

DISCLAIMER

By using the LOGIX Design Manual, in part or in whole, the user accepts the following terms and conditions.

The LOGIX Design Manual shall be used for the sole purpose of estimating, design or construction of LOGIX Insulated Concrete Forms used in residential, commercial or industrial structures.

The information represented herein is to be used as a reference guide only. The user shall check to ensure the information provided in this manual, including updates and amendments, meets local building codes and construction practices by consulting local building officials, construction and design professionals, including any additional requirements.

Logix reserves the right to make changes to the information provided herein without notice and assumes no liability in connection with the use of this manual including modification, copying or distribution.

The user shall check to ensure that any construction projects utilizing the LOGIX Design Manual includes the latest updates/amendments (related to the version of the LOGIX Design Manual being used at the time of the construction project). Updates/amendments to the LOGIX Design Manual are available for download in the "Technical Library" under "Addenda" at www.logixicf.com.

6.2 – CANADIAN ENGINEERING ANALYSIS REPORT: IMPERIAL UNITS

INTRODUCTION

LOGIX walls are intended to be used both above and below grade, and can carry large vertical as well as lateral loads. They are particularly effective for residential, commercial and industrial buildings; providing excellent insulation as well as thermal mass and structural strength. They can be easily adapted to accommodate concrete floors and other “non-standard” building systems.

Construction must be in conformance with the LOGIX Design Manual, including assembly of formwork, bracing, accurate rebar positioning, concrete mix design and placement, and details for interconnection with the other building components.

STRUCTURAL DESIGN AND PERFORMANCE

The LOGIX Building System can be used for an infinite variety of building situations with proper engineering. This report, with its load tables and diagrams, is intended to assist with the structural design of buildings using the LOGIX system for the basement only, or continuing to a second floor and/or roof. Where unusual conditions are encountered, it is recommended that the user consult a designer who can evaluate the loadings to the various components and who can appreciate the limitations of “prescriptive” design under unusual conditions. Connection details have generally been excluded from this report because of the great variety of floor and roof systems that can be used with the Logix wall system. The designer should refer to the Logix Product Manual and the literature for the various proprietary products that are available for connections, which are an important part of the total design.

REINFORCEMENT TABLES

Above- and below-grade walls and lintels were developed using the design criteria of Part 4 of the National Building Code of Canada 2010, and CSA A23.3-04, Design of Concrete Structures.

The reinforcement tables allow for bar spacings common in residential construction. In addition, the above-grade wall reinforcement tables have been properly developed to include LOGIX with a 4 inch concrete core. This is provided to reflect the construction industry’s common practice of using 4 inch concrete walls above-grade with both traditional concrete and ICF walls. This is further reflected by the fact that building codes in the United States (International Residential Code 2012) allows for larger bar spacings, and the use of ICF walls above-grade with concrete core thicknesses of 3.5 inches.

HELIX TSMR TABLES - ALTERNATIVE TO REBAR REINFORCEMENT TABLES

Where applicable, Helix TSMR (Twisted Steel Micro Rebar) Tables 1A-H to 1D-H, and Tables 2.1-H to 2.5-H, may be used in lieu of reinforcement requirements in Tables 1A to 1D, and Table 2. Helix is steel fibre reinforcement that can significantly reduce the amount of horizontal and vertical reinforcement in above- and below-grade concrete walls, with exception of lintel and shear wall reinforcement. (For lintel reinforcement see Tables 3A to 3E, and 4A to 4E)

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LIMITATIONS

The limitations of Reinforcement Tables 1A to 1D, and Table 2, also apply to Helix alternative reinforcement Tables 1A-H to 1D-H, and Table 2.1-H to 2.5-H.

Building limitations used to develop above- and below-grade Tables include:

Building perimeter = 24.384 m (80 ft) max x 12.192 m (40 ft) max
Roof clear span = 12.192 m (40 ft) max
Floor clear span = 9.754 m (32 ft) max
Number of stories above grade = 2 max
Number of stories below grade = 1

Tables 3A to 3E and Tables 4A to 4E provide lintel tables for factored uniform and concentrated loading conditions, respectively.

In addition, crawl space reinforcement requirements were developed and can be found in Figure 1.

More specific design assumptions and limitations are located with the corresponding reinforcement tables.

