House of Sweden

Structural Study of Alternative Floor Systems

2900 K St. NW Washington, DC 20007



The Pennsylvania State University Department of Architectural Engineering Senior Thesis 2008-2009

October 24, 20008

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Technical Report 2

October 24, 2008

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EXECUTIVE SUMMARY

Technical Report 2 is the Structural Study of Alternative Floor Systems Report. This report was generated to investigate alternative floor systems for the House of Sweden. Four alternative systems were considered and preliminary designs were conducted and compared to the original post-tensioned system. The north-east corner of the north building was taken as a representative area for the preliminary designs. The four alternative systems are:

- Composite Steel Deck with Non-Composite Beams
- Composite Steel Deck with Composite Beams
- Pre-Cast Hollow Core Slab on Pre-Cast Beams
- Two-Way Reinforced Concrete Slab

When the systems were compared, none of the alternatives systems were immediately recognized as a viable alternative to the existing system. This is due to the 22' cantilever that exists on the north side of the building. This cantilever presented a design challenge that was met by devising a steel tube hanger system for the composite steel systems and a non-prismatic beam with hollow core slabs for the concrete systems.

Overall, the composite steel deck with non-composite beams was not a viable system; however, this system was only analyzed as a baseline for the composite steel beam system. The two-way reinforced concrete slab might be a possible system, but is hard to construct and has the very deep non-prismatic beam. The hollow core slab is viable due to the ease of construction, but steel might want to be investigated to reduce the depth of the system. The most viable alternative is the composite steel deck with composite beams because of the weight is very small, the construction is fairly easy, and the erection time is short. It was noted that the existing system, is still the best option in overall depth, construction time, budget, and cantilever solution.

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House of Sweden Structural Study of Alternative Floor Systems

2900 K St. NW Washington, DC 20007

INTRODUCTION

This Structural Study of Alternative Floor Systems contains a description of the slab conditions currently existing in the House of Sweden, including gravity loading and deflection criteria. It provides a synopsis of the structural components including gravity and lateral load systems. Through analysis of the serviceability and strength of alternative floor systems, this report discusses the feasibility of implementing these systems in a later re-design that might become part of the overall proposal.

BACKGROUND

House of Sweden (Cover Figure) is located in Georgetown, Washington D.C. at the intersection of Rock Creek and the Potomac River. This development is built on a single mat foundation with a parking garage level and then two separate towers rise out of the site. The south building consists of 5 stories and a mechanical penthouse; the north building is 6 stories and a mechanical penthouse. Construction of the two buildings began on August 4, 2004 and finished on May 12, 2006. It was delivered in a design-bid-build method where the design of the south building was commissioned as a competition in Sweden.

Wingardh Arkitektkontor AB completed the winning design for the south building and houses the Swedish Embassy along with an exhibit hall, convention center, rooftop terrace, and apartments. They designed this building to be "a shimmering jewel in the surrounding parkland." To accomplish this goal, the base of the building is clad in light stone, while the upper floors are clad in glass laminated with a traditional Nordic blond wood pattern. This glass façade is backlit at night to create the illusion of the structure floating above the river.

Housed in the north building are offices and apartments, which incorporate expansive balconies and long stretches of ribbon windows to maximize exterior views. The façade employs the same type of light stone on the podium, but the upper floors are clad in metal panels. This lets the north building relate to the south building, yet keep its own identity.

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Both building envelopes are steel stud construction with faced blanket insulation and gypsum wallboard attached. A standoff system is used on the north building to attach light stone panels to the podium of the building and metal paneling to the upper floors. This same standoff system is used on the south building to attach light stone paneling on the lower level. The upper levels employ a different standoff system of laminated glass panels as cladding. None of these cladding systems are used as a barrier system, which is why the insulation is faced to prevent moisture penetration.

DOCUMENT AND CODE REVIEW

The following documents were either furnished for review or otherwise considered for this report:

- . ASCE/SEI 7-05 Minimum Design Loads for Buildings and Other Structures published in 2006 by the American Society of Civil Engineers
- IBC 2006 International Building Code published in January 2006 by the International Code Council, Inc.
- ACI 318-08 Building Code Requirements for Structural Concrete published in January 2008 by the American Concrete Institute
- AISC 13th Edition Steel Construction Manual published in December 2005 . by the American Institute of Steel Construction, Inc.
- PCI 6th Edition Design Handbook published in 2004 by the Precast/Prestressed Concrete Institute
- Post-tensioned Concrete Floors authored by Sami Khan and Martin Williams published in 1995 by Butterworth-Heinemann Ltd
- Notes on ACI 318-08 Building Code Requirements for Structural Concrete published in 2005 by the Portland Cement Association
- Two-Way Post-Tensioned Design Example published by the Portland Cement Association
- Construction Documents originally dated October 28, 2003 by VOA and • TCE

STRUCTURAL SYSTEM DISCUSSION

Foundation

Cast-in-place piles support a mat foundation. These piles are 16" in diameter with a concrete compressive strength of $f_c = 6,000$ psi and exist under the north perimeter of the parking garage. The mat foundation exists over the entire parking garage. It is a minimum of 38" thick, and 42" at the columns with a concrete compressive strength of $f_c = 4,000$ psi and rests on a 2" thick mud slab. It is reinforced with rebar varying from #18 bars to #6 bars and at a variety of spacings. This foundation is either set on the piles at the north perimeter, or held with tie-downs. Columns from both the north and south buildings will be supported on the mat foundation.

Framing System

House of Sweden is located in Georgetown, Washington, DC; therefore, the use of a post-tensioned concrete structural system was an obvious choice to help minimize the slab thickness and maximize the number of floors. Most of the floors above grade are two-way post-tensioned concrete flat slabs.

The north building has 6 levels above grade. The first floor slab is a 9"-10.5" thick reinforced with #4 and #5 bars and the drop panels are 5", 8", or 10" thick and reinforced with #7 and #8 bars. The second through sixth floors are 7"-8" thick with drop panels reinforced with #5 and #6 bars. Typical concrete strength on these floors is 6 ksi or 8 ksi. Concrete strength and slab thickness vary on each floor, which means that the slabs were not placed as single, monolithic pours and they had to be completed in sections. Because of the irregular building shape, there is no typical bay spacing, although many bays were kept at 30' x 30', possibly accounting for the change in slab strength and thickness.

The south building has 5 levels above grade. The first floor slab is a 9"-12" thick reinforced with #4-#6 bars and the drop panels are 8", 10", or 12" thick and reinforced with #6- #9 bars. The second through fifth floors are 10"-12" thick with drop panels reinforced with #5 and #6 bars. Typical concrete strength is 6 ksi or 8 ksi. Concrete strength and slab thickness vary on each floor, which means that the slabs were not placed as single, monolithic pours and they had to be completed in sections. Because of the irregular building shape, there is no typical bay spacing, although many bays were kept at 32' x 22', possibly accounting for the change in slab strength and thickness.

