



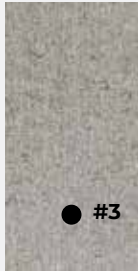
CONCRETE LINTEL

Design & Installation Guide

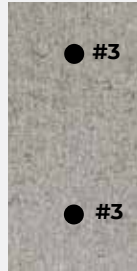


Manufacturing quality
lintels since 1956.

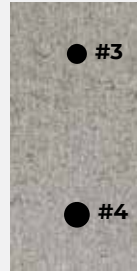
4" x 8" SOLID LINTELS



Lintel Length
30" to 68"



Lintel Length
72" to 88"



Lintel Length
90" to 96"



Lintel Length
102" to 144"

6" x 8" SOLID LINTELS



Lintel Length
30" to 64"



Lintel Length
72" to 88"

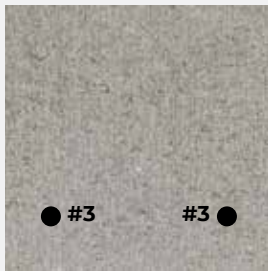


Lintel Length
90" to 96"

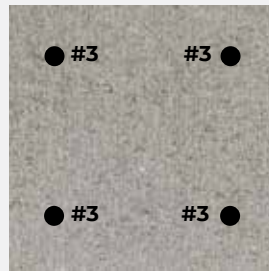


Lintel Length
104" to 144"

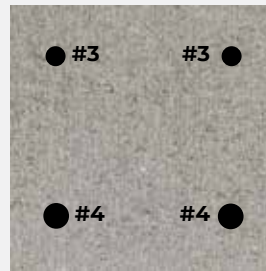
8" x 8" SOLID LINTELS



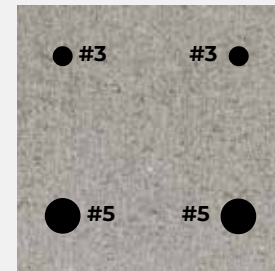
Lintel Length
40" to 64"



Lintel Length
72" to 88"



Lintel Length
96"



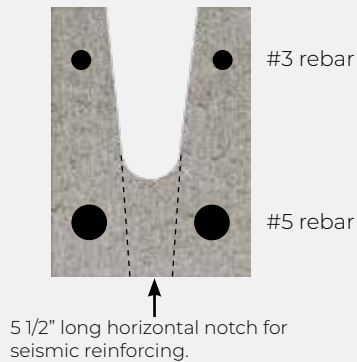
Lintel Length
108" to 144"

Special rebar schedules available upon request.

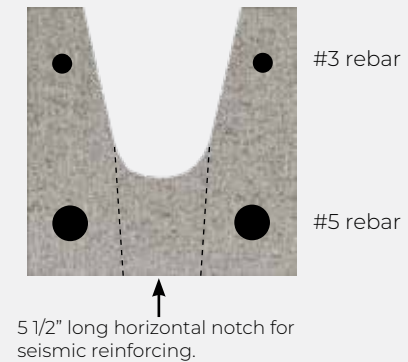
Sizing Overview

U-LINTEL

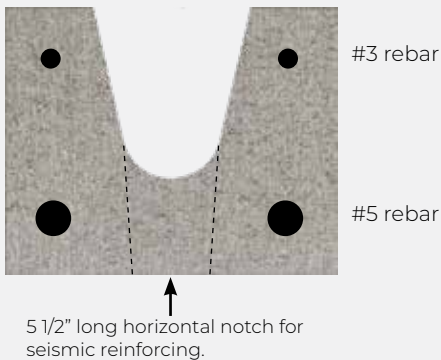
6" x 8" U-LINTELS



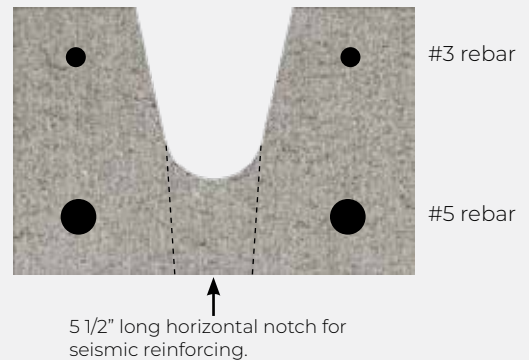
8" x 8" U-LINTELS



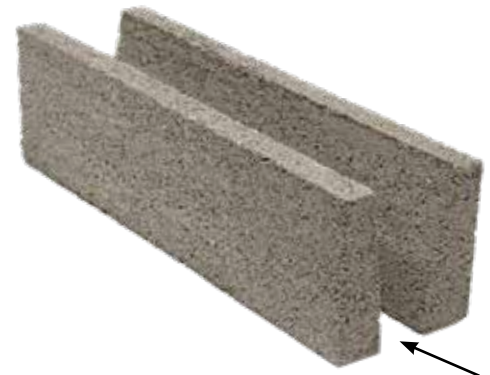
10" x 8" U-LINTELS



12" x 8" U-LINTELS



- U-lintels are available in lengths from 36" to 144."
- All four widths are stocked in various lengths.
- #3 and #5 rebar placed as shown.

