086	-0.058	-0.096		
10	-0.066	-0.058	-0.078	-0.070		

Average Deflection	-0.173	-0.194		
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All deflection readings measured in inches



GRATING DEFLECTION TEST

F. Point Load: 14" Hole Offset

July 2014

T5-J 14" Hole Offset 38" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	-0.019			
3	0.029			
4	0.048			
5	0.108			
6	0.110			
7	0.097			
8	0.052			
9	0.019			
10	-0.024			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.

The grating was split and a 14" hole was located near support 2.

Distance from support 1 to the edge of the 14" hole: 38"

Point Load: T5-J

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf
 Second Load: 273 lb on 0.627 Sq. ft. --- 436 psf

	Location A Load: 234 lb Total: 234 lb		Location A Load: 273 lb Total: 273 lb			
Point #	Reading	Actual Deflection	Reading	Actual Deflection	Reading	Actual Deflection
1	-0.052	-0.052	-0.065	-0.065		
2	-0.061	-0.042	-0.077	-0.058		
3	-0.033	-0.062	-0.048	-0.077		
4	-0.029	-0.077	-0.032	-0.080		
5	-0.028	-0.136	-0.047	-0.155		
6	-0.084	-0.194	-0.112	-0.222		
7	-0.086	-0.183	-0.109	-0.206		
8	-0.077	-0.129	-0.096	-0.148		
9	-0.063	-0.082	-0.077	-0.096		
10	-0.086	-0.062	-0.096	-0.072		

Average Deflection	-0.189	-0.214		
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All deflection readings measured in inches



GRATING DEFLECTION TEST

G. Special Point Load: 14" Center

July 2014

Banding 14" Hole In Center 20" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	0.021			
3	-0.112			
4	-0.123			
5	-0.081			
6	-0.086			
7	0.008			
8	0.021			
9	0.016			
10	0.043			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.

The grating was split and a 14" hole was centered.

Distance from support to the edge of the 14" hole: 20"

Point Load: Banding

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf

		Location A Load: 234 lb Total: 468 lb		Location A & A' Load: 234 lb Total: 936 lb			
Point #		Reading	Actual Deflection	Reading	Actual Deflection		
1		-0.162	-0.162	-0.314	-0.314		
2		-0.148	-0.169	-0.344	-0.365		
3		-0.263	-0.151	-0.296	-0.184		
4		-0.272	-0.149	-0.375	-0.252		
5		-0.251	-0.170	-0.357	-0.276		
6		-0.334	-0.248	-0.376	-0.290		
7		-0.204	-0.212	-0.306	-0.314		
8		-0.123	-0.144	-0.235	-0.256		
9		-0.121	-0.137	-0.223	-0.239		
10		-0.083	-0.126	-0.214	-0.257		

Average Deflection		-0.230	-0.321
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All deflection readings measured in inches



GRATING DEFLECTION TEST

G. Special Point Load: 14" Center

July 2014

GPC-14 14" Hole In Center 20" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	-0.007			
3	0.008			
4	0.076			
5	0.043			
6	-0.011			
7	-0.015			
8	0.017			
9	0.062			
10	0.020			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.

The grating was split and a 14" hole was centered.

Distance from support to the edge of the 14" hole: 20"

Point Load: GPC-14

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf

		Location A Load: 234 lb Total: 468 lb		Location A & A' Load: 234 lb Total: 936 lb			
Point #		Reading	Actual Deflection	Reading	Actual Deflection		
1		-0.144	-0.144	-0.304	-0.304		
2		-0.153	-0.146	-0.305	-0.298		
3		-0.129	-0.137	-0.264	-0.272		
4		-0.066	-0.142	-0.190	-0.266		
5		-0.111	-0.154	-0.223	-0.266		
6		-0.183	-0.172	-0.285	-0.274		
7		-0.201	-0.186	-0.308	-0.293		
8		-0.167	-0.184	-0.287	-0.304		
9		-0.108	-0.170	-0.241	-0.303		
10		-0.145	-0.165	-0.293	-0.313		

Average Deflection		-0.179	-0.292
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All deflection readings measured in inches