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The penthouse roof of the north building is similar to the floor slabs. It is a two-way, post-tensioned slab, 7" thick with a concrete strength of 6 ksi. It has drop panels reinforced with #4 and #5 bars. This roof was designed to hold a 30 psf snow load, plus snow drift load around the mechanical equipment.

The main roof of the south building is similar to the floor slabs. It is a two-way, posttensioned slab, 10" or 12" thick with a concrete strength varying from 6 ksi to 8 ksi. The drop panels are reinforced with #5 and #6 bars. This roof was designed to hold a 30 psf snow load plus snow drift load around the mechanical equipment and the penthouse to the north. Since the south half of the roof has a convention space, it was designed to hold a 100 psf terrace load plus a 25 psf paver load.

For ease of calculation, the north building was used as a representative building for the alternative slab designs. Calculations were completed using regular bay spacings of 30'x30' with the 22' cantilever and 24"x24" square concrete columns in the Northeast corner. Refer to Figure 1. for the specific location.

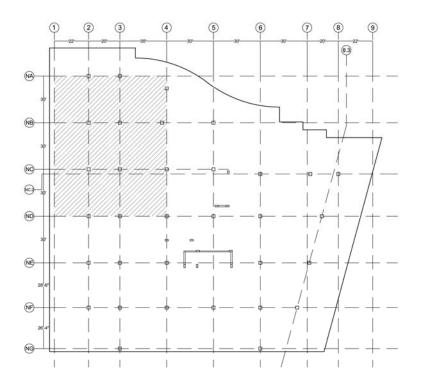
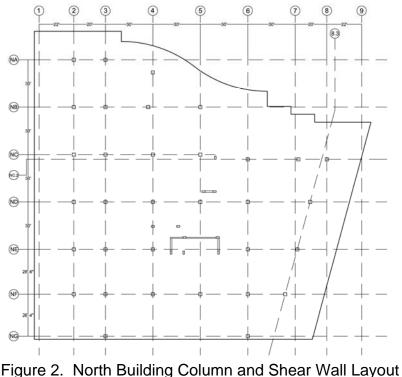


Figure 1. North Building Alternative Slab Area of Design

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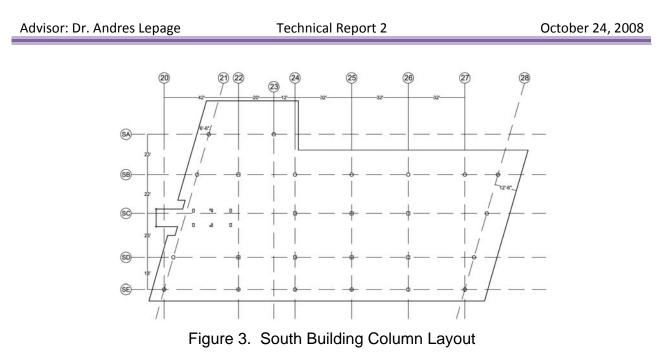
Lateral System

Shear walls make up the lateral system of the north building from the garage to the fourth floor (Figure 2.). These walls vary in width and are 8 " or 12" thick with concrete strength of 6 ksi reinforced with #4 bars at 12" spacing in two curtains. These shear walls stop below the fifth floor where the structure becomes a concrete moment frame. This system resists lateral loads in the north-south and east-west direction depending upon the orientation of the wall.



righte 2. North Building Column and Shear Wai Layout

Shear walls exist in the garage under the south building and are 12" thick with a concrete strength of 6 ksi reinforced with #4 bars at 12" spacing in two curtains. However, these walls do not extend past the garage level, and the building lateral system becomes a concrete slab-frame moment system to resist lateral loads in both the north-south and east-west directions Refer to Figure 3. for a typical floor plan.



GRAVITY LOAD DISCUSSION

To analyze the gravity system of the House of Sweden, the static and dynamic loading on the structure had to be determined. The following is a summary of the approximate design gravity loads and criteria used to spot check the House of Sweden's gravity system. Load references are listed in the tables.

Deflection Criteria

Floor Deflection – IBC 2006 Table 1604.3

Typical Live Load Deflection for Floor MembersL/360

Typical Total Deflection for Floor Members L/240

Floor Dead Loads								
Occupancy	Design Load	Reference						
Normal Weight Concrete	150 pcf	ACI 318-08						
Roof Pavers	25 psf	Structural Drawings						
Ballast, Insulation, and waterproofing	8 psf	AISC 13 th Edition						
Glass Curtain Wall	6.4 psf	Glass Association of North America						
Studs and Batt Insulation	4 psf	AISC 13 th Edition						

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Roof Live Loads							
Occupancy Design Load ASCE7-05 Load							
Public Terrace	100 psf	100 psf					
Snow Load**	30 psf*	20 psf*					
Rain Load**		41.6 psf					

**Snow drift will accumulate around the penthouse and on the lower roof of the north building. This load was calculated and can be found in the Appendix B along with the flat roof snow load and rain load calculations.

	Floor Live Loads			
Occupancy	Design Load	ASCE7-05 Load		
Penthouse Machine Room	150 psf*	Not listed specifically, but light storage warehouses - 125 psf*		
Residential	40 psf + 20 psf for partitions*	40 psf*		
Stairways	100 psf	100 psf		
Corridors	100 psf	100 psf		
Commercial and Plaza Area	100 psf*	Offices - 50 psf, Corridors above 1st floor - 80 psf, Lobby - 100 psf*		
Elevator Machine Room	300 lbs of concrete load on 4 square inches	300 lbs of concrete load on 4 square inches		
Loading Dock	400 psf	Not listed specifically		
Parking Garage	50 psf and 2000 lbs of concrete load on 20 square inches*	40 psf and 3000 lbs of concrete load on 20 square inches*		

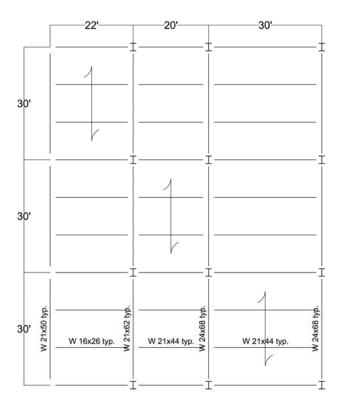
*For load discrepancies, worst case scenario loading was used.

