TF 209-03 Metric

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Design Aids For Structural Welded Wire Reinforcement (Metric Units for WWR/Rebar Comparison Tables)

INTRODUCTION

This Tech Fact* provides basic information on cold-worked wire and welded wire reinforcement (WWR) to assist in the design and detailing of WWR systems for concrete structures. Tables are included to compare metric steel areas and diameters for reinforcement with a minimum yield strength of 420 MPa and three higher minimum yield strengths, i.e., 485 MPa, 515 MPa and 550 MPa, for WWR[1]. Tables 3-6 consider steel wire diameters ranging from 5 mm to 16 mm.

The American Concrete Institute's (ACI) publication *318M ACI 318, Building Requirements for Structural Concrete* defines deformed reinforcement for structural concrete in Section 2.1. The section states that welded plain wire reinforcement, welded deformed wire reinforcement and deformed wire are defined as deformed reinforcement. For further definition and acceptance for the use of high strength reinforcement see 318M ACI 318, Chapter 3.

SPECIFICATIONS

The American Society for Testing and Materials (ASTM) publishes specifications for the wire used to manufacture reinforcement and for both plain and deformed WWR. The Canadian Standards Association (CSA) publishes similar specifications for use in Canada. The appropriate titles and numbers are given in Table 1. These are considered to be the governing specifications for both wire and WWR. Federal, State and local governmental agencies have special specifications that will control. The AASHTO specification numbers are a prime example of this. They are also stated in Table 1. Table 2 has minimum strength properties and weld shear test values. See the section on Minimum Yield Strengths for specific references to high strength reinforcement.

TABLE 1
SPECIFICATIONS COVERING WELDED WIRE REINFORCEMENT

U.S. Specifications	AASHTO Specifications	Canadian Standard	Title
ASTM A 82	M32	CSA G 30.3	Steel Wire, Plain, for Concrete Reinforcement
ASTM A 185	M55	CSA G 30.5	Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A 496	M225	CSA G 30.14	Steel Wire, Deformed, for Concrete Reinforcement
ASTM A 497	M221	CSA G 30.15	Steel Welded Wire Reinforcement, Deformed, for Concrete

TABLE 2
ASTM AND CSA PROPERTIES OF STEEL WIRE IN WELDED WIRE REINFORCEMENT

Type of WWR	Minimum Tensile Strength		Minimum Yield[2] Strength		Weld Shear	
	MPa	psi	MPa	psi	MPa	psi
Welded Wire Reinforcement, Plain	520	75,000	450	65,000	241	35,000
Welded Wire Reinforcement, Deformed	550	80,000	485	70,000	241	35,000

[1]Rebar sizes of #3, #4, #5 and #6 are not available in strengths higher than 420 MPa.
[2]For use of WWR with higher minimum yield strengths see the section on Minimum Yield Strengths.

**This Tech Fact may be inserted in the WRI Structural Detailing Manual, Chapter 2 and will be updated as manufacturing capabilities are changed.*

MINIMUM YIELD STRENGTHS

The yield strength values shown in Table 2 are ASTM and CSA requirements for minimum yield strengths measured at a strain of 0.5% of gage length. The 318M ACI 318 Structural Building Code, Chapter 3, states that minimum yield strength values greater than 420 MPa up to 550 MPa may be used, provided they are measured at a strain of 0.35% of gage length. The ACI strain requirements are now covered in supplements specified by ASTM and CSA. Also, the 318M ACI 318 Building Code limits the minimum design yield strength of reinforcement to 550 MPa (Chapter 9, 9.4), (Chapter 11, 11.5.2).

WELD SHEAR STRENGTH AND CONCRETE BOND

Plain WWR develops bond with the concrete through the positive mechanical anchorage at each welded intersection of wires. Deformed WWR utilizes wire deformations along with the welded intersections for bond and anchorage. The ASTM and CSA requirements for weld shear strength at the wire intersections are shown in Table 2.

