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Legacy report on the 1994 *Uniform Building Code*™

DIVISION: 05—METALS
Section: 05310—Steel Decks

H.H. ROBERTSON STEEL FLOOR DECK

ROBERTSON, A UNITED DOMINION COMPANY
400 HOLIDAY DRIVE
PITTSBURGH, PENNSYLVANIA 15220

1.0 SUBJECT

H.H. Robertson Steel Floor Deck.

2.0 DESCRIPTION

2.1 General:

The floor panels are cold rolled from galvanized steel sheet conforming to ASTM A 653, SQ Grade 33, U.B.C. Standard 22-1. The panels consist of a ribbed sheet resistance welded in the shop to a flat sheet. See profile drawings for different sections. Diaphragm shear values in pounds per linear foot and vertical loads for deck composite actions are as set forth in tables included in this report.

2.2 Welding:

Spot welds for field assembly of steel decking must have a fusion area of $\frac{1}{2}$ inch diameter. Seam welds are minimum $1\frac{1}{2}$ inches long. Minimum E60 XX or #70 XX filler metal complying with the appropriate AWS standard is used. Other weld requirements must comply with American Welding Society Standard AWS D1.3-81. See Tables B-1 and B-2 and Figures B.1.a and B.1.b for additional details. Prior to proceeding with the welding, the welder shall demonstrate his ability to produce the prescribed weld satisfactorily to the welding inspector.

2.3 Fire-resistive Floor Construction:

Fire-resistive ratings for unprotected steel decks are as set forth below:

DECK SECTION	TYPE OF CONCRETE	MINIMUM CONCRETE THICKNESS ABOVE TOP FLUTE (inches)	CLEAR SPAN MAXIMUM	FIRE-RESISTIVE TIME PERIOD (Hours)
3"-QL-GKX	3,000 psi Lightweight	$2\frac{1}{2}$	13' 2"	1
		$3\frac{1}{4}$		2
		$4\frac{3}{16}$		3
3"-QL-GKX	3,500 psi Stone Aggregate	$3\frac{1}{2}$	13' 2"	1
		$4\frac{1}{2}$		2

¹For fire-resistive ratings using the KE-Q/TD trench header (bottomless), the soffits of 2-inch- and 3-inch-deep steel decks of those spans in which trench header is located shall have fire protection in accordance with any one of Evaluation Report No. 1244, No. 1697 or No. 4607.

2.4 Trench Headers:

The KE-Q/TD trench header is a multicompartament steel trench designed for use with the deck sections described in this report. It consists of flute closures, side rails and a cover plate. The header is available in various widths as shown in the accompanying typical cross section. To calculate the allowable diaphragm shear values for the various decks with the trench header, the diaphragm shear ratios set forth in Table A-6 are multiplied by the allowable shear values given in Tables A-1 through A-5.

2.5 Design:

Composite sections shall not be used for vertical loads which are predominately vibratory due to continuous operation of heavy machinery. Where used as diaphragms, the allowable shears in pounds per linear foot shall not exceed the values set forth in the tables for the type of deck involved. Consideration shall be given to the diaphragm deflection requirements set forth in Table E-1. For decks with no trench header and with concrete fill, the flexibility factor may be taken as one. The flexibility factors for decks with KE-Q/TD trench headers are set forth in Table A-7. The flexibility factor is the average microinches a diaphragm web will deflect in a span of 1 foot under a shear of 1 pound per foot.

Vertical load design shall be based on section properties set forth in this report or where composite action is considered in accordance with tables in this report. Web crippling must be considered in accordance with Table F-1. Vertical load design for decks with Tapway trench header KE-Q/TD shall be based on the section properties of the deck units only (no composite action).

2.6 Special Inspection:

2.6.1 Concrete: Special inspection for concrete and concrete reinforcement is in accordance with Sections 1701.5.4 and 1701.5.5 of the code. The inspector's duties include sampling and testing; verification of concrete mixes, reinforcement types and placement; and concrete placement.

2.6.2 Welding: Special inspection for welding is in accordance with Section 1701.5.5 of the code. Before proceeding, the welder must demonstrate his ability to produce the prescribed weld to the special inspector's satisfaction. The inspector's other duties include verification of materials, weld preparation, welding procedures and welding processes.

2.7 Identification:

Each bundle of deck is identified by a label bearing the job and work order that indicates the type and gage of the decks.

3.0 EVIDENCE SUBMITTED

Report and analysis of tests on full-scale diaphragms, fire tests in accordance with U.B.C. Standard 7-1, load test results to establish criteria for composite action, and quality control manual on resistance welding.

4.0 FINDINGS

That the Robertson Steel Floor Deck is an alternate type of construction to those specified in the 1994 *Uniform Building Code*™ for use as floor or roof systems to resist vertical or horizontal forces, subject to the following conditions:

- 4.1 A one-third increase in allowable shear values is not permitted for short-time loading.**
- 4.2 The steel decks are welded as set forth in the tables accompanying this report for the particular deck involved.**
- 4.3 Where blended systems are used employing different sections, the lowest shear values of the sections used shall govern the design except for steel deck spans in which KE-Q/TD Trench Headers are located. (See Table A-6, Note 5).**
- 4.4 The minimum 28-day compressive strength of concrete shall be 3,000 psi except as noted in this report.**
- 4.5 Special inspection in accordance with Section 1701 of the Uniform Building Code is required for concrete and on-site welding. Details are in Section II F.**
- 4.6 The decks are produced at US 421 South and Taylor Road, Frankfort, Kentucky.**

This report is subject to re-examination in two years.