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LINTEL TABLES

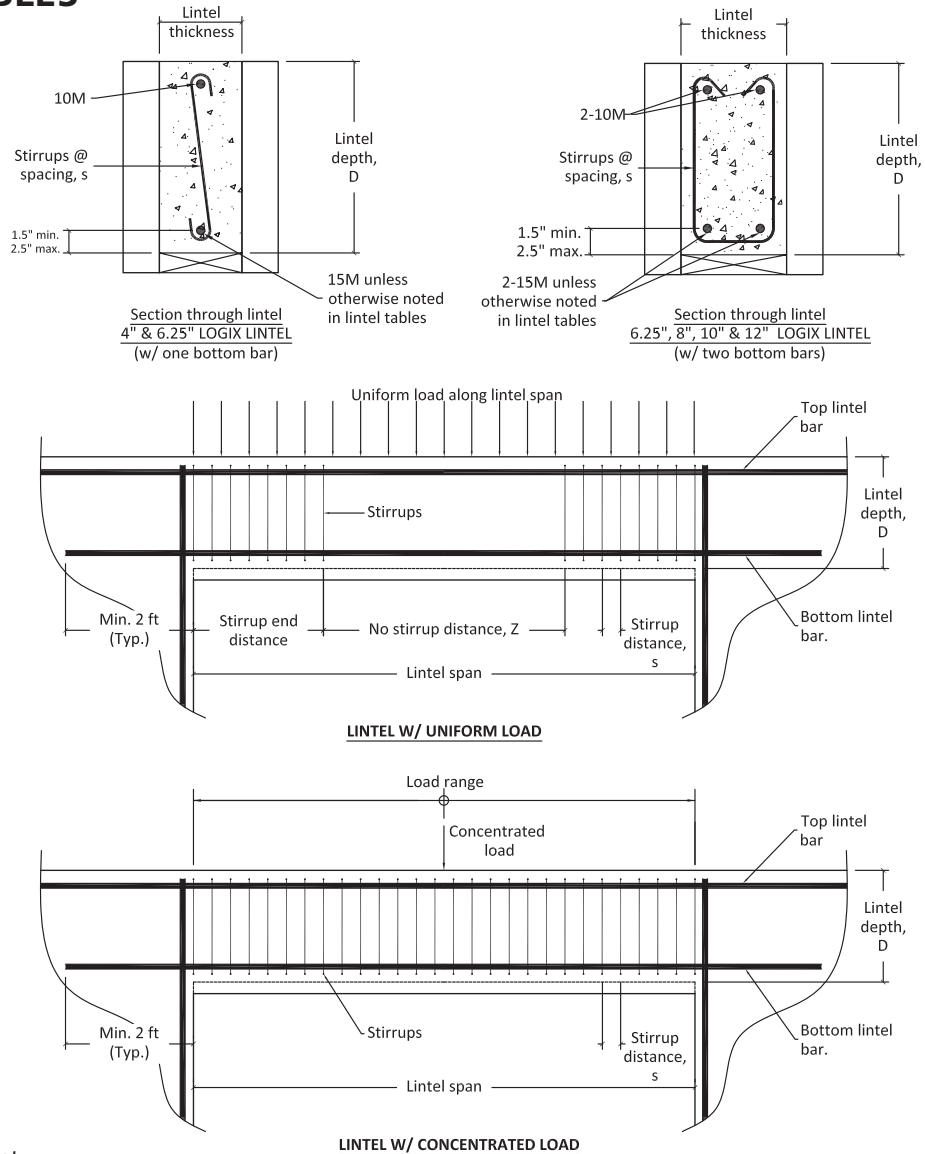


Fig 4
Lintel reinforcement

The lintel tables cover a wide range of uniform and concentrated load conditions, and span lengths. The depth of the lintels range from 8 inch to 30 inches. Uniform and concentrated loading are considered to be concentric and centered on the lintel. Uniform loads act along the entire lintel span, such as from roof trusses at 2 ft spacing. Concentrated load lintel tables consider only a single concentrated load acting anywhere along the lintel span. In addition, the lintel tables do not consider uniform and concentrated loads to act simultaneously on the lintel.

The following notes are common to both uniform and concentrated load lintel tables:

1. 28 day concrete compressive strength = 20 MPa. Steel yield strength = 400 MPa.
2. Stirrups are D9.5 wire or 10M bars, bent as shown, and conforming to CSA -A23.1.
3. Shaded areas of the lintel tables require reinforcement, except for length Z.
4. Dimension D is to the concrete surface, not counting bucks or top plate.
5. Bottom steel must extend a min. 2 ft beyond opening, and no splices are permitted.
6. Deflection is limited to $L/360$, not considering long term effects. Long term deflection could be twice the short term depending on the nature of the load.
7. Seismic and wind loads are not considered.
8. Shear planes are not interrupted by embedded joists.
9. Top of lintel is assumed to be laterally restrained.

These tables should only be used if the above conditions are met. For other conditions, consult a structural Engineer.