ASTM and CSA specify a size differential for wires being welded together to assure adequate weld shear strength. For welded wire reinforcement, plain and deformed, the smaller wire must have an area of 40 percent or more of the area of the larger wire.

EXAMPLE: *(Showing Use of Comparison Tables 3-6)*

Parameters:

f_y = 550 MPa to be used in lieu of f_y = 420 MPa reinforcing bars. The slab is for one-way stress calculations, 150 mm thick.

The positive moment reinforcement is 13 mm bars @ 250 mm c/c (A_S = 508 mm sq./m width)

The temperature reinforcement is 13 mm bars @ 450 mm c/c (A_S = 282 mm sq./m width)

The negative moment reinforcement is 16 mm bars @ 300 mm c/c (A_S = 656 mm sq./m)
Use Table 6 - Reinforcing Bar: f_y = 420 MPa, Welded Wire Reinforcement: f_y = 550 MPa
Begin with 150 mm spacings and adjust as necessary.
The parameters noted above are followed in these derivations:

POSITIVE MOMENT REINFORCEMENT (BOTTOM)

13mm wires @ 250mm c/c.- Select 8.6 diameter wires @ 150mm spacings

$$A_w = 508 \times \frac{420}{550} \times \frac{150}{1000} = 58.2\text{mm}^2, \text{ then } d_b = \sqrt{\frac{58.2}{0.7854}} = 8.6\text{mm - ok}$$

TEMPERATURE REINFORCEMENT

13mm wires @ 450mm c/c. – Select 6.4mm diameter wires @ 150mm spacings

$$A_w = 282 \times \frac{420}{550} \times \frac{150}{1000} = 32.3\text{mm}^2, \text{ then } d_b = \sqrt{\frac{32.3}{0.7854}} = 6.4\text{mm - ok}$$

To satisfy ASTM weld/shear requirements of 40% differential areas of larger to smaller wires:
58.2mm^2 x 0.4 = 23.3mm^2, and 32.3 is greater than 23.3mm^2 – ok

The style of WWR sheet for the positive moment reinforcement (bottom) is: 150 x 150 – 8.6x6.4

NEGATIVE MOMENT REINFORCEMENT (TOP)

16mm wires @ 300mm c/c. – Select 9.8mm diameter wires @ 150mm spacings

$$A_w = 656 \times \frac{420}{550} \times \frac{150}{1000} = 75.1\text{mm}^2, \text{ then } d_b = \sqrt{\frac{75.1}{0.7854}} = 9.8\text{mm - ok}$$

Cross wires: 75.1 x 0.4 = 30.1mm^2, then $d_b = \sqrt{\frac{30.1}{0.7854}} = 6.2\text{mm}$ - Select 400mm spacings

The style of WWR sheet for the negative moment reinforcement (top) is: 150 x 400 - 9.8 x 6.2

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Definition of expressions:

A_s - Area of steel (per meter width or per foot of width)

A_w- Area of wire

d_b - diameter of bar or wire

Conversions – Inch-Pound to Metric Measurements

Inch-pound (psi)	S.I. Units (MPa)	Metric (kg/cm^2)
60,000	420	4220
70,000	485	4920
75,000	515	5270
80,000	550	5620

Conversion Multipliers

kg/cm^2 x 14.2234 = psi

MPa x 145 = psi

MPa x 10.188 = kg/cm^2

REMARKS:

When the WWR style is required to furnish tension reinforcement in only one direction, the cross-wire should be the smallest size permitted at the maximum spacing permitted. ASTM and CSA specify the minimum size as noted above. The maximum spacing is 3 times the slab thickness or 450 mm as specified in ACI 318, Chapter 7.

NOTES FOR TABLES 3-6

1. Mass in kg/m^2 is for one direction only. Double the weight for the same reinforcing in the other direction, or add the appropriate weight for a different pattern in the other direction.