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**TABLE A-1—ALLOWABLE DIAPHRAGM SHEARS (plf) FOR QL-GKX-24" AND QL-GKX-30" SECTIONS
WITH 2-INCH-THICK STONE-AGGREGATE CONCRETE FILL (145 pcf)^{1,2,3,4,5}**

DECK TYPE	DECK GAGE	SPAN (feet)									
		6		8		10		12		14	
QL-GKX-24"	16-16	2080	2590	1860	2240	1740	2030	1650	1880	1590	1780
	18-16	2020	2490	1820	2160	1740	1970	1630	1840	1570	1740
	16-18	1990	2440	1800	2120	1690	1940	1620	1810	1560	1720
	18-18	1940	2330	1770	2050	1670	1880	1600	1770	1550	1690
	20-18	1890	2230	1730	1980	1640	1830	1580	1720	1540	1650
	16-20	1910	2280	1750	2010	1650	1830	1590	1740	1540	1670
	18-20	1860	2180	1720	1940	1630	1800	1570	1700	1530	1630
	20-20	1810	2090	1690	1880	1610	1750	1560	1660	1520	1600
QL-GKX-30"	16-16	2180	2330	1930	2050	1790	1880	1690	1770	1620	1690
	18-16	2110	2250	1880	1990	1750	1840	1660	1730	1600	1660
	16-18	2080	2210	1860	1960	1730	1810	1650	1710	1580	1640
	18-18	2010	2140	1810	1910	1700	1770	1620	1680	1560	1620
	20-18	1950	2060	1770	1860	1670	1730	1590	1650	1540	1590
	16-20	1980	2100	1790	1880	1680	1750	1610	1670	1550	1600
	18-20	1920	2020	1750	1830	1650	1710	1580	1640	1540	1580
	20-20	1860	1950	1710	1780	1620	1680	1560	1610	1520	1560

¹Sufficient seam attachment for above-deck sections consists of fastening at 5 feet 0 inches on center maximum between supports. Fastening may be by No. 12 self-tapping and self-drilling steel screws, 1 $\frac{1}{4}$ inch long, or by welds 1 $\frac{1}{2}$ inches long. Welds are illustrated under Table B-1, Figure B.1.b.

²Values to left of vertical line for each span are for two spot welds at supports and values to right of vertical line are for four spot welds at supports for QL-GKX-24". Values to left vertical line for each span are for three spot welds at supports and values to right of vertical line are for four spot welds at supports for QL-GKX-30".

³The spacing of boundary spot welds at perimeter supports shall be determined in accordance with the values set forth in Table B-2.

⁴The concrete shall have a minimum depth of 2 inches above the top flute.

⁵See Table B-1 for size, type and location of welds.

**TABLE A-2—ALLOWABLE DIAPHRAGM SHEARS (plf) FOR QL-GKX-24" and QL-GKX-30" SECTIONS
WITH 2-INCH-THICK STRUCTURAL LIGHTWEIGHT CONCRETE FILL (110 pcf)^{1,2,3,4,5}**

DECK TYPE	DECK GAGE	SPAN (Feet)									
		6		8		10		12		14	
QL-GKX-24"	16-16	1750	2270	1540	1910	1410	1700	1330	1560	1270	1460
	18-16	1700	2160	1500	1840	1380	1640	1300	1510	1250	1420
	16-18	1670	2110	1480	1800	1370	1610	1290	1490	1240	1400
	18-18	1610	2010	1440	1730	1340	1560	1270	1440	1220	1360
	20-18	1560	1910	1410	1650	1320	1500	1250	1400	1210	1330
	16-20	1590	1960	1430	1690	1330	1530	1260	1420	1220	1340
	18-20	1540	1860	1390	1620	1300	1470	1250	1380	1210	1310
	20-20	1490	1760	1360	1550	1290	1420	1230	1340	1200	1280
QL-GKX-30"	16-16	1850	2010	1610	1730	1460	1560	1360	1440	1290	1360
	18-16	1790	1930	1560	1670	1430	1510	1340	1410	1270	1330
	16-18	1750	1890	1540	1640	1410	1490	1320	1390	1260	1320
	18-18	1690	1810	1490	1580	1370	1450	1290	1360	1240	1290
	20-18	1620	1740	1450	1530	1340	1410	1270	1330	1220	1270
	16-20	1650	1770	1470	1560	1360	1430	1280	1340	1230	1280
	18-20	1590	1700	1430	1510	1330	1390	1260	1310	1210	1260
	20-20	1530	1630	1390	1460	1300	1350	1240	1290	1200	1240

For footnotes see Table A-1.

**TABLE A-3—ALLOWABLE DIAPHRAGM SHEARS (plf) FOR QL-GKX-24" AND QL-GKX-30" SECTIONS
WITH 2½-INCH-THICK STONE-AGGREGATE CONCRETE FILL (145 pcf)^{1,2,3,4,5}**

DECK TYPE	DECK GAGE	SPAN (Feet)									
		6		8		10		12		14	
QL-GKX-24"	16-16	2320	2830	2100	2480	1970	2260	1890	2120	1830	2020
	18-16	2260	2730	2060	2400	1950	2210	1870	2070	1810	1980
	16-18	2230	2680	2040	2360	1930	2180	1860	2050	1800	1960
	18-18	2180	2570	2010	2290	1900	2120	1840	2010	1790	1920
	20-18	2120	2470	1970	2220	1880	2060	1820	1960	1770	1890
	16-20	2150	2520	1990	2250	1890	2090	1830	1980	1780	1910
	18-20	2100	2420	1960	2180	1870	2040	1810	1940	1770	1870
	20-20	2050	2330	1930	2110	1850	1990	1800	1900	1760	1840
QL-GKX-30"	16-16	2420	2570	2170	2290	2030	2120	1930	2010	1860	1920
	18-16	2350	2490	2120	2230	1990	2070	1900	1970	1830	1900
	16-18	2320	2450	2100	2200	1970	2050	1880	1950	1820	1880
	18-18	2250	2370	2050	2150	1940	2010	1860	1920	1800	1860
	20-18	2190	2300	2010	2090	1990	1970	1830	1890	1780	1830
	16-20	2220	2340	2030	2120	1920	1990	1850	1910	1790	1840
	18-20	2160	2260	1990	2070	1890	1950	1820	1880	1770	1820
	20-20	2100	2190	1950	2020	1860	1920	1800	1850	1760	1800

¹Sufficient seam attachment for above-deck sections consists of fastening at 5 feet 0 inches on center maximum between supports. Fastening may be by No. 12 self-tapping and self-drilling steel screws, 1¼ inch long, or by welds 1½ inches long. Welds are illustrated under Table B-1, Figure B.1.b.