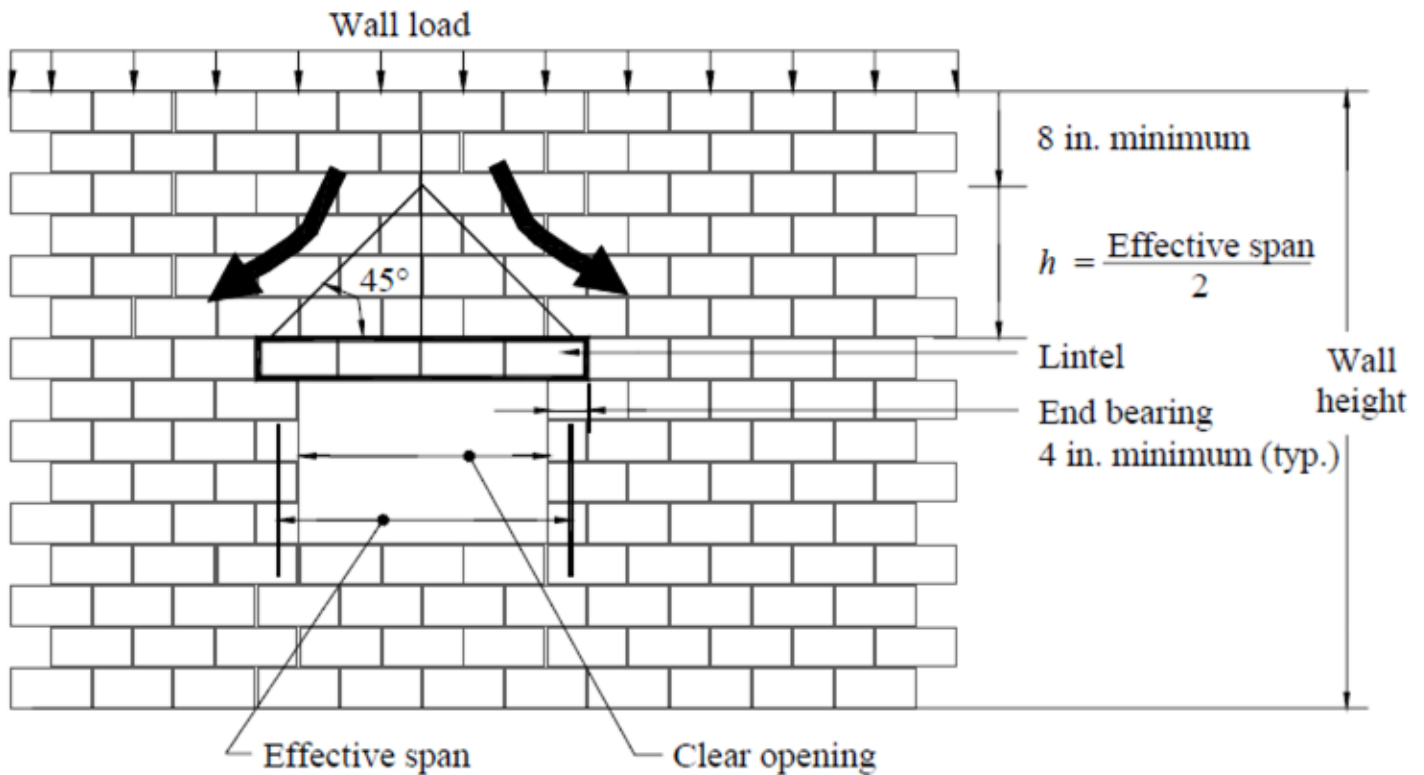


Notch to allow for seismic reinforcing

Rebar is grade 60 steel ASTM 615
5,000 PSI concrete mix design

Rebar placement:
Clearance from bottom: 1 1/2"
Clearance from top: 1 1/2"

Masonry Wall Arching Action



The typical door and window openings in masonry walls are bridged over by horizontal members spanning from opening jamb to jamb by lintels which are essentially beams. In many cases the loads to be applied to the York Building Products precast lintels may be calculated with consideration of masonry walls load “arching” behavior. Through the “arching” behavior some loads may be considered to distribute to either side of the opening and not need to be resisted by the precast lintel.

The wall surrounding the opening must meet several criterion in order to consider arching action to be occurring. These criteria are:

1. The masonry wall is laid in a running bond pattern.
2. At the time that all of loads that are to be supported by the lintel are applied, the masonry wall must be in a completed condition and cured to full wall material strength.
3. Minimum end bearing of at least 4 inches.
4. There is sufficient masonry wall on either side of the wall opening to resist the horizontal thrust induced by the arching action.
5. Control joints, expansion joints or other discontinuities are not located at or adjacent to the opening.
6. There is sufficient wall height above the top of the lintel to include a 45° triangular “arching” zone.
7. The wall height above the apex of the triangular zone is at least 8 inches.

If these criteria are met, arching action may be considered in lintel sizing and selection.

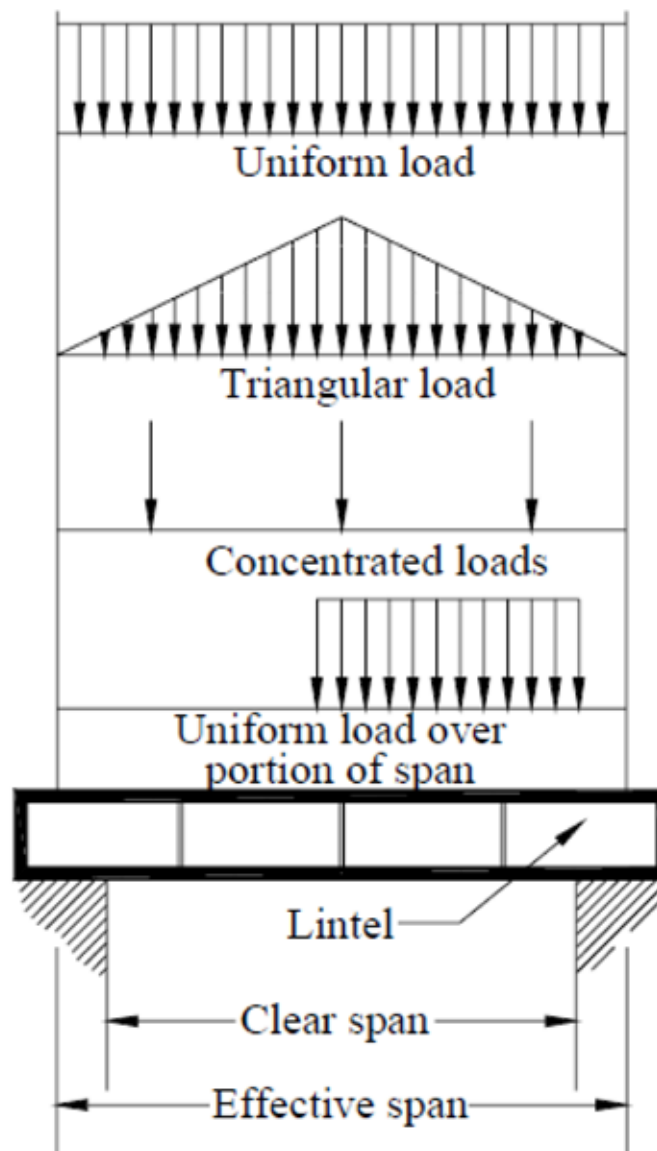
Masonry Wall Arching Action

The types of load patterns that are typically supported by lintels are, uniform, concentrated, partial uniform and triangular as indicated in the below diagram.

If arching action is in effect the final loads to be supported by the lintel include:

- The self weight of the lintel,
- The weight of the masonry wall within the triangular zone.
- Concentrated load within the triangular zone.

Other load types either dead or live load floor and roof loads above the triangular arching zone may be considered to “arch” and distribute the load to each side over the wall opening.