2. Mass in kg/m^2 is theoretical and are intended for estimating purposes only. Contact the WWR producers for more specific project requirements.

3. ACI 318 requires the minimum deformed wire diameter to be 5.7 mm for structural applications. Sheets of WWR can be both deformed and plain mixed. (ACI 318, Chapter 12, 12.7.4).

4. In accordance with ACI 318, the maximum spacing permitted for plain WWR is 300 mm and the maximum spacing for deformed welded wire reinforcement is 400 mm. The 450 mm spacing in the tables is only recommended for use in slab on grade applications, which are not governed by ACI 318, unless designed as a structural slab.

TABLE 3

COMPARISON TABLES - REINFORCING BARS AND WELDED WIRE REINFORCEMENT

Rebar @ 420 MPa and Welded Wire Reinforcement @ 420 MPa

#3 Rebar @ 420 MPa				Welded Wire Reinforcement @ 420 MPa							
Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	699	5.49	9.4	11.6	13.3				699	5.49
5	125	559	4.39	8.4	10.3	11.9	14.6			559	4.39
6	150	466	3.66	7.7	9.4	10.9	13.3	15.4		466	3.66
7	175	399	3.14	7.1	8.7	10.1	12.3	14.3	15.1	399	3.14
8	200	349	2.74	6.7	8.2	9.4	11.6	13.3	14.1	349	2.74
9	225	310	2.44	6.3	7.7	8.9	10.9	12.6	13.3	310	2.44
10	250	279	2.20	6.0	7.3	8.4	10.3	11.9	12.7	279	2.20
11	275	254	2.00	5.7	7.0	8.0	9.8	11.4	12.1	254	2.00
12	300	233	1.83	5.4	6.7	7.7	9.4	10.9	11.6	233	1.83
13	325	215	1.69	5.2	6.4	7.4	9.1	10.5	11.1	215	1.69
14	350	200	1.57	5.0	6.2	7.1	8.7	10.1	10.7	200	1.57
15	375	186	1.46	4.9	6.0	6.9	8.4	9.7	10.3	186	1.46
16	400	175	1.37	4.7	5.8	6.7	8.2	9.4	10.0	175	1.37
17	425	164	1.29	4.6	5.6	6.5	7.9	9.1	9.7	164	1.29
18	450	155	1.22	4.4	5.4	6.3	7.7	8.9	9.4	155	1.22

#4 Rebar @ 420 MPa				Welded Wire Reinforcement @ 420 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	1270	9.98	12.7	15.6					1270	9.98
5	125	1016	7.98	11.4	13.9					1016	7.98
6	150	847	6.65	10.4	12.7	14.7				847	6.65
7	175	726	5.70	9.6	11.8	13.6				726	5.70
8	200	635	4.99	9.0	11.0	12.7	15.6			635	4.99
9	225	564	4.44	8.5	10.4	12.0	14.7			564	4.44
10	250	508	3.99	8.0	9.8	11.4	13.9			508	3.99
11	275	462	3.63	7.7	9.4	10.8	13.3	15.3		462	3.63
12	300	423	3.33	7.3	9.0	10.4	12.7	14.7	15.6	423	3.33
13	325	391	3.07	7.1	8.6	10.0	12.2	14.1	15.0	391	3.07
14	350	363	2.85	6.8	8.3	9.6	11.8	13.6	14.4	363	2.85
15	375	339	2.66	6.6	8.0	9.3	11.4	13.1	13.9	339	2.66
16	400	318	2.50	6.4	7.8	9.0	11.0	12.7	13.5	318	2.50
17	425	299	2.35	6.2	7.6	8.7	10.7	12.3	13.1	299	2.35
18	450	282	2.22	6.0	7.3	8.5	10.4	12.0	12.7	282	2.22