²Values to left of vertical line for each span are for two spot welds at supports and values to right of vertical line are for four spot welds at supports for QL-GKX-24". Values to left vertical line for each span are for three spot welds at supports and values to right of vertical line are for four spot welds at supports for QL-GKX-30".

³The spacing of boundary spot welds at perimeter supports shall be determined in accordance with the values set forth in Table B-2.

⁴The concrete shall have a minimum depth of 2½ inches above the top flute.

⁵See Table B-1 for size, type and location of welds.

**TABLE A-4—ALLOWABLE DIAPHRAGM SHEARS (plf) FOR QL-GKX-24" AND QL-GKX-30" SECTIONS
WITH 2½-INCH-THICK STRUCTURAL LIGHTWEIGHT CONCRETE FILL (110 pcf)^{1,2,3,4,5}**

DECK TYPE	DECK GAGE	SPAN (Feet)									
		6		8		10		12		14	
QL-GKX-24"	16-16	1910	2430	1700	2070	1570	1860	1480	1720	1420	1620
	18-16	1850	2320	1660	2000	1540	1800	1460	1670	1410	1580
	16-18	1830	2270	1640	1960	1530	1770	1450	1650	1400	1560
	18-18	1770	2170	1600	1880	1500	1710	1430	1600	1380	1520
	20-18	1720	2070	1570	1810	1470	1660	1410	1560	1370	1480
	16-20	1750	2120	1580	1850	1490	1690	1420	1580	1380	1500
	18-20	1690	2020	1550	1780	1460	1630	1400	1540	1360	1470
	20-20	1650	1920	1520	1710	1440	1580	1390	1500	1360	1430
QL-GKX-30"	16-16	2010	2170	1770	1880	1620	1710	1520	1600	1450	1520
	18-16	1940	2090	1720	1830	1580	1670	1490	1560	1430	1490
	16-18	1910	2050	1690	1800	1570	1650	1480	1550	1420	1480
	18-18	1840	1970	1650	1740	1530	1610	1450	1510	1400	1450
	20-18	1780	1890	1600	1690	1500	1570	1430	1480	1380	1430
	16-20	1810	1930	1630	1720	1510	1590	1400	1500	1390	1440
	18-20	1750	1860	1580	1660	1480	1550	1420	1470	1370	1410
	20-20	1690	1780	1540	1610	1460	1510	1400	1440	1350	1390

For footnotes see Table A-3.

TABLE A-5—ALLOWABLE DIAPHRAGM SHEARS (plf) FOR QL-GKX-24" AND QL-GKX-30" SECTIONS WITH 3 1/4-INCH-THICK STRUCTURAL LIGHTWEIGHT CONCRETE FILL (110 pcf)^{1,2,3,4,5}

DECK TYPE	DECK GAGE	SPAN (Feet)									
		6		8		10		12		14	
QL-GKX-24"	16-16	2150	2660	2930	2310	1810	2100	1720	1950	1660	1850
	18-16	2090	2560	1890	2230	1780	2040	1700	1910	1640	1810
	16-18	2060	2570	1870	2190	1760	2010	1690	1880	1630	1790
	18-18	2010	2400	1840	2120	1740	1950	1670	1840	1620	1760
	20-18	1960	2300	1800	2050	1710	1900	1650	1790	1610	1720
	16-20	1980	2360	1820	2090	1720	1920	1660	1820	1610	1740
	18-20	1930	2260	1790	2010	1700	1870	1640	1770	1600	1700
	20-20	1880	2160	1760	1950	1680	1820	1630	1730	1590	1670
QL-GKX-30"	16-16	2250	2410	2000	2120	1860	1950	1760	1840	1690	1760
	18-16	2180	2320	1960	2060	1820	1910	1730	1800	1670	1730
	16-18	2150	2280	1930	2030	1800	1880	1720	1780	1650	1710
	18-18	2080	2210	1890	1980	1770	1840	1690	1750	1630	1690
	20-18	2020	2130	1840	1930	1740	1800	1660	1720	1610	1660
	16-20	2050	2170	1860	1950	1750	1820	1680	1740	1620	1670
	18-20	1990	2090	1820	1900	1720	1780	1650	1710	1610	1650
	20-20	1930	2020	1780	1850	1690	1750	1630	1680	1590	1630

¹Sufficient seam attachment for above-deck sections consists of fastening at 5 feet 0 inches on center maximum between supports. Fastening may be by No. 12 self-tapping and self-drilling steel screws, 1 1/4 inch long, or by welds 1 1/2 inches long. Welds are illustrated under Table B-1, Figure B.1.b.

²Values to left of vertical line for each span are for two spot welds at supports and values to right of vertical line are for four spot welds at supports for QL-GKX-24". Values to left vertical line for each span are for three spot welds at supports and values to right of vertical line are for four spot welds at supports for QL-GKX-30".

³The spacing of boundary spot welds at perimeter supports shall be determined in accordance with the values set forth in Table B-2.

⁴The concrete shall have a minimum depth of 3 1/4 inches above the top flute.

⁵See Table B-1 for size, type and location of welds.

TABLE A-6—DIAPHRAGM SHEAR RATIOS FOR DECK SECTIONS WITH KE-Q/TD TRENCH HEADER AND CONCRETE FILL^{1,2,3,4,5,6,7,8,9}

DECK TYPE	DECK GAGE	TRENCH HEADER (WIDTH) (Inches)	RATIO OF DIAPHRAGM SHEARS, q_w/q				
			Span (Feet)				
			6	8	10	12	14
QL-GKX	16-16	12	0.94	0.92	0.88	0.83	0.77
		24	0.92	0.89	0.82	0.75	0.68
		36	0.91	0.86	0.78	0.70	0.62
	18-16	12	0.94	0.92	0.88	0.83	0.78
		24	0.92	0.89	0.82	0.75	0.69
		36	0.91	0.86	0.78	0.70	0.62
	18-18	12	0.92	0.89	0.85	0.80	0.72
		24	0.90	0.85	0.79	0.71	0.62
		36	0.88	0.82	0.73	0.65	0.57
	20-18	12	0.92	0.89	0.85	0.80	0.73
		24	0.90	0.85	0.79	0.71	0.63
		36	0.88	0.82	0.73	0.65	0.58
	18-20	12	0.92	0.89	0.84	0.79	0.72
		24	0.90	0.84	0.78	0.70	0.62
		36	0.88	0.81	0.72	0.64	0.56
	20-20	12	0.91	0.88	0.83	0.77	0.70
		24	0.89	0.83	0.76	0.68	0.60
		36	0.87	0.79	0.70	0.62	0.54

¹Shear diaphragm values (q_w) for decks with trench headers equal above diaphragm shear ratios multiplied by diaphragm shear values (q) from Tables A-1 through A-5.