Lintel Fire Ratings:

4" Solid – 1 hour

6" Solid & U-lintel – 1 hour

8" Solid & U-lintel – 2 hour

10" & 12" U-lintel – 3 hour

(Compiled from ACI216.1-14/TMS 216-14, Table 5.1c)

Table 5.1c—Reinforced masonry lintels

Nominal lintel width, in.	Minimum longitudinal reinforcement cover for fire- resistance rating, in.			
	1 hour	2 hours	3 hours	4 hours
6	1-1/2	2	NP	NP
8	1-1/2	1-1/2	1-3/4	3
10 or more	1-1/2	1-1/2	1-1/2	1-3/4

Note: NP = Not permitted without a more detailed analysis.

SOLID LINTELS

4" x 8"

6" x 8"

8" x 8"

U-LINTELS

6" x 8"

8" x 8"

10" x 8"

12" x 8"

The load calculation tables on the following pages were independently developed by a third party engineering firm to ensure accuracy.

Should you need additional assistance, or more detailed data, please contact a York Building Products representative.

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DESIGN CAPACITY TABLE

Materials:
Concrete Compressive Strength (f'c) = 3,000 psi (min)
Reinforcing Fy = 60,000 psi
Lintel Weight: 28 lbs./ft.

Unit Dimensions:
Width: bw = 3.63 inch
Height: h = 7.63 inch

Reinforcement	Top		None																																			
	Bottom		(1) - #3																																			
			(1) - #4																												(1) - #5 (7)							
Nominal Lintel Length (inch) [LA-#]		24	30	32	36	40	42	44	48	54	56	60	64	66	72	78	80	84	88	90	96	102	104	108	112	114	120	128	132	136	144							
Masonry Opening M.O. (inch)		8	14	16	20	24	26	28	32	38	40	44	48	50	56	62	64	68	72	74	80	86	88	92	96	98	104	112	116	120	128							
Effective Span (LE = M.O. + h/2) (inch)		16	22	24	28	32	34	36	40	46	48	52	56	58	64	70	72	76	80	82	88	94	96	100	104	106	112	120	124	128	136							
Maximum Shear Strength (FVN) lbs.		1221	1221	1221	1221	1221	1221	1221	1221	1221	1221	1221	1221	1221	1221	1221	1221	1221	1221	1479	1479	1699	1699	1699	1699	1699	1699	1699	1699	1699	1699							
Maximum Moment Strength (+FMn) lb.-ft.		2762	2762	2762	2762	2762	2762	2762	2762	2762	2762	2762	2762	2762	2762	2762	2762	2762	2762	4703	4703	6276	6276	6276	6276	6276	6276	6276	6276	6276	6276							
Maximum Uniform Factored Load (Nwn) lbs/ft.		3662	6575	5525	3605	2416	2074	1817	1456	1121	1042	912	811	768	664	584	562	522	487	570	520	548	534	507	483	472	441	406	391	376	350							
Maximum Unif. Service Load (ws) lbs/ft. @																																						
DI =	LE / 240	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+							
	LE / 360	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+							
	LE / 600	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+							
DI + D s =	LE / 240	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+							
	LE / 360	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+							
	LE / 600	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+							

Table Use:

Enter Table with Required Strength = Factored Uniform Load wu

Deflections

1. Enter the table for given span with desired deflection limit at LE/240, LE/360, LE/600 for either immediate or long term deflection
2. Read value of SERVICE (Unfactored) uniform load on lintel that results in limiting deflection noted for LE/240, LE/360, LE/600.

DL: Dead Load
Factored Load Effect Wu; Greater of
1.4 DL OR 1.2DL + 1.6LL

Notes:

- (1) See "arching" data sheet for applied load calculation where arching action determined by Architect/Engineer is applicable.
- (2) See calculation example for explanation of table of calculation methods and Code references.
- (3) Mid-Span deflection DI at service load is calculated as $W_{SERVICE} = 0.67 \times F_w$, lbs./ft for the section in question.
For long term deflection Ds, sustained loads are assumed to be at maximum section capacity for time greater than 60 months
- (4) Immediate elastic deflections values are for maximum uniform service load values noted. Long term deflections consider that 50 percent of maximum service is sustained load. Load values noted indicate limiting load for deflection limits of LE/240, LE/360, LE/600, considering long term creep and shrinkage effect. Deflections values do not consider shear deformations and are for pin ended supports.
DI Immediate elastic deflection
DI + D s Immediate elastic deflection + Long Term Creep Deflection
- (5) Load capacity of installed lintel assumed to have lateral bracing at distances not greater than: [9.2.3.1] 50b_s, <5.2.1.2> 32 b_w OR 120(b_s)³/d_{eff} =
- (6) Minimum end bearing distance shall be 8 inches by width of the lintel.
- (7) Moment capacity noted limited by maximum allowable reinforcement area for tension controlled section [9.3.3 & 21.2.2]. Excess steel area ignored in moment capacity value indicated.
- (8) Shear span considered as M.O. for LA24.
- (9) 24" lintels contain NO rebar.

Controlling Section Capacity Fw.

Shear (Red)
Moment (Blue)

Code References:

ACI 318 - 19
TMS402-16
ASCE 7-16

116 in. =

9.67 ft.

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Materials: Concrete Compressive Strength (f' = 3,000 psi (min)
Reinforcing Fy = 60,000 psi
Lintel Weight: 28 lbs/ft.

Unit Dimensions: Width: bw = 3.625 inch
Height h = 7.625 inch
Code Reference: [ACI 318-19]

Reinforcement		Top		None																								(1) - #3		(1) - #4		(1) - #5															
		Bottom																																													
Nominal Lintel Length (inch)		[LA-#]	24	30	32	36	40	42	44	48	54	56	60	64	66	72	78	80	84	88	90	96	102	104	108	112	114	120	128	132	136	144															
Masonry Opening M.O. (inch) ⁽⁴⁾			8	14	16	20	24	26	28	32	38	40	44	48	50	56	62	64	68	72	74	80	86	88	92	96	98	104	112	116	120	128															
Effective Span (LE = M.O. + h/2) (inch)			16	22	24	28	32	34	36	40	46	48	52	56	58	64	70	72	76	80	82	88	94	96	100	104	106	112	120	124	128	136															
Case 0																																															
Maximum Factored w _{CMU} Load (lbs/ft)			3622	6536	5485	3566	2377	2035	1777	1416	1082	1002	873	772	729	625	545	523	483	448	531	481	509	495	468	444	433	402	367	351	337	311															
Case 1 - 1 Strut																																															
Maximum Factored w _{CMU} Load (lbs/ft)			NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	693	630	612	577	547	653	606	655	640	613	588	576	543	505	487	471	441													
Strut Load P _U (lbs)																		2441	2441	2441	2441	2441	3398	3398	3398	3398	3398	3398	3398	3398	3398	3398	3398														
Case 2 - 2 Struts																																															
Maximum Factored w _{CMU} Load (lbs/ft)			NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	1107	1009	980	926	878	1045	971	1048	1025	982	943	924	873	812	785	759	712													
Strut Load P _U (lbs)																		2242	2242	2242	2242	2242	2717	2717	3121	3121	3121	3121	3121	3121	3121	3121	3121	3121													

Table Use:

Check Lintel Size & Support Requirements During Construction

(1) Select weight of wall being supported by lintel from appropriate reference.