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ALTERNATIVE FRAMING DISCUSSION

System 1: Composite Steel Deck with Non-Composite Beams



This system was analyzed as a reference point for System 2: Composite Steel Deck with Composite Beams. The design is 3000 psi concrete reinforced with welded wire fabric on top of a 2" metal 18 gauge Volcraft deck. The beams are 10' on center.

To address the large cantilever, a hanger system was devised out of Round HSS steel. The tube is anchored at the top of the exterior column and connects to the 6th floor at a 46.1° angle. The 7th floor is only an 11' cantilever so it is able to carry its own weight to the column.

The overall depth of the system is 24½". The necessary 2-hour fire rating for the

deck is met by the 5¼" concrete slab thickness; however, the steel members will need spray fire-proofing to meet code. The positives of this system are the ease of erection of steel and the elimination of formwork due to the metal deck. Due to the non-Composite action of the beams, they are on the heavier side and therefore, this system is not viable due to the excessive depth and weight.

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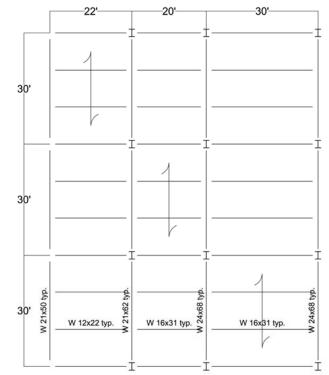
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System 2: Composite Steel Deck with Composite Beams

This design is 3000 psi concrete reinforced with welded wire fabric on top of a 2" metal 18 gauge Volcraft deck. It produced beams at 10' on center that are thinner in depth and less weight than the non-composite system as was anticipated. The girders are the same in both the composite and non-composite systems because deflection controlled the design.

To address the large cantilever, a hanger system was devised out of Round HSS steel. The tube is anchored at the top of the exterior column and connects to the 6th floor at a 46.1° angle. The 7th floor is only an 11' cantilever so it is able to carry its own weight to the column.

The overall depth of the system is 24½". The necessary 2-hour fire rating for the deck is



met by the 5¼" concrete slab thickness; however, the steel members will need spray fire-proofing to meet code. The positives of this system are the ease of erection of steel and the elimination of formwork due to the metal deck. Due to the fact that deflections controlled the design, the beams and girders are on the heavier side but this system may warrant further investigation due to the handling of the cantilever and the overall weight of the system.

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System 3: Pre-Cast Hollow Core Slab on Pre-Cast Beams

This design is pre-cast hollow core slabs, 6" deep with a 2" normal weight concrete topping. The slabs are 4' wide and pre-stressed with a strand designation of 66-S. The beams are also pre-cast and spaced at 15' on center. The exterior beams are 20" deep and 26" wide; the interior beams are 44" deep and 28" wide. The columns are kept as the original 24x24 design.

To address the large cantilever, a nonprismatic beam was designed to carry the pre-cast hollow core slabs. The total depth at the column is 44" and extends to the edge of the cantilever, where the beam tapers to 8". The pre-cast hollow core slabs will be supported on this beam and all the weight will be

transferred to the exterior columns. Shear reinforcing is necessary throughout the entire beam and will be provided by #3 stirrups. Flexural reinforcing is fairly standard, 12 #9 bars, but they should be located at the top of the beam to counteract the moment of the cantilever.

The overall depth of the system is 44". The necessary 2-hour fire rating for the deck is met by the 8" concrete slab thickness. No steel is used in this design, so no extra fireproofing is necessary for any members. The positives of this system are the ease of erection, the elimination of formwork due to the pre-cast components, and the short lead time. Due to the excessive depth of this system, this may not be a viable solution; however, using steel instead if the pre-cast beams, or possibly using a smaller beam spacing could make this system a more feasible solution.

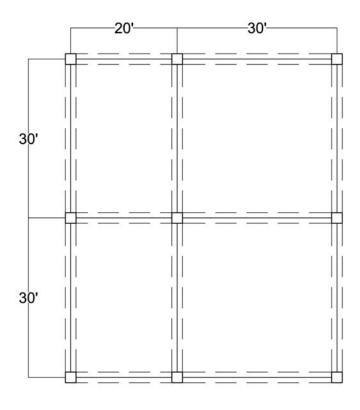


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System 4: Two-Way Reinforced Concrete Slab

This design is 6000 psi concrete with beams spanning between all the columns. The columns were kept as the original 24x24 design. A slab thickness of 101/2" was determined with 24x20 beams. Due to the large bay spacing, the moments induced in the slab are quite high so much reinforcing is necessary. #8 bars were used in the column strips with up to 25 bars necessary to support the exterior span negative interior moment in the column strip. The exterior panels needed less reinforcing with only up to 9 bars necessary to counteract the exterior span negative interior moments. Deflection was not calculated due to the use of the deflection table in ACI to find the slab thickness.



To address the large cantilever, a non-prismatic beam was designed to carry the precast hollow core slabs. The total depth at the column is 44" and extends to the edge of the cantilever, where the beam tapers to 8". The pre-cast hollow core slabs will be supported on this beam and all the weight will be transferred to the exterior columns. Shear reinforcing is necessary throughout the entire beam and will be provided by #3 stirrups. Flexural reinforcing is fairly standard, 12 #9 bars, but they should be located at the top of the beam to counteract the moment of the cantilever.

The overall depth of the system is 20" for the main building and 44" for the cantilever beams. The necessary 2-hour fire rating is met through the use of concrete and the clear cover for the reinforcing steel. The positives of this system are the small depth of the floor system in the main building and the elimination of fireproofing in the design versus steel design. More study should be conducted to see if this system is viable due to the elimination of the post-tensioning while keeping the design similar to the existing.

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SYSTEM COMPARISION DISCUSSION

	System 1	System 2	System 3	System 4	System 5
System	Two-Way Post- Tensioned Concrete Slab (Existing)	Composite Steel Deck with Non- Composite Beams	Composite Steel Deck with Composite Beams	Pre-Cast Hollow Core Slab on Pre-Cast Beams	Two-Way Reinforced Concrete Slab
Cost per ft ²	\$21.55	\$36.99	\$24.70	\$25.85	\$25.05
Slab Depth	8"	5¼"	5¼"	8"	10½"
Structural Depth	22"	24½"	24½"	44"	44"
Structural Weight	100 psf	48.4 psf	47.1 psf	120 psf	158 psf
Cantilever Solution	Post- Tensioning	Steel Tube Hangers	Steel Tube Hangers	Non- Prismatic Beam	Non- Prismatic Beam
Fireproofing	No Additional Fireproofing Required	Fireproofing Necessary on Beams	Fireproofing Necessary on Beams	No Additional Fireproofing Required	No Additional Fireproofing Required
Lead Time	Short	Long	Long	Long	Short
Construction Difficulty	Hard	Easy	Medium	Easy	Hard
Formwork	Necessary	None Necessary	None Necessary	Necessary for Cantilever	Necessary
Additional Study		No	Yes	Yes	Yes
Overall Feasibility	Existing System	No	Most Possible	Possible	Least Possible

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CONCLUSION

This report analyzed four alternative slab systems and compared them to the existing system for feasibility. The four alternative systems are composite steel deck with non-composite beams, composite steel deck with composite beams, pre-cast hollow core slab on pre-cast beams, and two-way reinforced concrete slab. The existing system is two-way post-tensioned concrete.