²Sufficient seam attachment for above-deck sections consists of fastening at 3 feet 0 inches on center between supports, one fastening to be approximately at trench header center line for each seam. Fastening may be by No. 12 self-tapping and self-drilling steel screws, 1 1/4 inches long, or by welds 1 1/2 inches long at top or side. Welds are illustrated under Table B-1, Figure B.1.b.

³Diaphragm shear ratios are applicable to two spot welds, three spot welds and four spot welds at supports.

⁴Notes 2 through 5 from Tables A-1 through A-5 are applicable.

⁵To determine the diaphragm shear for blended systems of fluted and cellular deck:

(Continued)

1. Compute diaphragm shear for fluted deck using ratio q_{df}/q .
2. Compute diaphragm shear for cellular deck using ratio q_{df}/q .
3. Compute weighted average of fluted deck and cellular deck present by proportioning width of each deck type to overall width.
4. Diaphragm shear for blended system is computed by multiplying the diaphragm shear for fluted and cellular decks by the respective weighted average, and summing the results.

⁶For 9-inch trench header width, use ratio of diaphragm shear, q_{df}/q , for 12-inch trench header width.

⁷For 18-inch trench header width, use straight line interpolation based on trench header width between 12- and 24-inch trench header widths, to obtain ratio of diaphragm shear, q_{df}/q .

⁸For 27-inch and 30-inch trench header width, use straight line interpolation based on trench header width between 24- and 36-inch trench header widths, to obtain ratio of diaphragm shear, q_{df}/q .

⁹Where the steel deck and/or the concrete slab continues over the transverse support beam, the trench header can be located anywhere within that span, or the trench header can be located directly over the transverse support beam. Where the steel deck and the concrete slab terminate at a transverse support beam, the minimum width of concrete between the edge of the trench header cover plate closest to the support member and the parallel center line of the transverse support member is 24 inches.

**TABLE A-7—FLEXIBILITY FACTORS FOR 3" QL-GKX SECTIONS
WITH KE-Q/TD TRENCH HEADER AND CONCRETE FILL^{1,2,3,4,5,6,7,8}**

DECK TYPE	DECK GAGE	TRENCH HEADER WIDTH (inches)	F_{TF} FLEXIBILITY FACTOR			
			Span (Feet)			
			8	10	12	14
QL-GKX	16-16	12	1.02	1.16	1.33	1.51
		24	1.69	2.02	2.39	2.78
		36	2.42	2.93	3.54	4.22
	18-16	12	1.15	1.31	1.50	1.67
		24	1.95	2.30	2.71	3.10
		36	2.80	3.36	4.04	4.72
	18-18	12	1.35	1.56	1.74	2.06
		24	2.33	2.76	3.23	3.94
		36	3.35	4.16	4.91	5.97
	20-18	12	1.57	1.77	2.00	2.29
		24	2.74	3.17	3.76	4.42
		36	3.98	4.81	5.76	6.73
	18-20	12	1.59	1.80	2.04	2.33
		24	2.78	3.21	3.81	4.48
		36	4.02	4.86	5.82	6.93
	20-20	12	1.86	2.14	2.40	2.74
		24	3.31	3.93	4.57	5.38
		36	4.88	5.99	7.04	8.41

¹Sufficient seam attachment for above-deck sections consists of fastening at 3 feet 0 inches on center maximum between supports, with one fastener to be located at trench header center line for each seam. Fastening consists of No. 12 self-tapping and self-drilling steel screws, 1 $\frac{1}{4}$ inches long, or 1 $\frac{1}{2}$ -inch-long welds at seam top or side. Welds are illustrated under Table B-1, Figure B.1.b.

²The flexibility factors, F_{TF} , are applicable to two puddle welds, three puddle welds and four puddle welds at supports.

³Notes 3, 4 and 5 from Tables A-1 through A-5 apply to this table.

⁴To determine the flexibility factor for blended systems of fluted and cellular deck:

1. Compute flexibility factor for fluted deck.
2. Compute flexibility factor for cellular deck.
3. Compute weighted average by width of fluted deck and cellular deck to total width.
4. Flexibility factor for the blended system is based on the average of flexibility factors for each deck section, weighted in accordance with Step 3.

⁵For the 9-inch-wide trench header, use the same flexibility factor, F_{TF} , as tabulated for 12-inch-wide trench header.

⁶To determine the flexibility factor for the 18-inch-wide trench header, use straight line interpolation between the flexibility factor for the 12-inch and 24-inch trench headers.

⁷To determine the flexibility factor for the 27-inch- and 30-inch-wide trench header, use straight line interpolation between the flexibility factors for the 24-inch- and 36-inch-wide trench headers.

⁸Where the steel deck and/or the concrete slab continues over the transverse support beam, the trench header can be located anywhere within that span or the trench header can be located directly over the transverse support beam. Where the steel deck and the concrete slab terminate at a transverse support beam, the minimum width of concrete between the edge of the trench header cover plate closest to the support member and the parallel center line of the transverse support beam is 24 inches.