#5 Rebar @ 420 MPa				Welded Wire Reinforcement @ 420 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	1969	15.47	15.8						1969	15.47
5	125	1575	12.38	14.2						1575	12.38
6	150	1312	10.31	12.9	15.8					1312	10.31
7	175	1125	8.84	12.0	14.7					1125	8.84
8	200	984	7.73	11.2	13.7	15.8				984	7.73
9	225	875	6.88	10.6	12.9	14.9				875	6.88
10	250	787	6.19	10.0	12.3	14.2				787	6.19
11	275	716	5.63	9.5	11.7	13.5				716	5.63
12	300	656	5.16	9.1	11.2	12.9	15.8			656	5.16
13	325	606	4.76	8.8	10.8	12.4	15.2			606	4.76
14	350	562	4.42	8.5	10.4	12.0	14.7			562	4.42
15	375	525	4.13	8.2	10.0	11.6	14.2			525	4.13
16	400	492	3.87	7.9	9.7	11.2	13.7	15.8		492	3.87
17	425	463	3.64	7.7	9.4	10.9	13.3	15.4		463	3.64
18	450	437	3.44	7.5	9.1	10.6	12.9	14.9	15.8	437	3.44

#6 Rebar @ 420 MPa				Welded Wire Reinforcement @ 420 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	2794	21.96							2794	21.96
5	125	2235	17.56							2235	17.56
6	150	1863	14.64	15.4						1863	14.64
7	175	1597	12.55	14.3						1597	12.55
8	200	1397	10.98	13.3						1397	10.98
9	225	1242	9.76	12.6	15.4					1242	9.76
10	250	1118	8.78	11.9	14.6					1118	8.78
11	275	1016	7.98	11.4	13.9					1016	7.98
12	300	931	7.32	10.9	13.3	15.4				931	7.32
13	325	860	6.76	10.5	12.8	14.8				860	6.76
14	350	798	6.27	10.1	12.3	14.3				798	6.27
15	375	745	5.85	9.7	11.9	13.8				745	5.85
16	400	699	5.49	9.4	11.6	13.3				699	5.49
17	425	657	5.17	9.1	11.2	12.9	15.8			657	5.17
18	450	621	4.88	8.9	10.9	12.6	15.4			621	4.88

TABLE 4

COMPARISON TABLES - REINFORCING BARS AND WELDED WIRE REINFORCEMENT

Rebar @ 420 MPa and Welded Wire Reinforcement @ 485 MPa

#3 Rebar @ 420 MPa				Welded Wire Reinforcement @ 485 MPa							
Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	699	5.49	8.8	10.7	12.4	15.2			605	4.75
5	125	559	4.39	7.8	9.6	11.1	13.6	15.7		484	3.80
6	150	466	3.66	7.2	8.8	10.1	12.4	14.3	15.2	403	3.17
7	175	399	3.14	6.6	8.1	9.4	11.5	13.3	14.1	346	2.72
8	200	349	2.74	6.2	7.6	8.8	10.7	12.4	13.2	302	2.38
9	225	310	2.44	5.9	7.2	8.3	10.1	11.7	12.4	269	2.11
10	250	279	2.20	5.6	6.8	7.8	9.6	11.1	11.8	242	1.90
11	275	254	2.00	5.3	6.5	7.5	9.2	10.6	11.2	220	1.73
12	300	233	1.83	5.1	6.2	7.2	8.8	10.1	10.7	202	1.58
13	325	215	1.69	4.9	6.0	6.9	8.4	9.7	10.3	186	1.46
14	350	200	1.57	4.7	5.7	6.6	8.1	9.4	10.0	173	1.36
15	375	186	1.46	4.5	5.6	6.4	7.8	9.1	9.6	161	1.27
16	400	175	1.37	4.4	5.4	6.2	7.6	8.8	9.3	151	1.19
17	425	164	1.29	4.3	5.2	6.0	7.4	8.5	9.0	142	1.12
18	450	155	1.22	4.1	5.1	5.9	7.2	8.3	8.8	134	1.06