The composite steel deck with non-composite beams is not a viable system, but it was analyzed as a reference for the composite steel deck with composite beams.

The two-way reinforced concrete slab may be a viable system if more research is conducted. This system eliminates the need for post-tensioning while keeping the slab at approximately the same overall depth. The lead time, budget, and construction difficultly are fairly close to the existing. The structural weight of the system is fairly high and reduces the possibility of use as an alternative system.

Pre-cast hollow core slab on pre-cast beams are a possible alternative. The main issue with this system is the depth of the pre-cast beams. As further study, looking at the possibility of using steel beams instead of the pre-cast beams may decrease the overall depth and weight of this system and create a higher likelihood of use as an alternative system.

Composite steel deck with composite beams is the most viable alternative. The budget and structural depth are comparable to the existing system. The need for formwork is eliminated, but the need for fireproofing is created. The lead time is longer than that of the post-tensioned slab, but the erection time is shortened and the schedule will not change much.

Overall, the composite steel deck with composite beam system is the most viable alternative and warrants further study. A look at the comparison chart shows that no specific system is a better alternative to the existing system. The existing system is also able to address the cantilever with an overall structural depth of 22" and no hanger system to hinder the exterior cladding of the building. Further study may be conducted into one of the alternatives, but the existing post-tensioned system appears to be the most economical and effective system for the House of Sweden.

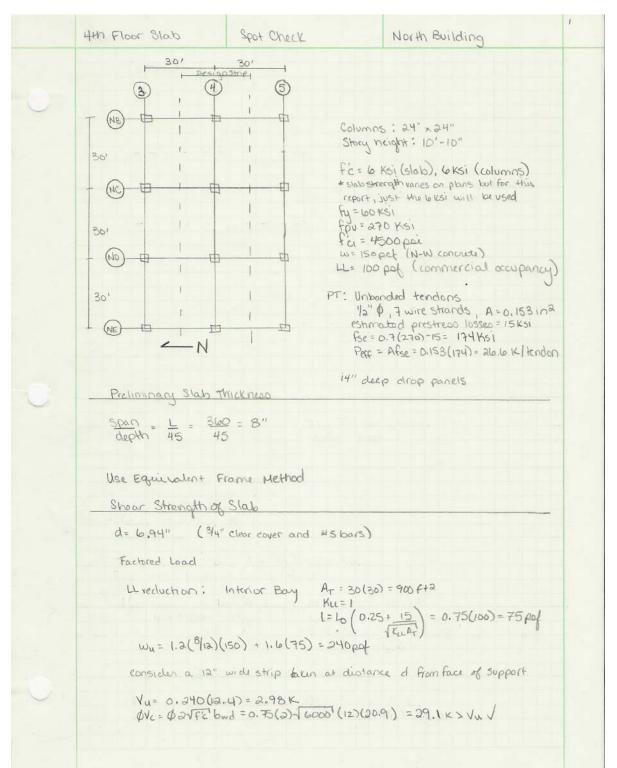
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APPENDIX A – Two-Way Post-Tensioned Concrete Slab (Existing)

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	4th Floor Slab	Spot Check	North Building	2
	Here I and the second			
	Shear strength o	ut distance d/2		
0	Vu=0,240[(30)((30)-1.29°] = 216K		
	\$V2=\$4√F2'b	od = 0.75(4) 16000 (4.15.4)	7) (20.9)/1000 = 301K > VuJ	
	Frame members of	Equivalent Force		
	· Flexural Stiffness o	of slab-beams at both end	is, Ksb	4
	$\frac{C_{N_1}}{L_1} = \frac{a4}{30(12)} = 0,$	$O7 = \frac{C_{N2}}{R_2} = \frac{24}{30(12)} = 0.07$		
	by Inter polation			
	with drop panels t	thickness = 1.75h		
	Cilli Cellez	KNE CNE MNE	KEN CEN MEN	5
			13 4.65 0.63 0.0732	
	Ecs = 57000 VF	=======================================	•	
0	15= <u>Lah³</u> =	30(12)(8)3= 15360 in4 12		
		$s = \frac{5.99(4.42.106.15360)}{30(a)}$	= 1130 • 10 ⁶ in-16	
	· Flexural Stiffness o	or Column Members at b	oth endo Ke	
	Table A7 ta	$= 18^{n}$ $t_{b} = 18^{n}$ $t_{c} = 112^{n}$ $t_{b} = 18^{n}$ $H_{c} = 112^{n}$ $H_{c} = 112^{n}$	1.0 1/Hc=1.16	
	KAB 5.8			
	CAB 0.60	64		
	$l_{c} = \frac{c^{4}}{12} = \frac{a u^{4}}{13}$	= 27648 in4		
	Ecs = 57000 V	6000 = 4.42.106		
	Kc = 5.84 Ecc	- 1c/lec = 5.84 (4.42.106) (2- 130	7648) = 5490 · 106 in -16	
\bigcirc				
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	4th Floor Slab	Spot Check	North Building	3
0		of Torsional Members, K_t = $9(4.42.10^4)(4224.2)$ $3(60(1-24/360)^3$) = 574 in-16 & so high due to drop panelo	
	· Equivalent Column	Stiffness, Kec		
	Kec = EKc · EKc = EKc	= 2 (5490.106)(2)(574.10 (2)(5490.106) + 2(574.10	(v) = 1039.100 in-16	
	· Slab beam joint	Distribution Factors		
	ot exterior joint DF = <u>1130</u> 1130+1039			
	ad interior join DF= 1130 1130 #130	+ = 0.843		
0	COF :0.509			
	Partial frame anal	ysis of equivalent fram	ne	
		$W_L = 75 \text{ pof} W \text{ bal} = 7$		
	• FEM For slab bear Dead load	MS = 0,1093(100×30)(30)2 =	295 Ft-K	
	Live Load	13(75)(30)(30) ² = Qal		
	Balanced Loa MOF = 0,1	d 093(75)(30)(30) ² = 22	al ft-K	
	Refer to Sprea	daheet for moment Dist	nbution	