TABLE B-1—WELDING SCHEDULE FOR 3" QL-GKX SECTIONS

TYPE PANEL	AT TRANSVERSE SUPPORTS			AT PERIMETER POINTS		SPACING OF SEAM WELDS AT SIDE LAPS ³ (inches)
	Spot Welds			Spot Welds		
	Effective Diameter (inches)	Number of Welds Per Unit Each Support	Location ²	Effective Diameter (inches)	Spacing (inches)	
QL-GKX-24"	¹ / ₂	2	2 and 4	¹ / ₂	To be calculated based on allowable weld values. See Table B-2.	24 or 60 ¹
	¹ / ₂	4	1, 2, 3 and 4	¹ / ₂		24 or 60 ¹
QL-GKX-30"	¹ / ₂	3	1, 2 and 4	¹ / ₂		24 or 60 ¹
	¹ / ₂	4	1, 2, 3 and 4	¹ / ₂	24 or 60 ¹	

¹Sixty-inch spacing used only with structural concrete fill. Also, for structural concrete fill only, side lap connection may be No. 12 self-tapping and self-drilling screws, $1\frac{1}{4}$ inch long.

²See Figure B.1.a for flute members.

³See Figure B.1.b for welds at sidelap.

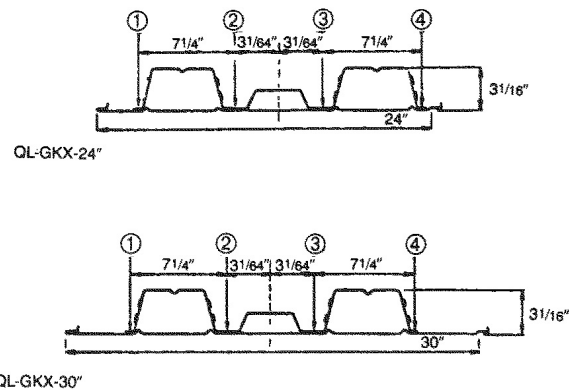


FIGURE B.1.a.—FLUTE NUMBERS FOR PUDDLE WELD LOCATIONS

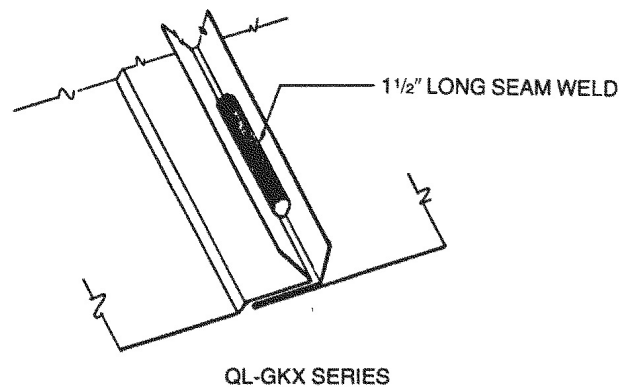


FIGURE B.1.b.—WELD AT SIDELAP

**TABLE B-2—ALLOWABLE SHEAR FOR
BOUNDARY WELDS ON GALVANIZED DECK**

A. MAXIMUM ALLOWABLE SHEAR ON MARGINAL PUDDLE WELDS (Pounds per Lineal Foot)¹			
Gage³	Spacing²		
	1 Foot	2 Feet	3 Feet
16-16	3200	1600	1070
18-16	2940	1470	980
18-18	2560	1280	850
20-20	1920	960	640
B. MAXIMUM ALLOWABLE SHEAR ON BOUNDARY 1½-INCH FILLET WELDS (Pounds per Lineal Foot)⁴			
Spacing			
1 Foot	2 Feet	3 feet	
720	360	240	

¹Values are based on the formula $q = \frac{32,000(t_1 + t'_2)}{S}$

where:

S = spacing in feet

t₁ = bottom sheet thickness in inches

t₂ = effective thickness of upper sheet in inches (t'₂ = 2/3t₂).

²In no case shall the spacing of boundary welds exceed 3 feet.

³The first number represents the thickness of the fluted sheet and the second number represents the thickness of the flat sheet.

⁴Values are based on the formula $q = (480l_w)/S$, where l_w = length of fillet weld (not less than 1½ inches). Where fillet welds attach the diaphragm to struts, ties or other collector elements, the values shall be reduced to 63 percent of those tabulated.

**TABLE C-1—ALLOWABLE SUPERIMPOSED LOADS (psf) FOR QL-GKX-24" AND QL-GKX-30" SECTIONS
WITH 2-INCH-THICK STONE-AGGREGATE CONCRETE FILL (145 pcf)^{1,2,3,4}**

DECK TYPE	DECK GAGE	DECK SPAN (Feet)																	
		8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5
QL-GKX-24"	20-20	293	274	256	241	228	216	205	195	186	150	142	136	129	123				
	20-18	296	276	259	244	230	218	207	197	188	151	144	137	130	124				
	18-20	290	271	254	239	225	214	203	193	184	176	169	162	156	122				
	18-18	293	274	257	242	228	216	205	195	187	178	171	164	158	123				
	18-16	296	276	259	243	230	218	207	197	188	180	172	165	159	124				
	16-20	288	269	252	237	224	212	201	192	183	175	168	161	155	149				
	16-18	292	272	255	240	227	215	204	194	185	177	170	163	157	151				
	16-16	294	275	258	242	229	217	206	196	187	179	172	165	158	152				
QL-GKX-30"	20-20	296	277	259	244	230	218	176	167	158	149	142	135	129	123				
	20-18	299	279	261	246	232	220	209	168	159	150	143	136	129	123				
	18-20	293	273	256	241	228	216	205	195	186	178	140	133	127	121				
	18-18	296	276	259	244	230	218	207	197	188	180	141	134	128	122				
	18-16	298	276	261	245	232	219	208	198	189	181	142	135	129	123				
	16-20	291	272	255	240	226	214	204	194	185	177	170	163	126	120				
	16-18	294	274	257	242	229	217	206	196	187	179	171	164	127	121				
	16-16	296	277	259	244	230	218	207	197	188	180	173	166	128	122				

¹Values tabulated represent the maximum allowable superimposed vertical loads for simply supported deck sections. These loads may be used with the steel floor units on simple or continuous spans. Composite slab design is to be based on simple span analysis. The QL deck sections require the depth of concrete to be above the top flange of the steel sections. The concrete shall be reinforced in accordance with Table C-6.

²Values located within the heavy line boundaries represent allowable superimposed loads that require temporary midspan shoring for single-span deck construction.

³Where the deck gage is represented by two numbers, the first number represents the thickness of the fluted sheet and the second number represents the thickness of the flat sheet.