GRATING DEFLECTION TEST

G. Special Point Load: 14" Center

July 2014

T5-L 14" Hole In Center 20" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	0.009			
3	0.012			
4	-0.029			
5	0.007			
6	0.029			
7	0.005			
8	-0.017			
9	-0.014			
10	-0.022			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 14" hole was centered.
 Distance from support to the edge of the 14" hole: 20"

Point Load: T5-L

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf

		Location A Load: 234 lb Total: 468 lb		Location A & A' Load: 234 lb Total: 936 lb			
Point #		Reading	Actual Deflection	Reading	Actual Deflection		
1		-0.168	-0.168	-0.329	-0.329		
2		-0.158	-0.167	-0.322	-0.331		
3		-0.150	-0.162	-0.295	-0.307		
4		-0.186	-0.157	-0.313	-0.284		
5		-0.178	-0.185	-0.290	-0.297		
6		-0.180	-0.209	-0.294	-0.323		
7		-0.210	-0.215	-0.321	-0.326		
8		-0.213	-0.196	-0.329	-0.312		
9		-0.195	-0.181	-0.331	-0.317		
10		-0.173	-0.151	-0.338	-0.316		

Average Deflection		-0.212	-0.327
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All deflection readings measured in inches



GRATING DEFLECTION TEST

G. Special Point Load: 14" Center

July 2014

T5-J 14" Hole In Center 20" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	0.017			
3	0.039			
4	-0.009			
5	0.023			
6	0.046			
7	0.019			
8	-0.023			
9	-0.040			
10	-0.021			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.

The grating was split and a 14" hole was centered.

Distance from support to the edge of the 14" hole: 20"

Point Load: T5-J

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf

		Location A Load: 234 lb Total: 468 lb		Location A & A' Load: 234 lb Total: 936 lb			
Point #		Reading	Actual Deflection	Reading	Actual Deflection		
1		-0.174	-0.174	-0.364	-0.364		
2		-0.132	-0.149	-0.306	-0.323		
3		-0.115	-0.154	-0.266	-0.305		
4		-0.159	-0.150	-0.293	-0.284		
5		-0.161	-0.184	-0.286	-0.309		
6		-0.174	-0.220	-0.28	-0.326		
7		-0.236	-0.255	-0.346	-0.365		
8		-0.233	-0.210	-0.362	-0.339		
9		-0.222	-0.182	-0.361	-0.321		
10		-0.199	-0.178	-0.372	-0.351		

Average Deflection		-0.238	-0.345
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All deflection readings measured in inches



GRATING DEFLECTION TEST

H. Special Point Load: 14" Offset

July 2014

Banding 14" Hole Offset 38" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	-0.087			
3	-0.066			
4	-0.021			
5	0.023			
6	0.031			
7	-0.005			
8	-0.056			
9	-0.108			
10	-0.126			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.

The grating was split and a 14" hole was located near support 2.

Distance from support 1 to the edge of the 14" hole: 38"

Point Load: Banding

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf

				Location A Load: 234 lb Total: 468 lb			
Point #			Reading	Actual Deflection			
1			-0.077	-0.077			
2			-0.159	-0.072			
3			-0.154	-0.088			
4			-0.141	-0.120			
5			-0.133	-0.156			
6			-0.209	-0.240			
7			-0.264	-0.259			
8			-0.229	-0.173			
9			-0.240	-0.132			
10			-0.226	-0.100			

Average Deflection			-0.250	
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All deflection readings measured in inches



GRATING DEFLECTION TEST

H. Special Point Load: 14" Offset

July 2014

GPC-14 14" Hole Offset 38" From Support

Height Gauge Zeroed At Point 1		Support 1	Support 2
No Load			
Point #	Reading		
1	0.000		
2	0.011		
3	0.065		
4	0.144		
5	0.113		
6	0.055		
7	0.036		
8	0.052		
9	0.068		
10	0.009		

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 14" hole was located near support 2.
 Distance from support 1 to the edge of the 14" hole: 38"

Point Load: GPC-14

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf

				Location A Load: 234 lb Total: 468 lb				
Point #					Reading	Actual Deflection		
1					-0.079	-0.079		
2					-0.053	-0.064		
3					-0.026	-0.091		
4					0.016	-0.128		
5					-0.058	-0.171		
6					-0.147	-0.202		
7					-0.166	-0.202		
8					-0.116	-0.168		
9					-0.063	-0.131		
10					-0.082	-0.091		