#4 Rebar @ 420 MPa				Welded Wire Reinforcement @ 485 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	1270	9.98	11.8	14.5					1100	8.64
5	125	1016	7.98	10.6	13.0	15.0				880	6.91
6	150	847	6.65	9.7	11.8	13.7				733	5.76
7	175	726	5.70	8.9	11.0	12.7	15.5			628	4.94
8	200	635	4.99	8.4	10.2	11.8	14.5			550	4.32
9	225	564	4.44	7.9	9.7	11.2	13.7	15.8		489	3.84
10	250	508	3.99	7.5	9.2	10.6	13.0	15.0	15.9	440	3.46
11	275	462	3.63	7.1	8.7	10.1	12.4	14.3	15.1	400	3.14
12	300	423	3.33	6.8	8.4	9.7	11.8	13.7	14.5	367	2.88
13	325	391	3.07	6.6	8.0	9.3	11.4	13.1	13.9	338	2.66
14	350	363	2.85	6.3	7.7	8.9	11.0	12.7	13.4	314	2.47
15	375	339	2.66	6.1	7.5	8.6	10.6	12.2	13.0	293	2.30
16	400	318	2.50	5.9	7.2	8.4	10.2	11.8	12.6	275	2.16
17	425	299	2.35	5.7	7.0	8.1	9.9	11.5	12.2	259	2.03
18	450	282	2.22	5.6	6.8	7.9	9.7	11.2	11.8	244	1.92

#5 Rebar @ 420 MPa				Welded Wire Reinforcement @ 485 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	1969	15.47	14.7						1705	13.40
5	125	1575	12.38	13.2						1364	10.72
6	150	1312	10.31	12.0	14.7					1136	8.93
7	175	1125	8.84	11.1	13.6	15.7				974	7.65
8	200	984	7.73	10.4	12.8	14.7				852	6.70
9	225	875	6.88	9.8	12.0	13.9				758	5.95
10	250	787	6.19	9.3	11.4	13.2				682	5.36
11	275	716	5.63	8.9	10.9	12.6	15.4			620	4.87
12	300	656	5.16	8.5	10.4	12.0	14.7			568	4.47
13	325	606	4.76	8.2	10.0	11.6	14.2			525	4.12
14	350	562	4.42	7.9	9.6	11.1	13.6	15.7		487	3.83
15	375	525	4.13	7.6	9.3	10.8	13.2	15.2		455	3.57
16	400	492	3.87	7.4	9.0	10.4	12.8	14.7	15.6	426	3.35
17	425	463	3.64	7.1	8.8	10.1	12.4	14.3	15.2	401	3.15
18	450	437	3.44	6.9	8.5	9.8	12.0	13.9	14.7	379	2.98

#6 Rebar @ 420 MPa				Welded Wire Reinforcement @ 485 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	2794	21.96							2420	19.01
5	125	2235	17.56	15.7						1936	15.21
6	150	1863	14.64	14.3						1613	12.68
7	175	1597	12.55	13.3						1383	10.86
8	200	1397	10.98	12.4	15.2					1210	9.51
9	225	1242	9.76	11.7	14.3					1075	8.45
10	250	1118	8.78	11.1	13.6	15.7				968	7.61
11	275	1016	7.98	10.6	13.0	15.0				880	6.91
12	300	931	7.32	10.1	12.4	14.3				807	6.34
13	325	860	6.76	9.7	11.9	13.8				744	5.85
14	350	798	6.27	9.4	11.5	13.3				691	5.43
15	375	745	5.85	9.1	11.1	12.8	15.7			645	5.07
16	400	699	5.49	8.8	10.7	12.4	15.2			605	4.75
17	425	657	5.17	8.5	10.4	12.0	14.7			569	4.47
18	450	621	4.88	8.3	10.1	11.7	14.3			538	4.23