(Ref. NCMA TEK 14-13B) , s_{WALL} (lbs/sf)

(2) Determine factored installed wall load as follows:

W_U = 1.4 x s_{WALL} x H or H_{max} = W_{CMU} / (1.4 x s_{WALL})

H is maximum height of masonry wall to be installed above top of lintel before wall is cured. (ft.)

(3) Enter table for appropriate support condition, lintel size, masonry opening.

Confirm calculated W_U is less than or equal to W_{CMU} noted in table.

(4) Confirm loads do not exceed immediate deflection value limits as noted in Design Capacity Tables.

For Case 1 and Case 2 support conditions deflection span is (L.E / 2) and (L.E/3), respectively.

(5) NR - Not Recommended, no negative flexural reinforcement. Use continuous temporary support if required.

(6) Load capacity of installed lintel assumed to have lateral bracing at distances not greater than:

[9.2.3.1] 50b_w , <5.2.1.2> 32 bw OR 120b_w²/d_{eff} = 116 in. = 9.67 ft.

(7) 24" lintels contain NO rebar.

Example:

Lintel : 4" solid with M.O. = 144 inches

4" Normal Weight Solid CMU = 41 lbs/sf.

Support Condition Case 2

H Installed = 8 feet

W_U = 1.4 x 41 x 8 = 459 lbs/ft.

Enter table and confirm W_U < W_{CMU} =

459 lbs/ft. < 712 lbs/ft OK

Strut Loads:

At W_U: P_U = [459 / (1.4 x 28 Lintel weight) + 712] x 3121 = 1907 lbs

P_{SERVICE} = P_U / 1.4 = 1907 / 1.4 = 1362 lbs.

At W_{CMU}: P_{SERVICE} = P_U / 1.4 = 3121 / 1.4 = 2229 lbs.

Ref. 6"x8" For Case 0 Example

Ref. 8"x8" For Case 1 Example

Support Conditions

Case 0 :	None - Clear Span Between Jambes
Case 1 :	One Temporary Strut at MidSpan
Case 2 :	Two Temporary Struts, Each at Third Points

DESIGN CAPACITY TABLE

Materials:

Concrete Compressive Strength (f'c) 3,000 psi (min)
Reinforcing Fy = 60,000 psi
Lintel Weight: 42 lbs/ft.

Unit Dimensions:

Width: bw = 5.625 inch
Height: h = 7.625 inch

Reinforcement	Top Bottom	None										(1) - #3									
		(1) - #3										(1) - #4									
Nominal Lintel Length (inch)	[LB-#]	30	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144				
Masonry Opening M.O. (inch)		14	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128				
Effective Span (LE = M.O. + h/2) (inch)		22	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136				
Maximum Shear Strength (FV _s) lbs.		1636	1636	1636	1636	1636	1636	1636	1636	1636	1883	2278	2278	2278	2278	2278	2278				
Maximum Moment Strength (+FM _n) lb.-ft.		2825	2825	2825	2825	2825	2825	2825	2825	2825	2825	2825	2825	2825	2825	2825	2825				
Maximum Uniform Factored Load (FW _n) lbs/ft.		6724	5650	3178	1951	1396	1038	795	628	509	697	716	648	592	545	504	449				
Maximum Unif. Service Load (w _s) lbs/ft. @																					
DI =	LE / 240	9999+	9999+	9689	5011	2934	1873	1278	912	676	764	789	624	502	410	340	285				
	LE / 360	9999+	9999+	6600	3451	2044	1321	913	660	496	536	543	431	349	286	238	201				
	LE / 600	9999+	9609	4209	2261	1373	910	644	475	364	366	356	285	233	194	163	139				
DI + Ds =	LE / 240	9999+	9999+	5530	3016	1863	1251	919	684	527	517	497	400	328	273	231	197				
	LE / 360	9999+	9016	4190	2364	1502	1033	762	576	450	417	384	313	260	218	186	161				
	LE / 600	8185	6565	3226	1897	1241	826	593	439	337	320	295	238	195	162	137	117				

Table Use:

Enter Table with Required Strength = Factored Uniform Load w_u

Select Lintel Size Where w_u < FW_n

DL: Dead Load LL: Live Load

Factored Load Effect Wu; Greater of

1.4 DL OR 1.2DL + 1.6LL

Notes:

(1) See "arching" information sheet for applied load calculation where arching action determined by Architect/Engineer is applicable.

(2) See calculation example for explanation of table calculation methods and Code references.

(3) Mid-Span deflection Di at service load is calculated as W_{service} = 0.67 x Fw_n lbs/ft for the section in question.

(4) Immediate elastic deflections values are for maximum uniform service load values noted. Long term deflections consider that 50 percent of maximum service is sustained load. Load values noted indicate limiting load for deflection limits of LE/240, LE/360, LE/600, considering long term creep and shrinkage effect. Deflections values do not consider shear deformations and are for pin ended supports.

Di Immediate elastic deflection
Di + Ds Immediate elastic deflection + Long Term Creep Deflection

(5) Load capacity of installed lintel assumed to have lateral bracing at distances not greater than: [9.2.3.1] 50b_w, <5.2.1.2> 32 b_w OR 120(b_w)²/d_{eff} = 180 in. = 15.00 ft.

(6) Minimum end bearing distance shall be 8 inches by width of the lintel.

Controlling Section Capacity Fw_n

Shear (Red)

Moment (Blue)

Code References:

ACI 318 - 19 []

TMS402-16 < >

ASCE 7-16 { }

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INSTALLATION GUIDE TABLE

Materials:

Concrete Compressive Strength (f'c) 3,000 psi (min)
Reinforcing Fy = 60,000 psi
Lintel Weight: 42 lbs/ft.