Average Deflection			-0.202	
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All deflection readings measured in inches



GRATING DEFLECTION TEST

H. Special Point Load: 14" Offset

July 2014

T5-L 14" Hole Offset 38" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	0.016			
3	0.078			
4	0.091			
5	0.098			
6	0.094			
7	0.080			
8	0.061			
9	0.038			
10	-0.008			

Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.
 The grating was split and a 14" hole was located near support 2.
 Distance from support 1 to the edge of the 14" hole: 38"

Point Load: T5-L

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf

				Location A Load: 234 lb Total: 468 lb				
Point #					Reading	Actual Deflection		
1					-0.079	-0.079		
2					-0.051	-0.067		
3					-0.016	-0.094		
4					-0.038	-0.129		
5					-0.091	-0.189		
6					-0.160	-0.254		
7					-0.169	-0.249		
8					-0.132	-0.193		
9					-0.105	-0.143		
10					-0.109	-0.101		

Average Deflection			-0.252	
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All deflection readings measured in inches



GRATING DEFLECTION TEST

H. Special Point Load: 14" Offset

July 2014

T5-J 14" Hole Offset 38" From Support

Height Gauge Zeroed At Point 1		Support 1		Support 2
No Load				
Point #	Reading			
1	0.000			
2	-0.019			
3	0.029	<p>Test used 5' x 3' x 1 1/4" serrated steel grating supported by I-beams.</p> <p>The grating was split and a 14" hole was located near support 2.</p> <p>Distance from support 1 to the edge of the 14" hole: 38"</p>		
4	0.048			
5	0.108			
6	0.110			
7	0.097			
8	0.052			
9	0.019			
10	-0.024			

Point Load: T5-J

First Load: 234 lb on 0.627 Sq. ft. --- 373 psf

				Location A Load: 234 lb Total: 468 lb			
Point #			Reading	Actual Deflection			
1			-0.079	-0.079			
2			-0.097	-0.078			
3			-0.071	-0.100			
4			-0.075	-0.123			
5			-0.092	-0.200			
6			-0.161	-0.271			
7			-0.181	-0.278			
8			-0.162	-0.214			
9			-0.129	-0.148			
10			-0.132	-0.108			

Average Deflection			-0.275	
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All deflection readings measured in inches



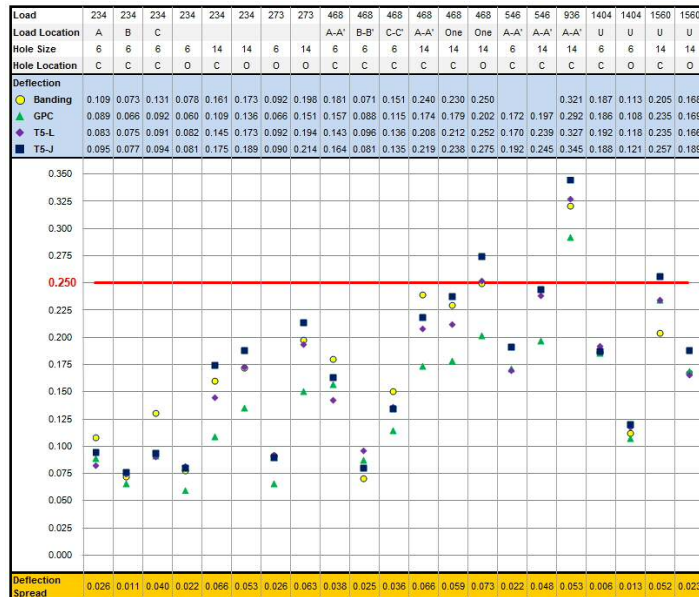
INTREPID INDUSTRIES INC.