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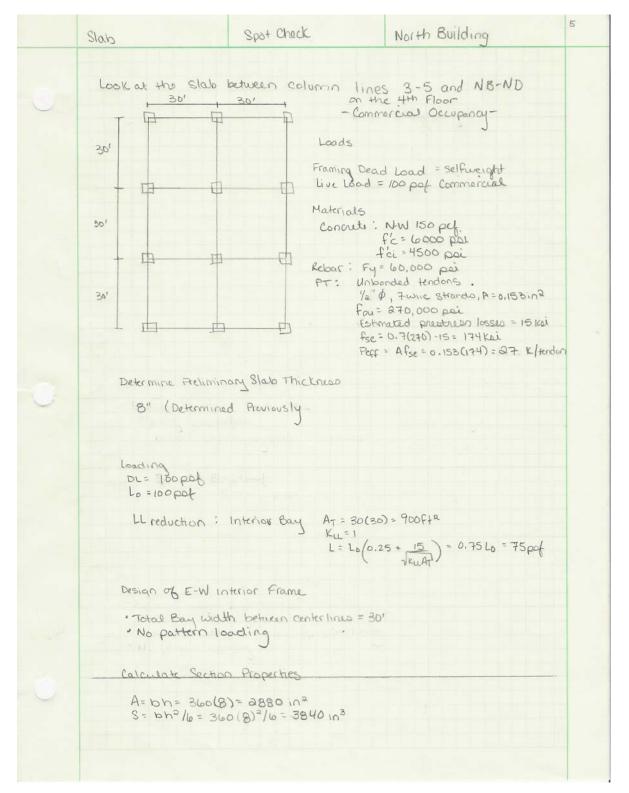
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		Dead L	.oad Mom	ents				Live Load Moments						
Joint	1	2	2	3	3	4		Joint	1	2		3	3	4
Member	1-2	2-1	2-3	3-2	3-4	4-3		Member	1-2	2-1	2-3	3-2	3-4	4-3
DF	0.521	0.343	0.343	0.343	0.343	0.521		DF	0.521	0.343	0.343	0.343	0.343	0.521
COF	0.509	0.509	0.509	0.509	0.509	0.509		COF	0.509	0.509	0.509	0.509	0.509	0.509
FEM	295	-295	295	-295	295	-295		FEM	221	-221	221	-221	221	-221
DIST	-153.7					153.7		DIST	-115.1					115.1
СО		-78.23			78.23			со		-58.61			58.61	
DIST		128.02			-			DIST		95.91			-	
CO			65.16	-65.16				CO			48.82	-48.82		
DIST			-	123.54				DIST			-	92.55		
CO			62.88	-62.88				CO			47.11	-47.11		
DIST			-32.01	32.01				DIST			-	23.98		
CO		-16.29			16.29			CO		-12.20			12.20	
DIST		5.59			-5.59			DIST		4.19			-4.19	
CO	2.84					-2.84		CO	2.13					-2.13
DIST	-1.48					1.48		DIST	-1.11					1.11
CO		-0.75			0.75			CO		-0.57			0.57	
DIST		0.26			-0.26			DIST		0.19			-0.19	
CO			0.13	-0.13				CO			0.10	-0.10		
DIST			-0.05	0.05				DIST			-0.03	0.03		
CO		-0.02			0.02			CO		-0.02			0.02	
DIST		0.01			-0.01			DIST		0.01			-0.01	
CO	0.00					0.00		CO	0.00					0.00
DIST	0.00					0.00		DIST	0.00					0.00
Neg. M	142.7	-256.4	267.6	-267.6	256.4	-142.7		Neg. M	106.9	-192.1	200.5	-200.5	192.1	-106.9
M @	137	7.95	69	.91	137	.95				103	3.63			
Midspan								Midspan						
Balanced Load Moments														

Balanced Load Moments										
Joint	1	2	2	3		4				
Member	1-2	2-1	2-3	3-2	3-4	4-3				
DF	0.521	0.343	0.343	0.343	0.343	0.521				
COF	0.509	0.509	0.509	0.509	0.509	0.509				
FEM	221	-221	221	-221	221	-221				
DIST	-115.1					115.1				
CO		-58.61			58.61					
DIST		95.91			-95.91					
CO			48.82	-48.82						
DIST			-92.55	92.55						
CO			47.11	-47.11						
DIST			-23.98	23.98						
CO		-12.20			12.20					
DIST		4.19			-4.19					
CO	2.13					-2.13				
DIST	-1.11					1.11				
CO		-0.57			0.57					
DIST		0.19			-0.19					
CO			0.10	-0.10						
DIST			-0.03	0.03						
CO		-0.02			0.02					
DIST		0.01			-0.01					
CO	0.00					0.00				
DIST	0.00					0.00				
Neg. M	106.9	-192.1	200.5	-200.5	192.1	-106.9				
M @	103	3.63	52	.66	103	3.63				
Midspan										

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	Slab	Spot Check	North Building	φ
	Set Design R	arameters		
	At time of	Jacking		
	$f'c_i = 45$	500 poir J 500 = 0.60 f'ci = 2700 poir		
		= 3-fri = 201 poi		
	At service lo			
-	$f'_{C} = 6C$	200 pai 2010 = 0,45 fic = 2700 p	oi.	
		$n = 6\sqrt{Fc} = 465 pai$		
	Average Preco	ompression limits		
		5 pai min Opai may		
	Target Load	Balances		
-		0% of DL for slabs		
	For this	o example 0.75 wor = 75	pof	
	Cover Riqu	irements		
	514"	clear cover top and bot	tom	
-	Tendon Profi	0		
		E Paint	N.A.	
	A0 30'	80 30' CA 30'	52	
	1	1 20' 1 30'	-	
	Tendor	ordinade Tendon (CF	Discation	
	STORAGE STORAGE	SUPPORT-TOP 7.0"		
	JUFLUOL	span-bottom 1.0"		
		O'' - 1, O'' = (0, O'')	the end of the hard of	
	Eccentricit to the N	lite, is the dustance. tra	on the center of the kindon	
-		and to make more 1.		
	Prestress Force	e Required to Balance.	75% of the DL	
	Wb= 0	, 80WDL = 0.75(100) (30))= 2350 PIF	
3	Force nee	ided in tendons to con	unteract load	
	P=wb	La/8a = 2250 (30)2/8 (3)	25)= BIO K	