Code Reference: [ACI 318-19]

bw = 5.625 inch

h = 7.625 inch

Reinforcement	Top	None												(1) - #3				(1) - #4				(1) - #5			
	Bottom																								
Nominal Lintel Length (inch) [LB-#]		30	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144								
Masonry Opening M.O. (inch) ⁽⁴⁾		14	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128								
Effective Span (LE = M.O. + h/2) (inch)		22	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136								
Case 0																									
Maximum Factored w _{cmu} Load (lbs/ft)		6666	5592	3120	1892	1337	979	736	569	450	338	252	188	136	104	80	64								
Case 1 - 1 Strut																									
Maximum Factored w _{cmu} Load (lbs/ft)		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR								
Strut Load P _U (lbs)																									
Case 2 - 2 Struts																									
Maximum Factored w _{cmu} Load (lbs/ft)		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR								
Strut Load P _U (lbs)																									

Table Use:

Check Lintel Size & Support Requirements During Construction

(1) Select weight of wall being supported by lintel from appropriate reference.

(Ref. NCMA TEK 14-13B), s_{WALL} (lbs/sf)

(2) Determine factored installed wall load as follows:

$$W_u = 1.4 \times s_{WALL} \times H \text{ or determine } H_{max} = W_{cmu} / (1.4 \times s_{WALL})$$

"H" (ft.) is the height of masonry wall to be installed above top of lintel before wall is cured.

(3) Enter table for appropriate support condition, lintel size, masonry opening.

Confirm calculated W_u is less than or equal to w_{cmu} noted in table.

(4) Confirm loads do not exceed immediate deflection value limits desired as noted in Design Capacity Tables.

For Case 1 and Case 2 support conditions deflection span is (LE / 2) and (LE / 3), respectively.

(5) NR - Not Recommended, no negative flexural reinforcement. Continuous temporary support if required.

(6) Load capacity of installed lintel assumed to have lateral bracing at distances not greater than:

$$[9.2.3.1] 50b_w, < 5.2.1.2 > 32 b_w \text{ OR } 120(b_w)^2/d_{eff} = 180 \text{ in.} = 15.00 \text{ ft.}$$

Example:

Lintel : 6" solid with M.O. = 72 inches

6" Normal Weight CMU wall grouted at 48" o.c. = 36 lbs/sf.

Support Condition Case 0

H Installed = 8 feet

$$W_u = 1.4 \times 36 \times 8 = 403 \text{ lbs/ft.}$$

Enter table and confirm W_u < W_{cmu} =

403 lbs/ft. < 600 lbs/ft. OK

Ref. 8"x8" For Case 1 Example

Ref. 4"x8" For Case 2 Example

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DESIGN CAPACITY TABLE

Materials:

Concrete Compressive Strength (f'c) 3,000 psi (min)

Reinforcing Fy = 60,000 psi

Lintel Weight: 56 lbs/ft.

Unit Dimensions:

Width: bw = 7.625 inch

Height: h = 7.625 inch

Reinforcement		Top		None				(2) - #3												(2) - #5				(2)-#6 (7)	
		Bottom		(2) - #3				(2) - #3				(2)-#4				(2) - #5				(2)-#6 (7)					
Nominal Lintel Length (inch) [LC-#]		40	48	56	64	72	80	88	96	104	108	112	120	128	136	144	168								
Masonry Opening M.O. (inch)		24	32	40	48	56	64	72	80	88	92	96	104	112	120	128	152								
Effective Span (LE = M.O. + h/2) (inch)		32	40	48	56	64	72	80	88	96	100	104	112	120	128	136	160								
Maximum Shear Strength (F _{Vn}) lbs.		2525	2525	2525	2525	2525	2525	2525	3033	3496	3496	3496	3496	3496	3496	3496	3921								
Maximum Moment Strength (+F _{Mn}) lb-ft.		5542	5542	5542	5542	5542	5542	5542	9255	13201	13201	13201	13201	13201	13201	13201	12919								
Maximum Uniform Factored Load (F _{wn}) lbs/ft.		4997	3011	2154	1677	1373	1162	998	1067	1098	1044	994	908	836	774	721	581								
Maximum Unif. Service Load (w _s) lbs/ft. @																									
Di =	LE / 240	9999+	9235	5381	3411	2305	1633	1202	1343	1387	1228	1093	878	715	591	494	382								
	LE / 360	9999+	6262	3675	2347	1599	1143	849	922	941	835	744	599	490	406	341	261								
	LE / 600	7510	3951	2356	1534	1064	774	585	600	594	529	473	384	316	264	223	168								
Di + D s =	LE / 240	9660	5142	3106	2045	1518	1108	842	853	837	746	668	543	448	375	318	272								
	LE / 360	6990	3830	2374	1600	1187	883	681	649	613	549	494	406	338	286	244	197								
	LE / 600	5030	2876	1847	1281	949	693	525	503	449	409	368	305	252	211	179	139								

Table Use:

Enter Table with Required Strength = Factored Uniform Load w_u

Select Lintel Size Where Wu < Fw_n

DL: Dead Load LL: Live Load

Factored Load Effect Wu; Greater of

1.4 DL OR 1.2DL + 1.6LL

Notes:

(1) See "arching" information sheet for applied load calculation where arching action determined by Architect/Engineer is applicable.

(2) See calculation example for explanation of table calculation methods and Code references.

(3) Mid-Span deflection Di at service load is calculated as W_{service} = 0.67 x Fw_n lbs/ft for the section in question.

For long term deflection Ds, sustained loads are assumed to be at maximum section capacity for time greater than 60 months

(4) Immediate elastic deflections values are for maximum uniform service load values noted. Long term deflections consider that

50 percent of maximum service is sustained load. Load values noted indicate limiting load for deflection limits of LE/240, LE/360, LE/600,

considering long term creep and shrinkage effect.

Di Immediate elastic deflection

Di + D s Immediate elastic deflection + Long Term Creep Deflection

(5) Load capacity of installed lintel assumed to have lateral bracing at distances not greater than: [9.2.3.1] 50b_w, <5.2.1.2> 32 b_w OR 120(b_w)²/d_{eff} = 244 in. = 20.33 ft.

(6) Minimum end bearing distance shall be 8 inches by width of the lintel.

(7) Moment capacity noted limited by maximum allowable reinforcement area for tension controlled section [9.3.3 & 21.2.2]. Excess steel area ignored in moment capacity value indicated.