La Porte, TX

Deflection Test Data

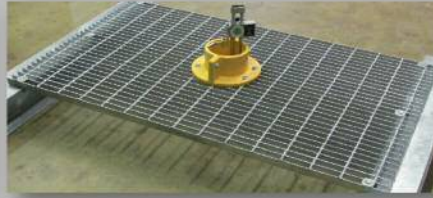
DEFLECTION TEST

Summary



DEFLECTION TEST

Introduction



Split Steel Grating
- 5'x3' 1.25" Serrated

Centered
- 24" From Support For 6"
- 20" From Support For 14"
Offset
- 45" From Support For 6"
- 40" From Support for 14"

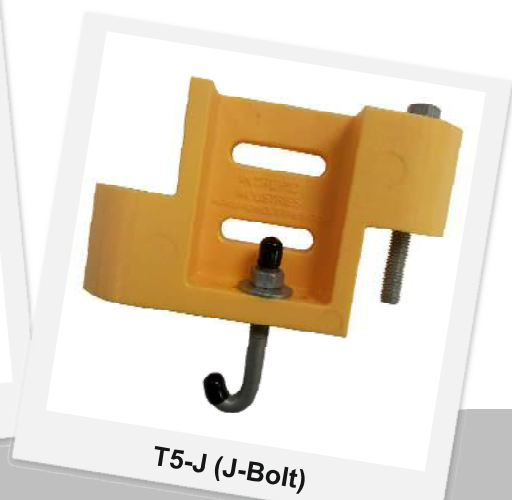
Tested
- Banding
- Grating Penetration Collar (GPC)
- Toeboard Link (T5-L)
- Toeboard Link (T5-J)



DEFLECTION TEST
T5-L v T5-J



T5-L (Locking Bar)

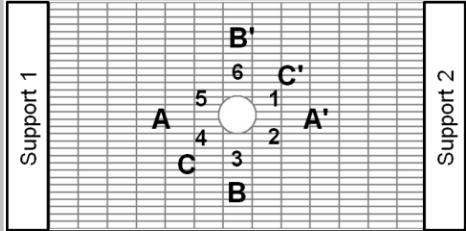


T5-J (J-Bolt)

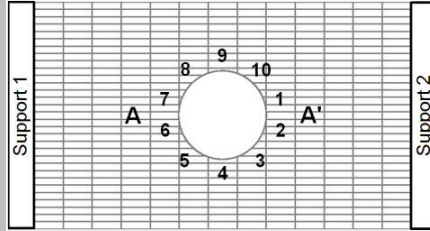


DEFLECTION TEST

Points



6" Hole Points



14" Hole Points

Load

- Hardware Boxes
- Steel Hardware
- Area: 0.627 sq ft
- Weight: 39 lbs

6" Hole

- Points 1 - 6
- Measurements Taken
- A-C & A'-C'
- Point Load Location

14" Hole

- Points 1 - 10
- Measurements Taken
- A & A'
- Point Load Location



DEFLECTION TEST

Uniform Load Summary

6" Hole

	Center		Offset	
	Uncut	Banding	Uncut	Banding
All performed as well as uncut grating.	-0.205	-0.187	-0.079	-0.113
	-0.186	-0.186	-0.108	-0.108
	-0.192	-0.192	-0.118	-0.118
	-0.188	-0.188	-0.121	-0.121
	-0.188	-0.188	-0.121	-0.121
All performed consistently, uncut grating deflected the least.	-0.205	-0.187	-0.079	-0.113
	-0.186	-0.186	-0.108	-0.108
	-0.192	-0.192	-0.118	-0.118
	-0.188	-0.188	-0.121	-0.121
	-0.188	-0.188	-0.121	-0.121

14" Hole

	Center		Offset	
	Uncut	Banding	Uncut	Banding
GPC-14, T5-L, and T5-J did not perform as well as uncut grating.	-0.224	-0.205	-0.131	-0.168
	-0.235	-0.235	-0.166	-0.166
	-0.235	-0.235	-0.166	-0.166
	-0.257	-0.257	-0.189	-0.189
	-0.257	-0.257	-0.189	-0.189
All performed consistently, uncut grating deflected the least.	-0.224	-0.205	-0.131	-0.168
	-0.235	-0.235	-0.166	-0.166
	-0.235	-0.235	-0.166	-0.166
	-0.257	-0.257	-0.189	-0.189
	-0.257	-0.257	-0.189	-0.189




The spread of all deflection for the GPC-6, GPC-14, T5-L, and T5-J was .050 inches.