⁴Side laps must be fastened in accordance with the appropriate diaphragm shear table in Section A.

**TABLE C-2—ALLOWABLE SUPERIMPOSED LOADS (psf) FOR QL-GKX-24" AND QL-GKX-30" SECTIONS
WITH 2-INCH-THICK STRUCTURAL LIGHTWEIGHT CONCRETE FILL (110 pcf)^{1,2,3,4}**

DECK TYPE	DECK GAGE	DECK SPAN (Feet)																	
		7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5
QL-GKX-24"	20-20	293	273	256	241	228	216	205	195	186	178	171	142	136	130				
	20-18	295	275	258	243	229	217	206	197	118	179	172	143	137	131				
	18-20	291	272	255	240	226	215	204	194	185	177	170	163	157	151				
	18-18	295	275	258	243	229	217	206	196	187	179	172	165	158	153				
	18-16	297	277	260	244	231	218	208	198	189	180	173	166	160	154				
	16-20	291	271	254	239	226	214	203	194	185	177	169	163	156	151				
	16-18	295	275	258	243	229	217	206	196	187	179	172	165	158	153				
	16-16	297	278	260	245	231	219	208	198	189	181	173	166	160	154				
QL-GKX-30"	20-20	295	275	258	243	229	217	06	196	164	156	148	142	135	129				
	20-18	297	277	259	244	231	218	207	198	165	157	149	142	136	130				
	18-20	293	273	256	241	228	216	205	195	186	178	171	164	134	129				
	18-18	296	276	259	243	230	218	207	197	188	180	172	165	136	130				
	18-16	297	277	260	245	231	219	208	198	189	181	173	166	136	130				
	16-20	292	273	256	241	227	215	204	195	186	178	170	163	157	151				
	16-18	295	275	258	243	229	217	206	197	188	179	172	165	159	153				
	16-16	297	277	260	245	231	219	208	198	189	181	173	166	160	154				

For footnotes see Table C-1.

**TABLE C-3—ALLOWABLE SUPERIMPOSED LOADS (psf) FOR QL-GKX-30" SECTIONS
WITH 2 1/2-INCH-THICK STONE-AGGREGATE CONCRETE FILL (145 pcf)^{1,2,3,4}**

DECK TYPE	DECK GAGE	DECK SPAN (Feet)																	
		8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5
QL-GKX-24"	20-20	280	263	248	235	224	213	170	162	154	146	139	133	127	121	116			
	20-18	282	266	251	238	226	215	172	163	155	147	140	134	128	122	117			
	18-20	276	259	245	232	220	210	200	192	184	176	137	130	125	119	114			
	18-18	279	262	248	235	223	212	203	194	186	178	138	132	126	120	115			
	18-16	281	264	250	236	225	214	204	195	187	180	139	133	127	121	116			
	16-20	273	257	242	230	218	208	198	190	182	174	168	161	123	118	113			
	16-18	276	260	245	232	221	210	201	192	184	177	170	163	158	119	114			
	16-16	279	262	248	235	223	212	203	194	186	178	171	165	159	120	115			
QL-GKX-30"	20-20	283	266	252	238	191	180	171	162	153	146	139	132	126	121	116			
	20-18	285	269	254	240	193	182	172	163	154	147	140	133	127	122	116			
	18-20	279	163	248	235	223	213	203	159	151	143	136	130	124	119	114			
	18-18	282	265	251	237	226	215	205	160	152	145	138	131	125	120	115			
	18-16	284	267	252	239	227	216	206	161	153	145	138	132	126	120	115			
	16-20	276	260	246	233	221	210	201	192	184	142	135	129	123	117	112			
	16-18	279	263	248	235	223	213	203	194	186	143	136	130	124	118	113			
	16-16	282	265	250	237	225	214	205	196	188	144	137	131	125	119	114			

For footnotes see Table C-1.

**TABLE C-4—ALLOWABLE SUPERIMPOSED LOADS (psf) QL-GKX-24" AND QL-GKX-30" SECTIONS
WITH 2 1/2-INCH-THICK STRUCTURAL LIGHTWEIGHT CONCRETE FILL (110 pcf)^{1,2,3,4}**

DECK TYPE	DECK GAGE	DECK SPAN (FEET)																	
		8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5
QL-GKX-24"	20-20	277	261	246	233	222	211	202	193	160	153	146	139	134	128	123			
	20-18	280	263	249	235	224	213	203	194	161	154	147	140	134	129	124			
	18-20	275	258	244	231	220	209	200	191	183	176	169	162	132	127	122			
	18-18	278	261	247	234	222	211	202	193	185	177	171	164	133	128	123			
	18-16	279	263	248	235	223	213	203	194	186	179	172	165	134	129	124			
	16-20	273	257	242	230	218	208	198	190	182	174	168	161	156	150	121			
	16-18	276	260	245	232	221	210	201	192	184	177	170	163	158	152	47			
	16-16	279	262	248	234	223	212	202	194	186	178	171	165	159	153	148			
QL-GKX-30"	20-20	280	264	249	236	224	187	177	168	160	153	146	139	133	128	123			
	20-18	282	266	251	238	226	215	178	169	161	153	146	140	134	128	123			
	18-20	277	261	246	233	222	211	201	193	185	151	144	138	132	126	121			
	18-18	280	263	249	236	224	213	203	194	186	152	145	139	133	127	122			
	18-16	281	265	250	237	225	214	204	196	187	153	146	139	133	128	123			
	16-20	275	259	245	232	220	210	200	191	183	176	169	163	131	125	120			
	16-18	278	262	247	234	222	212	202	193	185	178	171	165	132	126	121			
	16-16	280	264	249	236	224	213	204	195	187	179	172	166	133	127	122			

For footnotes see Table C-1.