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1	Slab	-	Spot Check	North Building	7
	Charl	()	00		_
0	Chica		umber of tendens needer = 810/27= 30	1	
		Actual Force	for bandled tendons		
		Pactual =	30(27) = 810 K		
		Adjust balanc	ed load		
		Wb= (810	(810) (2250) = 2.25 Klf	4	-
		Determine a	ctual precompression st	ne00 .	
		Pactual A =	810 (1000)/2880 = 281 pai	~ 7 125 poi min / ~ 300 poi max /	
		Peff = 810 K]		
0	Chid	CSTab Streep	eo		
	• Sta	Midspan St	nesses Moal /5 - P/A	ing (OL+PT)	
		fbottom = (+ M	loc - Mbal)/5 - P/A		
		=-33: fbottom=(n 9.91 + 5266)(12)(1000)/3840 5 pai (compression < 0.6 (9.91 - 52,66)(12)(1000)/38 - 227; pai (compression) <	fci= 2700 por V 40 -281	
		= -3" frottom= (13	5pan 17.95+ 103.93) (12) (1000) /384 87 pai (compression) < 0.6 17.95 - 103.93) (12) (1000) /381 17.95 pai (compression) .	ofici = a700 pai / 40 - 281	
0					
~					

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	4th Floor Slab	Spot Check	North Building	8
0	Support Strebbe Ftop= (+MOL-+ Foottom= (-MOL	16al)/S-P/A		
	ftop = (524 = 130 fbottom=(-5	nce of Monunt Distribution Mo .02 - 392,50(12)(1000)/3840 - pai (tension) < 3-JFG = 24.02+349.56)(12)(1000)/384 092 pai (compression)<	281 201 pár J 10-281	
	· Stage 2: Stresses	at service Load (OL+	LL+PT)	
	Midspan Streed Ftop = (-Mou - foottom = (+Mou	es Mu + Hoal) /s - P/A L+Mu - Mbal)/S - P/A		
0	= -49 Fustion= (6	20 11-52.66+52.66)(12)(1000) Proin (compression) <0.4 9.91+52.66-52.66)(12)(1000 02.5 poin (compression) <	55'2 = 2700poi J 5)/3840-281	
	= - 712 flootform= (26.17 95-103.63+103.63)(12)(100 2 pai (computation) < 0.454 37.95+103.103-103.63)(12 pai (tension) < 6.1752=4	12=2700pai / 2)(1000)/3840-281	
	Support Stresser ftop = (+MoL+ N Foottom= (MoL-	Nu - Pibal)/S - P/A -Mu + Mibal)/S - P/A		
	= 136 Froothorn =	4.02+392.56-39256)(12) 0 pai (tension) > 6772= (-524.02-392.56+392.56)(120 pei (compression).	465pai -> 12×1000)/3840-281	
0				

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4th Floor Slab	Spot Check	North Building	9
1) line is Shares the			
Ultimate Strength			-
Primary post-tension	ning moments, M,		
Mi=P*e			_
	the exterior support the interior support (N.	A. to center of tendon)	
M1=(810)(3)/12	= 203 ft-K		
Secondary post-tens	sioning Moments, Msec		
Moec = Mbai - M,			
= 392.56-3	103 = 190 Ft-K at inter		
	at mic	ispan	
My=1.2MDL+1.6	MLL + 1. D Msec		
At Midspan: At Support: 1	Mu = 1.2(137.95)+1.6(10 Mu = 1.2(-524.02)+1.6(-	3.63) + 1.0(95)= 426 ft-K 392.56)+1.0(190)= -1070 ft-K	
Determine minimu	in bonded reinforcemen	r	
	Region n: ft= 15pai ~27ft=27 reinBrament required	6000 = 155 pai	
Exterior Spar	* ft=180 pai > 155 pai		
Minimum positive	moment reinforcement	required	
$y = f_t / (f_t + f_c) V$			
= [180/(180+	622738 = 1.80 m		
NC= MOLIL /S = (137.95+1	+0.5 y lz 03.63)(12)/3840 (0.5(1.	80)(30)(12))	
= 245 K			
As, min = Nc/o	.5 Fy		
= 245/	0.5(00)		
= 8.17	in a		
As, min = 8.17 /	$30 = 0.272 \text{ in}^{3} \text{ lf}^{1}$		
USE # 5 @ 12'	oc Bottom = 0.31 in 21ft		

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	4th Floor Slab	Spot Check	North Building	/D.
	· Negative Momer	nt Region		
	9	30+30)/2 (12) = 2880		-
		30)/12=2880		
	Interior Supports			
	Asmin = 0.0007 = 0.0007		7 #5 top (A=2.17in2)	
	= 2.16108			
	Exterior Suppor	15		
	Act = max	B(30/2)(12)=1440 B(30)(12)=2880	Try 7 #5 top (A= 2.17in2)	
	Asmin= 0.0	0075 Acc	7	
		0675(2880)		
	= 210	p mr.		
	Maximum bar s	pacing		
	=1.5h=1.51	(8) = 12"		
	A. 1. 11. 1		cultural	
		um reinforcement is	SUFICIENT	
-	Mn= (ASFy + Ap	s fps) (d-a/2)		
	d = effective dupth	11		
	Aps = 0,153(30) fps = fse +10,0	00 + (f'ebd)/300 Aps		
	a = (As fy + Aps fr			-
	At supports			
	d=18"-3/4"-1/4"	=17" 00 + (6000 (30)(12)(17))/:	1,150	
	= 210,667 ps		566(4.57)	
	$\alpha = (2.17(60) + 4.5)$	59(211))/0.85(6)(30)(12)		
	= 0,59			
	\$Mn= 0.9 (2.17(60)+4.59(211))(17- 0.55	1/2) . ivm reinforcement ak	
	= 1376Ft	K>1070 Ft-K Minim	ium reinforcement ak	_
	7 # 5 @ 12"	oc top at supports		
0				

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		ŧı.
0	At MidSpan (end Span) d= 8-1.525=6.25" fps=184000 + (6000 (30)(12)(6.35))/300(4.59) = 193,804 pai a= [9.3(60) + 4.59(195)]/0.85(6)(30)(12)=0.79 \$	
	In Conclusion	
	Design: 8" post-tensioned slab with drop panels in the E-W direction, 30 tendons are bundled to give 810 K. In the N-W direction, 30 tendons are Uniformity distributed to total 810 K. Use #5@12" oc Bottom reinforcing at end spans	
~	Use 7#5@ 12" OC TOP reinforcing alt supports	
0		