TABLE 5
COMPARISON TABLES - REINFORCING BARS AND WELDED WIRE REINFORCEMENT
Rebar @ 420 MPa and Welded Wire Reinforcement @ 515 MPa

#3 Rebar @ 420 MPa				Welded Wire Reinforcement @ 515 MPa							
Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	699	5.49	8.5	10.4	12.0	14.8			570	4.48
5	125	559	4.39	7.6	9.3	10.8	13.2	15.2		456	3.58
6	150	466	3.66	7.0	8.5	9.8	12.0	13.9	14.8	380	2.98
7	175	399	3.14	6.4	7.9	9.1	11.2	12.9	13.7	326	2.56
8	200	349	2.74	6.0	7.4	8.5	10.4	12.0	12.8	285	2.24
9	225	310	2.44	5.7	7.0	8.0	9.8	11.4	12.0	253	1.99
10	250	279	2.20	5.4	6.6	7.6	9.3	10.8	11.4	228	1.79
11	275	254	2.00	5.1	6.3	7.3	8.9	10.3	10.9	207	1.63
12	300	233	1.83	4.9	6.0	7.0	8.5	9.8	10.4	190	1.49
13	325	215	1.69	4.7	5.8	6.7	8.2	9.4	10.0	175	1.38
14	350	200	1.57	4.6	5.6	6.4	7.9	9.1	9.7	163	1.28
15	375	186	1.46	4.4	5.4	6.2	7.6	8.8	9.3	152	1.19
16	400	175	1.37	4.3	5.2	6.0	7.4	8.5	9.0	142	1.12
17	425	164	1.29	4.1	5.1	5.8	7.2	8.3	8.8	134	1.05
18	450	155	1.22	4.0	4.9	5.7	7.0	8.0	8.5	127	0.99

#4 Rebar @ 420 MPa				Welded Wire Reinforcement @ 515 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	1270	9.98	11.5	14.1					1036	8.14
5	125	1016	7.98	10.3	12.6	14.5				829	6.51
6	150	847	6.65	9.4	11.5	13.3				690	5.43
7	175	726	5.70	8.7	10.6	12.3	15.0			592	4.65
8	200	635	4.99	8.1	9.9	11.5	14.1			518	4.07
9	225	564	4.44	7.7	9.4	10.8	13.3	15.3		460	3.62
10	250	508	3.99	7.3	8.9	10.3	12.6	14.5	15.4	414	3.26
11	275	462	3.63	6.9	8.5	9.8	12.0	13.8	14.7	377	2.96
12	300	423	3.33	6.6	8.1	9.4	11.5	13.3	14.1	345	2.71
13	325	391	3.07	6.4	7.8	9.0	11.0	12.7	13.5	319	2.50
14	350	363	2.85	6.1	7.5	8.7	10.6	12.3	13.0	296	2.33
15	375	339	2.66	5.9	7.3	8.4	10.3	11.9	12.6	276	2.17
16	400	318	2.50	5.7	7.0	8.1	9.9	11.5	12.2	259	2.03
17	425	299	2.35	5.6	6.8	7.9	9.6	11.1	11.8	244	1.92
18	450	282	2.22	5.4	6.6	7.7	9.4	10.8	11.5	230	1.81

#5 Rebar @ 420 MPa				Welded Wire Reinforcement @ 515 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	1969	15.47	14.3						1605	12.62
5	125	1575	12.38	12.8	15.7					1284	10.09
6	150	1312	10.31	11.7	14.3					1070	8.41
7	175	1125	8.84	10.8	13.2	15.3				917	7.21
8	200	984	7.73	10.1	12.4	14.3				803	6.31
9	225	875	6.88	9.5	11.7	13.5				714	5.61
10	250	787	6.19	9.0	11.1	12.8	15.7			642	5.05
11	275	716	5.63	8.6	10.6	12.2	14.9			584	4.59
12	300	656	5.16	8.3	10.1	11.7	14.3			535	4.21
13	325	606	4.76	7.9	9.7	11.2	13.7	15.9		494	3.88
14	350	562	4.42	7.6	9.4	10.8	13.2	15.3		459	3.60
15	375	525	4.13	7.4	9.0	10.4	12.8	14.8	15.7	428	3.36
16	400	492	3.87	7.1	8.8	10.1	12.4	14.3	15.2	401	3.15
17	425	463	3.64	6.9	8.5	9.8	12.0	13.9	14.7	378	2.97
18	450	437	3.44	6.7	8.3	9.5	11.7	13.5	14.3	357	2.80