**TABLE C-5—ALLOWABLE SUPERIMPOSED LOADS (psf) FOR QL-GKX-24" AND QL-GKX-30" SECTIONS
WITH 3 1/4-INCH-THICK STONE-AGGREGATE CONCRETE FILL (145 pcf)^{1,2,3,4}**

DECK TYPE	DECK GAGE	DECK SPAN (Feet)																	
		8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5
QL-GKX-24"	20-20	312	294	278	263	250	238	227	188	178	170	162	155	149	143	137	131	126	122
	20-18	315	296	280	265	252	240	229	189	180	171	164	156	150	144	138	132	127	122
	18-20	308	290	274	259	246	234	224	214	205	197	189	153	146	140	134	129	124	119
	18-18	311	293	276	262	249	237	226	216	07	199	191	154	148	141	136	130	125	121
	18-16	313	294	278	263	250	238	227	217	208	200	192	155	148	142	136	131	126	121
	16-20	304	286	271	256	243	232	221	212	203	195	187	180	174	138	133	127	122	118
	16-18	308	290	274	259	246	234	224	214	05	197	189	182	176	170	134	129	124	119
	16-16	310	292	276	261	248	236	226	216	207	198	191	184	177	171	135	130	125	120
QL-GKX-30"	20-20	316	298	281	266	221	209	198	188	179	171	163	156	149	143	137	132	126	122
	20-18	318	300	283	268	255	211	199	189	180	172	164	157	150	143	138	132	127	122
	18-20	312	293	277	262	249	237	227	217	176	168	160	153	146	140	135	129	124	119
	18-18	314	296	279	265	251	239	229	219	178	169	161	154	148	141	136	130	125	120
	18-16	316	297	281	266	253	241	230	220	178	170	162	155	148	142	136	131	126	121
	16-20	309	290	274	260	247	235	224	215	206	197	158	151	145	139	133	128	123	118
	16-18	311	293	277	262	249	237	226	216	207	199	160	152	146	140	134	129	124	119
	16-16	313	295	279	264	251	239	228	218	209	200	161	153	147	141	135	129	124	120

For footnotes see Table C-1.

TABLE C-6—STRUCTURAL CONCRETE MINIMUM REINFORCING¹

SLAB THICKNESS (inches)	6 BY 6 WELDED WIRE FABRIC ² (Wire Size)
3 1/4 or less	W 1.4 × W 1.4
3 1/2	W 1.7 × W 1.7
4	W 2.1 × W 2.1
4 1/2	W 2.5 × W 2.5
5	W 2.9 × W 2.9
5 1/2	W 2.9 × W 2.9
6	W 3.4 × W 3.4

¹A 6 by 6 welded wire fabric shrinkage mesh, located one inch from the top of the concrete slab, is recommended for all slab thicknesses. Listed above are the recommended wire sizes for respective slab thicknesses measured from top of deck to top of slab. These wire sizes apply to both stone and lightweight concrete.

²Other reinforcement having an equivalent area and a maximum spacing of 18 inches may be substituted.

TABLE D-1—DECK SECTION PROPERTIES^{1,2}

SECTION AND GAGE	WEIGHT Lbs.-Sq./Ft.	Y DIST (inches)	I FOR DEFLECTION (inches ⁴)	POSITIVE S.M. (Inches ³)	NEGATIVE S.M. (Inches ³)
1					
QL-GKX-24"-20-20	3.6	2.145	1.440	.637	.648
QL-GKX-24"-20-18	4.2	2.262	1.553	.643	.676
QL-GKX-24"-18-20	4.3	2.044	1.781	.872	.839
QL-GKX-24"-18-18	4.8	2.158	1.928	.893	.875
QL-GKX-24"-18-16	5.4	2.250	2.047	.910	.901
QL-GKX-24"-16-20	5.0	1.970	2.100	1.066	1.022
QL-GKX-24"-16-18	5.5	2.079	2.275	1.094	1.067
QL-GKX-24"-16-16	6.1	2.170	2.422	1.116	1.102
1					
QL-GKX-30"-20-20	3.2	2.228	1.216	.514	.526
QL-GKX-30"-20-18	3.7	2.345	1.308	.530	.548
QL-GKX-30"-18-20	3.7	2.124	1.508	.710	.679
QL-GKX-30"-18-18	4.3	2.241	1.629	.727	.706
QL-GKX-30"-18-16	4.8	2.334	1.726	.740	.733
QL-GKX-30"-16-20	4.3	2.046	1.799	.879	.828
QL-GKX-30"-16-18	4.8	2.161	1.926	.891	.867
QL-GKX-30"-16-16	5.3	2.254	2.048	.909	.898

¹The properties shown are for units used in "Flat Plate Down" position. The deck gage is represented by two numbers. The first number represents the thickness of the fluted sheet and the second number represents the thickness of the flat sheet.

²Centroid measured from top of section.

TABLE E-1—DIAPHRAGM FLEXIBILITY LIMITATION^{1,2,3}

FLEXIBILITY CATEGORY	<i>F</i>	MAXIMUM SPAN IN FEET FOR MASONRY OR CONCRETE WALLS	SPAN-DEPTH LIMITATION			
			Rotation Not Considered in Diaphragm		Rotation Considered in Diaphragm	
			Masonry or Concrete Walls	Flexible Walls ⁴	Masonry or Concrete Walls	Flexible Walls ⁴
Very flexible	More than 150	Not used	Not Used	2:1	Not used	1 ¹ / ₂ :1
Flexible	70-150	200	2:1 or as required for deflection	3:1	Not used	2:1
Semi-flexible	10-70	400	2 ¹ / ₂ :1 or as required for deflection	4:1	As required for deflection	2 ¹ / ₂ :1
Semi-rigid	1-10	No limitation	3:1 or as required for deflection	5:1	As required for deflection	3:1
Rigid	Less than 1	No limitation	As required for deflection	No limitation	As required for deflection	3 ¹ / ₂ :1

¹Roof diaphragms are to be investigated regarding their flexibility and recommended span-depth limitations. Refer to above tables for determination of value of "*F*".

²Roof diaphragms supporting masonry or concrete walls are to have their deflections limited to the following amount:

$$\Delta_{wall} = \frac{H^2 f_c}{0.01Et}$$

where:

H = Unsupported height of wall in feet.

t = Thickness of wall in inches.

E = Modulus of elasticity of wall material for deflection determination in pounds per square inch.

f_c = Allowable compressive strength of wall material in flexure in pounds per square inch. For concrete, *f_c* = 0.45 *f'_c*. For masonry, = *f_c* = *F_b* = 0.33 *f'_m*.