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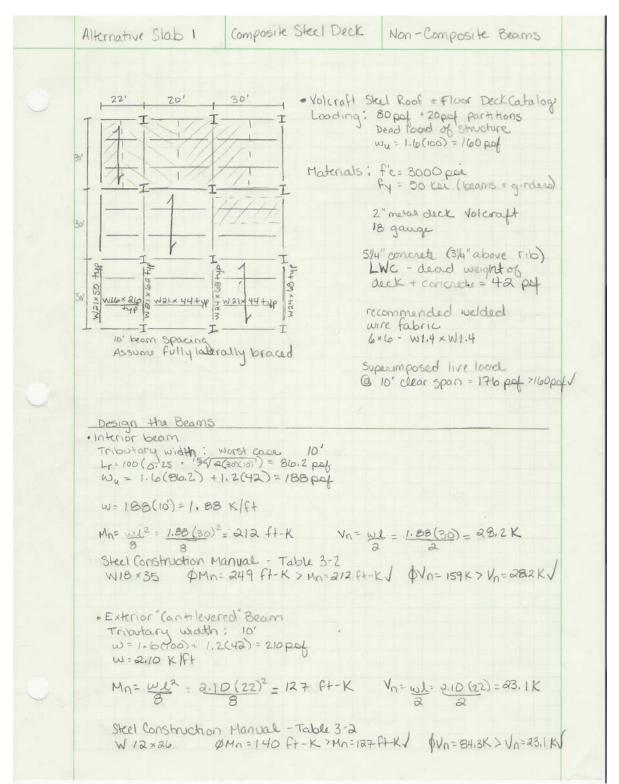
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APPENDIX B – Composite Steel Deck with Non-Composite Beams

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Composite Stel Deck Non-Composite Beams Alternate Slab 1 Check Deflections in Beams . Intertor Beam (worst case Span) $\begin{array}{l} \Delta_{\rm max} = 1/_{360} = \frac{50(12)}{360} = 1"\\ \Delta_{\rm W} = \frac{5\omega}{364E1} \frac{14}{364(27000)(500)^4(12)^8} = 1.23" > 1" \,{\rm max} \,{\rm NO} \, , \end{array}$ $T_{M} = \frac{5(0,1'10)(30)^4(12)^3}{5(0,1'10)(30)^4(12)^3} = 0.75'' < 1''$ 384(2900)(843) $A_{D+L} = 5(0.142.10)(3.0)^4(12)^5 = 1.060' < 1.5'' \int 384(2900)(843)$ $A_{max} = 2_{1240} = 30(12)(240 = 1.5'')$ · Exterior Beam $\Delta_{Max} = \frac{2}{360} = \frac{22(12)}{360} = 0.73''$ $\Delta_{LL} = 5 \frac{2}{384} = \frac{5(0.1)(10)(22)^4(12)^3}{3844(29000)(204)} = 0.89'' > 0.73'' max NO!$ $T_{Y} = \frac{100 \times 26}{26(1-10)(22)^4(12)^3} = 0.60'' < 0.73'' \sqrt{\frac{364(29000)(301)}{364(29000)(301)}}$ $\Delta_{DL} = \frac{2}{384E1} = \frac{28(12)}{240} = 1.1''$ $\Delta_{DL} = \frac{5.0.142}{384E1} = \frac{5(0.142 \cdot 10)(22)^4(12)^3}{384(29000)(301)} = 0.86'' < 1.1''$

	Alternative Slab 1 Composite Steel Deck Non-composite Beams
	Design the Girders
	 Interior Girder Tributary width: worst case - 30'
	beam self-weight: 44 plf (301)=1.32K 1.2(1.32)= 1.44+2(28.2)=57.8K
	Vn= 57.8 K
	$M_n = P_a = 57.8 (10) = 578 Ft-K$
	Skel Construction Manual - Table 3-2 W21×68 ØMn=6001A-K>Mn=578ft-K/ ØVn=273K>Vn=57.8KJ
	• Exterior Girden Tributany width: 11' + 10'
	beam self-weight: 44pif (10) + 26pif (11) = 0.73 K
	0.73 (1.2) + 23,1+28.2 = 52,2 K 52.2K 52.2K
	$\frac{1}{V_{n}} = 52.3 \text{ K}$
	$M_n = Pa = 5a.a. (10) = 5aa. Fr-K$
	Steel Construction Manual - Table 3-2 W21×62 OMn=540Ft-K>Mn=522Ft-KJ ØVn=252K>Vn=52.2KJ
	· "Cantilevered" Grden Tributary width: 11'
	beam self-weight: 26 plf(11) = 0.29 K
	0.29 (1.2) + 23,1 = 23.4 K . 1 23.4 K 1 23.4 K
	$\frac{10'}{10'}$ 10' 10' 1
)	$V_{n} = 23.4 \text{ K}$ $M_{n} = Ra = 23.4 \text{ (10)} = 234 \text{ Ft} - \text{K}$
	Steel Construction Manual - Table 3-2 W 18×35 \$Mn = 249 ft-K>Mn = 234ft-K \$
	and the second sec

Alternative Slab 1	Composite Steel Deck	Non-Composite Beams
<u>Check Deflection</u>		
· Interior Girder	(worst case 30' widt	h)
Au= Pl3 - 30	: 30(12)/360 = 1" (30) ³ (12) ³ = 1.16" >1" (29000)(1480)	No!
Try a W24 × 68		
$\Delta_{11} = PL^3 = 3$	0(30)3(12)3 - 0,94"×1 (29000)(1830)	· " /
AD+L = P23 = 4	30(12)/240 = 1.5" 3.9(30) ³ (12) ³ = 1.38" ^ B(29000)(1830)	·1.5″√.
· Exterior Girden		
$D_{max} = \frac{2}{360} = \frac{21}{380}$ $\Delta_{11} = \frac{213}{380} = \frac{21}{380}$	9 (30)3(12)3 = 0.95" < 1"	
$\Delta D + 1 = P = 3$	30(12)/240 = 1.5" 0.5 (30)3(12)3 = 1.32" <1. (29000)(1330)	5″ J
· "Cantilever" Girde	^	
Amax = 2/360 = Au = <u>P13 = 15</u> 28ET 28	$\frac{30(12)}{300} = 1"$ $\frac{(3)^{3}(A)^{3}}{(A)^{3}} = 1.69" > 1"$ (2900)(510)	NO!
$Try a Walx50$ $\Delta_{LL} = \frac{PL3}{28E1} = \frac{15(1)}{28E1}$	$\frac{36)^{3}(12)^{3}}{260} = 0.88'' <1'' \sqrt{260}$	
$\Delta max = \frac{2}{240}$ $\Delta D + L = \frac{1}{28E1} = \frac{1}{2}$	= ³⁶⁽¹²⁾ /240 =1.5", 5.9(<u>30)³(12)³</u> = 0,93"<1 28(29000)(984)	.5" /