Controlling Section Capacity Fw_n

Shear (Red)

Moment (Blue)

Code References:

ACI 318 - 19 []

TMS402-16 < >

ASCE 7-16 { }

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INSTALLATION GUIDE TABLE

Code Reference: [ACI 318-19]

Materials:
Concrete Compressive Strength (f_c) 3,000 psi (min)
Reinforcing F_y 60,000 psi
Lintel Weight: 56 lbs/ft.

$bw = 7.625$ inch
 $h = 7.625$ inch

Reinforcement	Top		None				(2) - #3				(2) - #4				(2) - #5				(2) - #6
		Bottom	(2) - #3				(2) - #3				(2) - #4				(2) - #5		(2) - #6		
Nominal Lintel Length (inch) [L-C-#]	40		48	56	64	72	80	88	96	104	108	112	120	128	136	144	168		
Masonry Opening M.O. (inch) ⁽⁴⁾	24		32	40	48	56	64	72	80	88	92	96	104	112	120	128	152		
Effective Span (LE = M.O. + h/2) (inch)	32		40	48	56	64	72	80	88	96	100	104	112	120	128	136	160		
Case 0																			
Maximum Factored w_{cmu} Load (lbs/ft)	4919		2932	2076	1599	1295	1084	919	988	1020	965	916	830	757	696	642	503		
Case 1 - 1 Strut																			
Maximum Factored w_{cmu} Load (lbs/ft)	NR		NR	NR	NR	1436	1268	1133	1245	1320	1264	1212	1120	1040	970	909	863		
Strut Load P_U (lbs)						5049	5049	5049	6067	6991	6991	6991	6991	6991	6991	6991	7842		
Case 2 - 2 Struts																			
Maximum Factored w_{cmu} Load (lbs/ft)	NR		NR	NR	NR	2293	2030	1819	1994	2111	2023	1942	1798	1673	1563	1467	1395		
Strut Load P_U (lbs)						4638	4638	4638	5572	6421	6421	6421	6421	6421	6421	6421	7203		

Table Use:

Check Lintel Size & Support Requirements During Construction

(1) Select weight of wall being supported by lintel from appropriate reference.

(Ref. NCMA TEK 14-13B), s_{WALL} (lbs/sf)

(2) Determine factored installed wall load as follows:

$$W_u = 1.4 \times s_{WALL} \times H \text{ or } H_{max} = W_{cmu} / (1.4 \times s_{WALL})$$

"H" is maximum height of masonry wall to be installed above top of lintel before wall is cured. (ft.)

(3) Enter table for appropriate support condition, lintel size, masonry opening.

Confirm calculated W_u is less than or equal to w_{cmu} noted in table.

(4) Confirm loads do not exceed immediate deflection value limits desired as noted in Design Capacity Tables.

For Case 1 and Case 2 support conditions deflection span is (L.E / 2) and (L.E / 3), respectively.

(5) NR - Not Recommended, no negative flexural reinforcement. Continuous temporary support if required.

(6) Load capacity of installed lintel assumed to have lateral bracing at distances not greater than:

$$[9.2.3.1] 50b_w, < 5.2.1.2 > 32 b_w \text{ OR } 120(b_w)^{2/3} d_{eff} = 244 \text{ in.} = 20.33 \text{ ft.}$$

Example:

Lintel : 8" solid with M.O. = 120 inches **CASE 1**

8" Normal Weight CMU wall grouted at 24" o.c. = 55 lbs/sf.

H Installed = 10.67 feet

$$W_u = 1.4 \times 55 \times 10.67 = 822 \text{ lbs/ft.}$$

Enter capacity table and confirm $W_u < w_{cmu} =$

822 lbs/ft. < 970 lbs/ft OK

Strut Loads:

$$\text{At } W_u: P_u = [822 / ((1.4 \times 56 \text{ Lintel weight}) + 970)] \times 6991 = 5481 \text{ lbs}$$

$$P_{SERVICE} = P_u / 1.4 = 5481 / 1.4 = 3915 \text{ lbs.}$$

$$\text{At } W_{cmu}: P_{SERVICE} = P_u / 1.4 = 6991 / 1.4 = 4993 \text{ lbs.}$$

Ref. 6"x8" For Case 0 Example

Ref. 4"x8" For Case 2 Example

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U-LINTEL SIZE: 6"x8"

Materials:

Concrete Compressive Strength (f'c) 5,000 (min)
Reinforcing Fy = 60,000 psi
Lintel Weight 34 lbs/ft. ungrouted

Masonry Comp. Strength f'm : 3,000 psi
Grout Comp. Strength fg: 3,000 psi

Unit Dimensions:

Actual Width: bw = 5.625 inch
Nominal Height: h = 7.625 inch
8 inch

DESIGN CAPACITY TABLE

Reinforcement		Top		(2) - #3																								(2) - #5 ⁽⁸⁾																					
		Bottom																																															
Nominal Lintel Length (inch) [LUB-#]		24	30	32	36	40	48	54	56	60	64	66	72	78	80	84	88	90	96	102	104	108	112	114	120	128	132	136	144																				
Masonry Opening M.O. (inch)		8	14	16	20	24	32	40	44	48	50	56	62	64	68	72	74	80	86	88	92	96	98	104	112	116	120	128																					
Effective Span (LE = M.O. + h _{nom}) (inch)		16	22	24	28	32	40	46	48	52	56	64	70	72	76	80	82	88	94	96	100	104	106	112	120	124	128	136																					
Maximum Shear Strength (FV _{adm}) lbs.		3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431	3431																					
Maximum Moment Strength (+FM _m) lb-ft.		11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364	11364																					
Maximum Uniform Factored Load (Fw _n) lbs/ft.		10293	5862	5147	4117	3431	2574	2167	2059	1872	1716	1647	1471	1328	1287	1211	1144	1173	1029	958	936	895	858	840	792	735	710	686	643																				
Maximum Unif. Service Load (w _s) lbs/ft. @																																																	
Di =	M.O./240	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+																			
	M.O./360	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+																			
	M.O./600	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+																			
Di + D s =	M.O./240	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+																			
	M.O./360	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+																			
	M.O./600	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+																			

Table Use:

Enter Table with Required Strength = Factored Uniform Load W_u

Select Lintel Size Where W_u < F W_n

DL: Dead Load LL: Live Load

Factored Load Effect Wu : Greater of 1.4 DL OR 1.2DL + 1.6LL

Deflections

1. Enter the table for given span with desired deflection limit at M.O./240, M.O./360, M.O./600 for either immediate or long term deflection

2. Read value of SERVICE (Unfactored) uniform load on lintel that results in limiting deflection noted for M.O./240, M.O./360, M.O./600.