³The total deflection Δ of the diaphragm may be computed from the equation:

$$\Delta = \Delta_f + \Delta_w$$

where:

Δ_f = Flexural deflection of the diaphragm determined in the same manner as the deflection of beams.

Δ_w = The web deflection may be determined by the equation:

$$\Delta_w = \frac{q_{ave} L_1 F}{10^6}$$

where:

L₁ = Distance in feet between vertical resisting element (such as shear wall()) and the point to which the deflection is to be determined.

q_{ave} = Average shear in diaphragm in pounds per foot over length *L₁*.

F = Flexibility factor: The average microinches a diaphragm web will deflect in a span of 1 foot under a shear of 1 pound per foot.

⁴When applying these limitations to cantilevered diaphragms, the allowable span-depth ratio will be half that shown.

TABLE F-1—ALLOWABLE REACTIONS BASED ON WEB CRIPPLING
(Pounds per Foot of Deck Width)^{1,2}

REACTION LOCATION	LENGTH OF BEARING (inches)	GAGE OF TOO ELEMENT	DECK SECTION	
			QL-GKX-24"	QL-GKX-30"
			Lbs./Ft.	Lbs./Ft.
End of panel	3	22	NA	NA
		20	698	558
		18	1,378	1,102
		16	2,240	1,792
Interior	4	22	NA	NA
		20	1,763	1,410
		18	2,883	2,306
		16	4,216	3,373

¹Values calculated in accordance with Section 2230, C3.4 of the code.

²Values measured per foot of panel width.

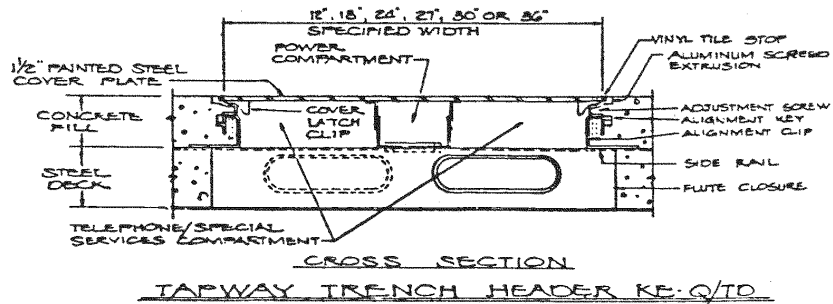
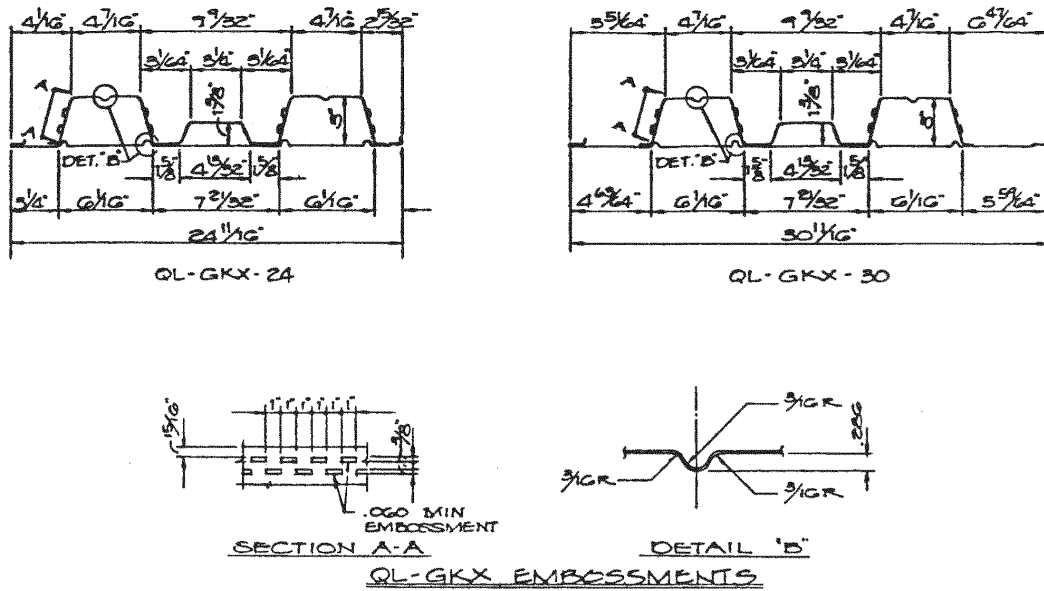


FIGURE 1—DESCRIPTIVE DETAILS

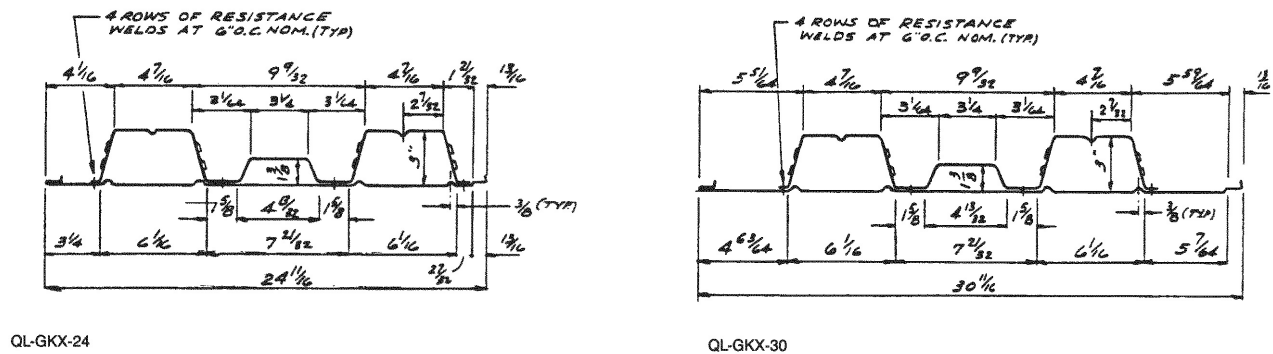


FIGURE 2—RESISTANCE WELDS FOR CELLULAR SECTIONS