#6 Rebar @ 420 MPa				Welded Wire Reinforcement @ 515 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	2794	21.96							2279	17.91
5	125	2235	17.56	15.2						1823	14.32
6	150	1863	14.64	13.9						1519	11.94
7	175	1597	12.55	12.9	15.8					1302	10.23
8	200	1397	10.98	12.0	14.8					1139	8.95
9	225	1242	9.76	11.4	13.9					1013	7.96
10	250	1118	8.78	10.8	13.2	15.2				911	7.16
11	275	1016	7.98	10.3	12.6	14.5				829	6.51
12	300	931	7.32	9.8	12.0	13.9				760	5.97
13	325	860	6.76	9.4	11.6	13.4				701	5.51
14	350	798	6.27	9.1	11.2	12.9	15.8			651	5.12
15	375	745	5.85	8.8	10.8	12.4	15.2			608	4.77
16	400	699	5.49	8.5	10.4	12.0	14.8			570	4.48
17	425	657	5.17	8.3	10.1	11.7	14.3			536	4.21
18	450	621	4.88	8.0	9.8	11.4	13.9			506	3.98

TABLE 6
COMPARISON TABLES - REINFORCING BARS AND WELDED WIRE REINFORCEMENT
Rebar @ 420 MPa and Welded Wire Reinforcement @ 550 MPa

#3 Rebar @ 420 MPa				Welded Wire Reinforcement @ 550 MPa							
Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	699	5.49	8.2	10.1	11.7	14.3			533	4.19
5	125	559	4.39	7.4	9.0	10.4	12.8	14.7	15.6	427	3.35
6	150	466	3.66	6.7	8.2	9.5	11.7	13.5	14.3	356	2.79
7	175	399	3.14	6.2	7.6	8.8	10.8	12.5	13.2	305	2.40
8	200	349	2.74	5.8	7.1	8.2	10.1	11.7	12.4	267	2.10
9	225	310	2.44	5.5	6.7	7.8	9.5	11.0	11.7	237	1.86
10	250	279	2.20	5.2	6.4	7.4	9.0	10.4	11.1	213	1.68
11	275	254	2.00	5.0	6.1	7.0	8.6	9.9	10.5	194	1.52
12	300	233	1.83	4.8	5.8	6.7	8.2	9.5	10.1	178	1.40
13	325	215	1.69	4.6	5.6	6.5	7.9	9.1	9.7	164	1.29
14	350	200	1.57	4.4	5.4	6.2	7.6	8.8	9.3	152	1.20
15	375	186	1.46	4.3	5.2	6.0	7.4	8.5	9.0	142	1.12
16	400	175	1.37	4.1	5.0	5.8	7.1	8.2	8.7	133	1.05
17	425	164	1.29	4.0	4.9	5.7	6.9	8.0	8.5	126	0.99
18	450	155	1.22	3.9	4.8	5.5	6.7	7.8	8.2	119	0.93