Notes:

- See "arching" information sheet for applied load calculation where arching action determined by Architect/Engineer is applicable.
- See calculation example for explanation of table calculation methods and Code references.
- Mid-span immediate deflection Di at service load noted is calculated for the section in question.
For long term deflection Ds , sustained loads are assumed to be applied for a time greater than 60 months.
- Immediate elastic deflections values are for maximum uniform service load values noted. Long term deflections consider that 50 percent of maximum service is sustained load. Load values noted indicate limiting load for deflection limits of M.O./240/M.O./360, M.O./600, considering long term creep and shrinkage effect.
Deflections values do not consider shear deformations and are for pin ended supports.

Di = Immediate elastic deflection

Di + D s = Immediate elastic deflection + Long Term Creep Deflection

- Load capacity of installed lintel assumed to have lateral bracing at distances not greater than: <5.2, 1.2> 32 b_w = 180.0 OR 120b_w²/d_{eff} = 613.6 in. L_o = 180 in. = 15.00 ft.
- Minimum end bearing distance shall be 8 inches by width of the lintel.

Controlling Section Capacity Fw_d

Shear (Red)

Moment (Blue)

Code References:

TMS402-16

ASCE 7-16

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(7) Masonry Mortar ASTM C270 PCL or Masonry Cement Type M or S

(8) Shear span considered as M.O., at face of support for shear controlled capacity values.

(9) Moment capacity noted limited by maximum allowable reinforcement area for tension controlled section <9.3.2.1 (a). Excess steel area provided ignored in moment capacity value indicated in table.

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U-INTEL SIZE: 8"x8"

DESIGN CAPACITY TABLE

Materials:

Concrete Compressive Strength (f_c): 5,000 (min)
Reinforcing F_y = 60,000 psi
Lintel Weight: 39 lbs/ft, ungrouted

Masonry Comp. Strength f_m: 3,000 psi
Grout Comp. Strength f_g: 3,000 psi

Unit Dimensions:
Actual Width: bw = 7.625 inch
Nominal Width: bw = 8 inch
Actual Height: h = 7.625 inch
Nominal Height: h = 8 inch

Reinforcement		(2) - #3																(2) - #5																
		Top								Bottom								(2) - #3								(2) - #5								
		Nominal Lintel Length (Inch.) [LU#]																																
Masonry Opening	M.O. (Inch)	24	30	32	36	40	42	44	48	54	56	60	64	66	72	78	80	84	88	90	96	102	104	108	112	114	120	128	132	136	144			
Masonry Opening	M.O. (Inch)	8	14	16	20	24	26	28	32	38	40	44	48	50	56	62	64	68	72	74	80	86	88	92	96	98	104	112	116	120	128			
Effective Span	(LE = M.O. + h _{nom}) (Inch)	16	22	24	28	32	34	36	40	46	48	52	56	58	64	70	72	76	80	82	88	94	96	100	104	106	112	120	124	128	136			
Maximum Shear Strength	(F _{Vmax}) lbs.	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651	4651			
Maximum Moment Strength	(+F _M) lb-ft.	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427	14427			
Maximum Uniform Factored Load	(F _w) lbs/ft.	13953	7973	6977	5561	4651	4293	3987	3489	2938	2791	2537	2326	2233	1993	1801	1744	1642	1550	1509	1395	1298	1269	1213	1163	1139	1073	997	962	930	872			
Maximum Unif. Service Load	(w _s) lbs/ft. @																																	
DL =	M.O./240	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	7725	5691	5175	4316	3638	3351	2654	2137	1995	1747	1538	1447	1211	971	875	791	653		
	M.O./360	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	7238	5160	3806	3462	2889	2436	2244	1780	1436	1341	1176	1037	975	818	658	594	445		
	M.O./600	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	4380	3129	2316	2110	1766	1493	1380	1100	892	835	735	651	614	518	421	381	290		
DL + D s =	M.O./240	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	6858	6078	4352	3230	2943	2467	2090	1931	1543	1254	1175	1036	918	867	734	597	542	493	413
	M.O./360	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	4178	3016	2261	2067	1744	1486	1376	1111	912	856	759	676	640	546	448	408	373	315	
	M.O./600	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	2760	2028	1543	1418	1207	1038	966	787	652	614	548	491	465	400	330	273	229		

Table Use:

Enter Table with Required Strength = Factored Uniform Load W_u

Select Lintel Size Where W_u < F W_u

DL: Dead Load

Factored Load Effect W_u: Greater of

1.4 DL OR 1.2DL + 1.6LL

Deflections

1. Enter the table for given span with desired deflection limit at M.O./240, M.O./360, M.O./600 for either immediate or long term deflection
2. Read value of SERVICE (Unfactored) uniform load on lintel that results in limiting deflection noted for M.O./240, M.O./360, M.O./600.

Notes:

- (1) See "arching" information sheet for applied load calculation where arching action determined by Architect/Engineer is applicable.
- (2) See calculation example for explanation of table calculation methods and Code references.
- (3) Mid-span immediate deflection DL at service load noted is calculated for the section in question.
For long term deflection Ds, sustained loads are assumed to be applied for a time greater than 60 months.
- (4) Immediate elastic deflections values are for maximum uniform service load values noted. Long term deflections consider that 50 percent of maximum service is sustained load. Load values noted indicate limiting load for deflection limits of M.O./240, M.O./360, M.O./600, considering long term creep and shrinkage effect.
Deflections values do not consider shear deformations and are for pin ended supports.
DL = Immediate elastic deflection
DL + D s = Immediate elastic deflection + Long Term Creep Deflection
- (5) Load capacity of installed lintel assumed to have lateral bracing at distances not greater than: <5.2, 1.2> 32 b_w = 244.0 OR 120b_w²/d_{eff} = 1127.6 in. L_u = 244 in. = 20.33 ft.
- (6) Minimum end bearing distance shall be 8 inches by width of the lintel.
- (7) Masonry Mortar ASTM C270 PCL or Masonry Cement Type M or S
- (8) Shear span considered as M.O., at face of support for shear controlled capacity values.