Load

- 6" Hole: 1404 lbs
- 14" Hole: 1560 lbs



DEFLECTION TEST
Point Load Summary

6" Hole In Center		24" From Center		234 lb	
	A	Banding	A-A'		
	-0.109		-0.181		
	-0.089	GPC-6	-0.157		
	-0.083	T5-L	-0.143		
	-0.095	T5-J	-0.164		
	B	Banding	B-B'		
	-0.073		-0.071		
	-0.066	GPC-6	-0.088		
	-0.075	T5-L	-0.096		
	-0.077	T5-J	-0.086		
	C	Banding	C-C'		
	-0.131		-0.151		
	-0.092	GPC-6	-0.115		
	-0.091	T5-L	-0.136		
	-0.094	T5-J	-0.135		
Summary					
Single experiment to determine significance of location of point loading.					
A and A-A' = Most cut bars --- most deflection					
B and B-B' = Least cut bars --- least deflection					
C and C-C' = Similar to A and A-A'					
All further testing utilized A and A-A' locations for point loads.					



DEFLECTION TEST
Summary

234 lb Load (373 psf)

- All Deflection <0.200"
- Max Deflection Spread: 0.066" (Approx. 1/16")

273 lb Load (436 psf)

- All Deflection <0.220"
- Max Deflection Spread: 0.063" (Approx. 1/16")

468 lb, 546 lb and 936 lb Load

- Deflection Exceeded 0.250" in 2 out of 9 tests

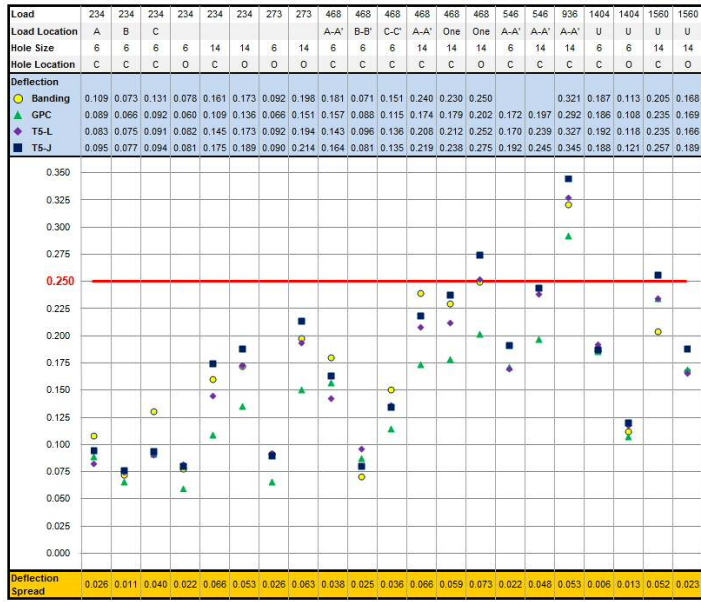
1404 lb, 1560 lb Load

- Deflection Exceeded 0.250" in 1 out of 4 tests



DEFLECTION TEST

Summary



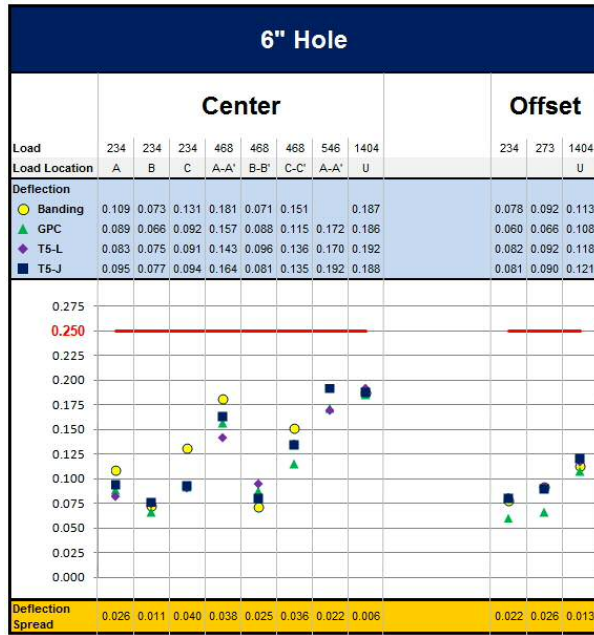
THANK YOU!



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DEFLECTION TEST
6" Hole Summary



DEFLECTION TEST
14" Hole Summary