#4 Rebar @ 420 MPa				Welded Wire Reinforcement @ 550 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	1270	9.98	11.1	13.6	15.7				970	7.62
5	125	1016	7.98	9.9	12.2	14.1				776	6.10
6	150	847	6.65	9.1	11.1	12.8	15.7			647	5.08
7	175	726	5.70	8.4	10.3	11.9	14.5			554	4.35
8	200	635	4.99	7.9	9.6	11.1	13.6	15.7		485	3.81
9	225	564	4.44	7.4	9.1	10.5	12.8	14.8	15.7	431	3.39
10	250	508	3.99	7.0	8.6	9.9	12.2	14.1	14.9	388	3.05
11	275	462	3.63	6.7	8.2	9.5	11.6	13.4	14.2	353	2.77
12	300	423	3.33	6.4	7.9	9.1	11.1	12.8	13.6	323	2.54
13	325	391	3.07	6.2	7.5	8.7	10.7	12.3	13.1	298	2.34
14	350	363	2.85	5.9	7.3	8.4	10.3	11.9	12.6	277	2.18
15	375	339	2.66	5.7	7.0	8.1	9.9	11.5	12.2	259	2.03
16	400	318	2.50	5.6	6.8	7.9	9.6	11.1	11.8	242	1.91
17	425	299	2.35	5.4	6.6	7.6	9.3	10.8	11.4	228	1.79
18	450	282	2.22	5.2	6.4	7.4	9.1	10.5	11.1	216	1.69

#5 Rebar @ 420 MPa				Welded Wire Reinforcement @ 550 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	1969	15.47	13.8						1503	11.81
5	125	1575	12.38	12.4	15.2					1203	9.45
6	150	1312	10.31	11.3	13.8	16.0				1002	7.88
7	175	1125	8.84	10.5	12.8	14.8				859	6.75
8	200	984	7.73	9.8	12.0	13.8				752	5.91
9	225	875	6.88	9.2	11.3	13.0	16.0			668	5.25
10	250	787	6.19	8.7	10.7	12.4	15.2			601	4.73
11	275	716	5.63	8.3	10.2	11.8	14.4			547	4.30
12	300	656	5.16	8.0	9.8	11.3	13.8	16.0		501	3.94
13	325	606	4.76	7.7	9.4	10.9	13.3	15.3		463	3.63
14	350	562	4.42	7.4	9.1	10.5	12.8	14.8	15.7	429	3.38
15	375	525	4.13	7.1	8.7	10.1	12.4	14.3	15.2	401	3.15
16	400	492	3.87	6.9	8.5	9.8	12.0	13.8	14.7	376	2.95
17	425	463	3.64	6.7	8.2	9.5	11.6	13.4	14.2	354	2.78
18	450	437	3.44	6.5	8.0	9.2	11.3	13.0	13.8	334	2.63

#6 Rebar @ 420 MPa				Welded Wire Reinforcement @ 550 MPa							
Bar Spacing		Area	Mass	Wire Diameter (mm) at Various Spacing (mm)						Area	Mass
(inches)	(mm)	(mm2/m)	(kg/m2)	100	150	200	300	400	450	(mm2/m)	(kg/m2)
4	100	2794	21.96							2134	16.77
5	125	2235	17.56	14.7						1707	13.41
6	150	1863	14.64	13.5						1422	11.18
7	175	1597	12.55	12.5	15.3					1219	9.58
8	200	1397	10.98	11.7	14.3					1067	8.38
9	225	1242	9.76	11.0	13.5	15.5				948	7.45
10	250	1118	8.78	10.4	12.8	14.7				853	6.71
11	275	1016	7.98	9.9	12.2	14.1				776	6.10
12	300	931	7.32	9.5	11.7	13.5				711	5.59
13	325	860	6.76	9.1	11.2	12.9	15.8			657	5.16
14	350	798	6.27	8.8	10.8	12.5	15.3			610	4.79
15	375	745	5.85	8.5	10.4	12.0	14.7			569	4.47
16	400	699	5.49	8.2	10.1	11.7	14.3			533	4.19
17	425	657	5.17	8.0	9.8	11.3	13.8	16.0		502	3.95
18	450	621	4.88	7.8	9.5	11.0	13.5	15.5		474	3.73