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TABLE 4A - LOGIX 4" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD

Where not shown otherwise, bottom steel is 1-15M

NOTE: LOGIX recommends builders, owners and/or designers using these tables confirm that on-site building conditions are w/in the scope of the tables being used.

s=3", D=8"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=4", D=10"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																1 - 20M	1 - 20M
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=5", D=12"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=7", D=16"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

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TABLE 4A - LOGIX 4" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD Cont'd

s=9", D=20"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																1 - 20M	1 - 20M
10															1 - 20M	1 - 20M	1 - 20M
12													1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M
14											1 - 20M	1 - 20M	1 - 20M	1 - 20M	-	-	-
16									1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	-	-	-	-
18								1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	-	-	-	-	-
20							1 - 20M	1 - 20M	1 - 20M	-	-	-	-	-	-	-	-

s=11", D=24"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	1 - 20M
12															1 - 20M	1 - 20M	1 - 20M
14														1 - 20M	1 - 20M	1 - 20M	-
16											1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	-	-
18									1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	-	-	-
20								1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	-	-	-	-	-

s=14", D=30"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																1 - 20M	1 - 20M
16															1 - 20M	1 - 20M	1 - 20M
18													1 - 20M	1 - 20M	1 - 20M	1 - 20M	-
20											1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	-	-

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- Notes:**
1. Where not shown otherwise, bottom steel is 1-15M
 2. Table is to be read in conjunction w/ **Figure 4**.
 3. Where spaces contain "-" the bar is presumed to be less economical and/or practical. Alternatively, consult with a local engineer to determine if a practical bar size is possible based on local load conditions.
 4. Blank regions require no stirrups. Shaded regions require stirrups. For stirrup information refer to **Figure 4**.
 5. Factored Point Load includes 1.25, and 1.5 for dead and live load, respectively. For example, (1.25*dead load)+(1.5*live load)



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TABLE 4B - LOGIX 6.25" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD

Where not shown otherwise, bottom steel is 1-15M

NOTE: LOGIX recommends builders, owners and/or designers using these tables confirm that on-site building conditions are w/in the scope of the tables being used.

s=3", D=8"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																1 - 20M	1 - 20M
4																1 - 20M	1 - 20M
5																1 - 20M	1 - 20M
6																1 - 20M	1 - 20M
7																1 - 20M	1 - 20M
8																1 - 20M	1 - 20M
9																1 - 20M	1 - 20M
10																1 - 20M	1 - 20M
12																1 - 20M	1 - 20M
14																1 - 20M	1 - 20M
16																1 - 20M	1 - 20M
18																1 - 20M	1 - 20M
20																1 - 20M	1 - 20M

s=4", D=10"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=5", D=12"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=7", D=16"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

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TABLE 4B - LOGIX 6.25" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD Cont'd

s=9", D=20"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																1 - 20M	1 - 20M
12														1 - 20M	1 - 20M	1 - 20M	1 - 20M
14														1 - 20M	1 - 20M	1 - 20M	1 - 20M
16										1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	2 - 15M	2 - 15M	2 - 15M
18									1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	1 - 20M	2 - 15M	2 - 15M	2 - 20M
20								1 - 20M	1 - 20M	1 - 20M	1 - 20M	2 - 15M	2 - 15M	2 - 15M	2 - 15M	2 - 20M	2 - 20M

s=11", D=24"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	1 - 20M
14																	1 - 20M
16																	1 - 20M
18																	1 - 20M
20																	1 - 20M

s=14", D=30"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-11																	
12																	
14																	1 - 20M
16																	1 - 20M
18																	1 - 20M
20																	1 - 20M

- Notes:**
1. Where not shown otherwise, bottom steel is 1-15M
 2. Table is to be read in conjunction w/ **Figure 4**.
 3. Where spaces contain "-" the bar is presumed to be less economical and/or practical. Alternatively, consult with a local engineer to determine if a practical bar size is possible based on local load conditions.
 4. Blank regions require no stirrups. Shaded regions require stirrups. For stirrup information refer to **Figure 4**.
 5. Factored Point Load includes 1.25, and 1.5 for dead and live load, respectively. For example, (1.25*dead load)+(1.5*live load)

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TABLE 4C - LOGIX 8" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD

Where not shown otherwise, bottom steel is 2-15M

NOTE: LOGIX recommends builders, owners and/or designers using these tables confirm that on-site building conditions are w/in the scope of the tables being used.

s=3", D=8"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=4", D=10"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																2 - 20M	2 - 20M
9																2 - 20M	2 - 20M
10																2 - 20M	2 - 20M
12																2 - 20M	2 - 20M
14																2 - 20M	2 - 20M
16																2 - 20M	2 - 20M
18																2 - 20M	2 - 20M
20																2 - 20M	2 - 20M

s=5", D=12"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=7", D=16"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