Controlling Section Capacity F_{wu}

Shear (Red)

Moment (Blue)

Code References:

TMS402-16 < >
ASCE 7-16 { }

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U-LINTEL SIZE: 10"x8"

DESIGN CAPACITY TABLE

Materials:

Concrete Compressive Strength (f'_c) = 5,000 (min)
Reinforcing F_y = 5,000 psi
Lintel Weight: 55 lbs/ft, ungrouted

Unit Dimensions:

Masonry Comp. Strength f_m : 3,000 psi
Grout Comp. Strength f_g : 3,000 psi
Width: bw = 9.625 inch
Height: h = 7.625 inch
Nominal 10 inch
8 inch

Reinforcement		Top		(2) - #3																								(2) - #5																							
		Bottom																																																	
Nominal Lintel Length (inch) [LUD-#]		24	30	32	36	40	48	54	56	60	64	66	72	78	80	84	88	90	96	102	104	108	112	114	120	128	132	136	144																						
Masonry Opening M.O. (inch)		8	14	16	20	24	32	38	40	44	48	50	56	62	64	68	72	74	80	86	88	92	96	98	104	112	116	120	128																						
Effective Span (LE = M.O. + h _{nom}) (inch)		16	22	24	28	32	40	46	48	52	56	58	64	70	72	76	80	82	88	94	96	100	104	106	112	120	124	128	136																						
Maximum Shear Strength (F _V) _{min} lbs.		5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872	5872																						
Maximum Moment Strength (+F _M) _{min} lb-ft.		15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017	15017																						
Maximum Uniform Factored Load (F _w) _{min} lbs/ft.		17616	10066	8808	7046	5872	4404	3708	3523	3203	2936	2818	2516	2273	2202	2072	1957	1904	1761	1639	1601	1532	1468	1438	1355	1201	1125	1056	935																						
Maximum Unif. Service Load (w _s) lbs/ft. @																																																			
3/4"	D i =	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	8270	6100	5545	4626	3900	3593	2848	2295	2143	1877	1654	1556	1305	1047	944	854	706																					
		9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	7770	5541	4091	3724	3110	2625	2421	1923	1555	1453	1276	1127	1061	893	720	651	491																					
		9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	3399	2526	2304	1935	1643	1519	1217	993	931	822	731	690	568	479	436	398	335																					
3/4"	D i + D s =	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	4679	3492	3190	2685	2284	2114	1700	1380	1305	1155	1028	971	827	677	616	563	474																					
		9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	3340	2523	2313	1961	1680	1561	1267	1045	984	875	782	741	635	524	478	438	371																					
		9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	9999+	2341	1794	1652	1412	1218	1136	930	774	730	652	585	556	476	390	355	325	274																					

Table Use:

Enter Table with Required Strength = Factored Uniform Load W_u

Select Lintel Size Where W_u < F W_n

DL: Dead Load LL: Live Load

Factored Load Effect W_u; Greater of

1.4 DL OR 1.2DL + 1.6LL

Deflections

1. Enter the table for given span with desired deflection limit at M.O./240, M.O./360, M.O./600 for either immediate or long term deflection
2. Read value of SERVICE (Unfactored) uniform load on lintel that results in limiting deflection noted for M.O./240, M.O./360, M.O./600.

Controlling Section Capacity F_W a

Shear (Red)
Moment (Blue)

Code References:

TMS402-16
ASCE 7-16

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Notes:
(1) See "arching" data sheet for applied load calculation where arching action determined by Architect/Engineer is applicable.
(2) See calculation example for explanation of table of calculation methods and Code references.

(3) Mid-span immediate deflection D_i at service load noted is calculated for the section in question.

For long term deflection D_s, sustained loads are assumed to be applied for a time greater than 60 months.

(4) Immediate elastic deflections values are for maximum uniform service load values noted. Long term deflections consider that

50 percent of maximum service is sustained load. Load values noted indicate limiting load for deflection limits of M.O./240, M.O./360, M.O./600,

considering long term creep and shrinkage effect. Deflections values do not consider shear deformations and are for pin ended supports.

D I = Immediate elastic deflection

D I + D s = Immediate elastic deflection + Long Term Creep Deflection

(5) Load capacity of installed lintel assumed to have lateral bracing at distances not greater than: <5.2, 1.2> 32 b_w = 308.0 in. OR 120b_w²/deff = 1796.7 in.

(6) Minimum end bearing distance shall be 8 inches by width of the lintel.

(7) Masonry Mortar ASTM C270 PCL or Masonry Cement Type M or S

(8) Shear span considered as M.O., at face of support for shear controlled capacity values.

L_p = 308 in. = 25.67 ft.

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DESIGN CAPACITY TABLE

Unit Dimensions:

Width:	bw =	11	Actual
Height:	h =	7.6	

<u>Table Use:</u>	Enter Table with Required Strength = Factored Uniform Load W_u	<u>Deflections</u>	<u>Controlling Section Capacity</u>	<u>FW_a</u>	Code References:
Select Lintel Size Where $W_u < F'W_n$		1. Enter the table for given span with desired deflection limit at	(Red)		TMS402-16
LL: Live Load		M.O./240, M.O./360, M.O./600 for either immediate or long term deflection	(Blue)		ASCE 7-16
DL: Dead Load		2. Read value of SERVICE (Unfactored) uniform load on lintel that			
Factored Load Effect W_u ; Greater of		results in limiting deflection noted for M.O./240, M.O./360, M.O./600.			
1.4 DL OR					
1.2DL + 1.6LL					

(2) See calculation example for explanation of table of calculation methods and Code references.

(3) Mid-span immediate deflection Δ_i at service load noted for the section in question.

For long term deflection D_s , sustained loads are assumed to be applied for a time greater than 60 months.

(4) Immediate elastic deflections values are for maximum uniform service load values noted. Long term deflections consider that 50 percent of maximum service is sustained load. Load values noted indicate limiting load for deflection limits of M/O /240, M/O considering long term creep and shrinkage effect. Deflections values do not consider shear deformations and are for pin ends.

$D_i =$ Immediate elastic deflection

$$D_i + D_s = \text{Immediate elastic deflection} + \text{Long Term Creep Deflection}$$

(5) Load capacity of installed lintel assumed to have lateral bracing at distances not greater than: $< 5.2.1.2 > 32 b_w =$

(6) Minimum end bearing distance shall be 8 inches by width of the lintel.

(7) Masonry Mortar ASTM C270 PCL or Masonry Cement Type M or S

(8) Shear span considered as M.O., at face of support for shear controlled capacity values.

$$L_b = 372 \text{ in.} = 31.00 \text{ ft.}$$



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