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TABLE 4C - LOGIX 8" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD Cont'd

s=9", D=20"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																2 - 20M	2 - 20M
20																2 - 20M	2 - 25M

s=11", D=24"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-13																	
14																	
16																	
18																	2 - 20M
20																2 - 20M	2 - 20M

D=30"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-20																	

- Notes:**
1. Where not shown otherwise, bottom steel is 2-15M
 2. Table is to be read in conjunction w/ **Figure 4**.
 3. Where spaces contain "-" the bar is presumed to be less economical and/or practical. Alternatively, consult with a local engineer to determine if a practical bar size is possible based on local load conditions.
 4. Blank regions require no stirrups. Shaded regions require stirrups. For stirrup information refer to **Figure 4**.
 5. Factored Point Load includes 1.25, and 1.5 for dead and live load, respectively. For example, (1.25*dead load)+(1.5*live load)

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TABLE 4D - LOGIX 10" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD

Where not shown otherwise, bottom steel is 2-15M

NOTE: LOGIX recommends builders, owners and/or designers using these tables confirm that on-site building conditions are w/in the scope of the tables being used.

s=3", D=8"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	2 - 20M
7																	2 - 20M
8													2 - 20M	2 - 20M	2 - 20M		
9													2 - 20M	2 - 20M	2 - 20M		
10																	
12																	
14				2 - 20M													
16																	
18																	
20																	

s=4", D=10"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	2 - 20M
9																	2 - 20M
10																	2 - 20M
12																	
14																	
16																	
18				2 - 20M													
20																	

s=5", D=12"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	2 - 20M
12																	2 - 20M
14																	2 - 20M
16																	2 - 25M
18																	2 - 25M
20																	2 - 25M

s=7", D=16"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	2 - 20M
16																	2 - 20M
18																	2 - 25M
20																	2 - 25M

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TABLE 4D - LOGIX 10" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD Cont'd

s=9", D=20"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-15																	
16																2 - 20M	2 - 20M
18															2 - 20M	2 - 20M	2 - 20M
20													2 - 20M	2 - 20M	2 - 20M	2 - 20M	2 - 25M

D=24"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-17																	
18																2 - 20M	2 - 20M
20															2 - 20M	2 - 20M	2 - 20M

D=30"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-19																	
20																	2 - 20M

- Notes:**
1. Where not shown otherwise, bottom steel is 2-15M
 2. Table is to be read in conjunction w/ **Figure 4**.
 3. Where spaces contain "-" the bar is presumed to be less economical and/or practical. Alternatively, consult with a local engineer to determine if a practical bar size is possible based on local load conditions.
 4. Blank regions require no stirrups. Shaded regions require stirrups. For stirrup information refer to **Figure 4**.
 5. Factored Point Load includes 1.25, and 1.5 for dead and live load, respectively. For example, (1.25*dead load)+(1.5*live load)

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TABLE 4E - LOGIX 12" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD

Where not shown otherwise, bottom steel is 2-15M

NOTE: LOGIX recommends builders, owners and/or designers using these tables confirm that on-site building conditions are w/in the scope of the tables being used.

s=3", D=8"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	2 - 20M
7																2 - 20M	2 - 20M
8																2 - 20M	2 - 20M
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=4", D=10"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=5", D=12"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

s=7", D=16"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-6																	
9																	
10																	
12																	
14																	
16																	
18																	
20																	

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TABLE 4E - LOGIX 12" LINTEL REINFORCEMENT WITH CONCENTRATED LOAD Cont'd

D=20"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-15																	
16																2 - 20M	2 - 20M
18														2 - 20M	2 - 20M	2 - 20M	2 - 20M
20											2 - 20M	2 - 20M	2 - 20M	2 - 20M	2 - 20M	2 - 20M	2 - 25M

D=24"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-17																	
18																2 - 20M	2 - 20M
20														2 - 20M	2 - 20M	2 - 20M	2 - 20M

D=30"																	
Opening ft	Factored Point Load, lb																
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000	9000	10000
3-19																	
20																2 - 20M	2 - 20M

- Notes:**
1. Where not shown otherwise, bottom steel is 2-15M
 2. Table is to be read in conjunction w/ **Figure 4**.
 3. Where spaces contain "-" the bar is presumed to be less economical and/or practical. Alternatively, consult with a local engineer to determine if a practical bar size is possible based on local load conditions.
 4. Blank regions require no stirrups. Shaded regions require stirrups. For stirrup information refer to **Figure 4**.
 5. Factored Point Load includes 1.25, and 1.5 for dead and live load, respectively. For example, (1.25*dead load)+(1.5*live load)

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