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10	Design Steel Hangers for Cantilever 12' Jabook Material: Round HSS, A500 Fy=42 KSI 10-10" HSK Tensile Loading: 10-10" HSK Tensile Loading: 10-10" JHSK	
19	12' 12' 10:10' 10:1	
19	10+10" 10+10"	
19	10-10" 145K TENSILE Loading: 10-10" 145K TENSILE Loading: 10-10" 96.6K 3rd Flow-(28.4 K)2 girdens per rod + 1. 400 Flow-(28.4 K)2 girdens per rod + 1.	
	10-10" 96.6K ord Floor-(20.7 K) a girding per rod +1.	
J.	4th Floor- (3,4 K) aguidure per rod+1.	54
	SHD FLOOD - (23.4 K) 20 Hours ALA Fred + 1	.5K
	10-10 48.31K 6th Floor - (23.4 K) 2 griders per rod + 1.5 7th Floor - will carry itself. to the col	SK
	Total tensile force in top rod Pu = 2618 K	
	Steel Construction Manual - Table 5-7	
	HS\$ 6.875 × 0.500	
<u> </u>	Ag= 9.86 in = Ph yielding = 354 K > Pu = 268 K J Ae=0.75 Ag= 7.02 in = Ph rupture = 305 K > Pu = 268 K J	
	If this alternative system gets used, the columns should be redesigned in steel and the hanger connections should be checked against the AZ = 7.02102	
0		

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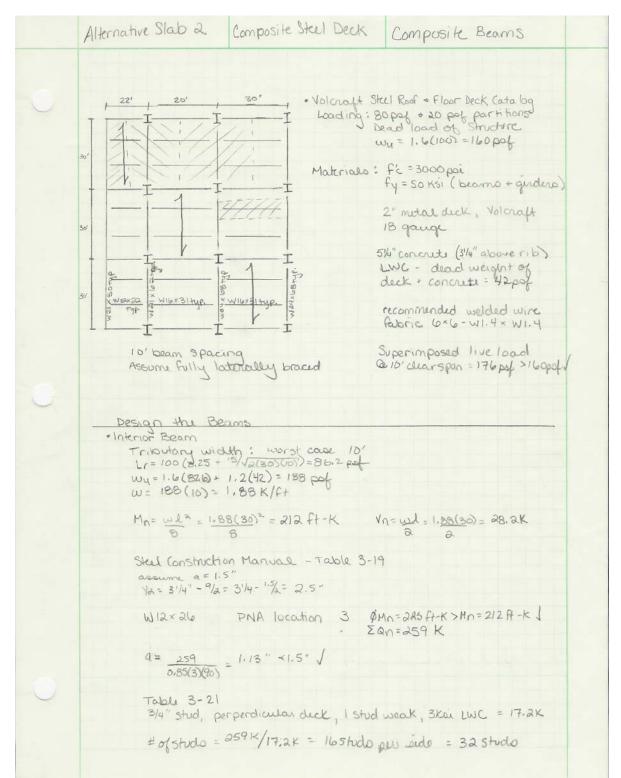
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APPENDIX C – Composite Steel Deck with Composite Beams

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	Alternative Slab 2	Composite Steel Deck	Composite Beams
	Table 3-19		
0	WI4×24 PNA 1	ocation 10 \$Mn= 220 ft ZQn=135K	-K > Mn = 212 Ft - K /
	a= 135 0,85(3)(60)	= 0.180" × 1.5" V	
	# 06560do = 13	25 = 8 latudo per led 1.2	e = 16 studes
	• Exterior "Cantile tributary widd w = 1.6(100) + 1. w= 210(10) = 2.1	Hn : 10' 2(42) = 210 pot	
	$Mn = \frac{\omega d^2}{8} = \frac{2}{2}$	10(22) = 127 A-K Vn= 8	$\frac{\omega d}{2} = \frac{2.10(22)}{2} = 23.1 \text{ K}$
	asource a=1	5" = 3'/4" - ¹¹⁵ /2 = 2.5"	
0	W12×19 PNF	location 7 $\beta Mn = 1301$ $\Sigma On = 69.7$	
	a = <u>69.7</u> 0.85 (3)(66)	0.41" < 1.5" \	
	Table 3-21 Qn=17.ak		
	# of studs = 69.	7/17 2 = 5 studo per si	de = 10 stude
0			

Check Defle • Interior Beam (Table 3-20 I=424in4	Smax = 4/360	0)	
• Interior Beam (Table 3-20	worst case spa	0)	
Table 3-20	Smax = 4/360		
	Dray = 1/360 ALL = Swell 5 (1	30(12)/	
	38487 384	(29000)(424)=1" 1:48" >1" No!
Ireq = 6 29 inf			
Try W16×31	dinostrano AN9	1Mn= 294 EQN=164	Ft-K SMN = RIRFT-R K
a = 164 0.85(3)(66)=	0.97" × 15" J	# 07 SI	rudo = 164/17.2 = 10 studo per side = 20 studo
ALL = 5(1×30)4(384(29000)	12) ³ = 0.98" ~1" (38)	' /	
		1.1	
AD+L= 5(1.42)(2 384(290	10) ⁴ (12) ³ = 1,40 ~ イ 200(63日)	(1,5" /	
- Exterior "Cantilever	ed" Beam	22/12/1	
Table 3-20 I = 212104	AL = 5wl4.	5(1)(22)4(120° - 0.96" >0.73" No.
Ireq= 249 102			
2		5.Qn = B1.C	
a = 81.0 = 0.4	18"×1.5" #0	Estudis = 81	117.2 = Sstudo per side = 10 studo
ALL = 5(1)(22)+(12)) ³ = 0.72" ×0.73 263)	"√	
D+L= 5(1.42) (2 384(29000	<u>a)4(12)3</u> =1.02"× D(253)),}''√	
	Try W16×31 $a = \frac{164}{0.85(3)(66)}$ $\Delta u = \frac{5(1230)4}{384(29005)(66)}$ $\Delta u = \frac{5(1230)4}{384(29005)(66)}$ $\Delta max = \frac{1}{240}$ $\Delta D + L = \frac{5(1.42)(2}{384(29005)(62)}$ $\Delta D + L = \frac{5(1.42)(2}{384(29005)(20)}$ T = 212in4 Try W12×22 $a = \frac{81.0}{0.95(32(20))} = 0.4$ $\Delta u = \frac{5(1)(22)^4(12)}{384(29005)(20)}$ $\Delta max = \frac{2}{240} = 2$	Try W16×31 PNA location 6 $a = \frac{164}{2.85(3)(66)} = 0.97' \times 15" J$ $\Delta u = \frac{5(1\times 30)^4(12)^3}{384(29005)(638)} = 0.98" \times 1'$ $\Delta u = \frac{5(1\times 30)^4(12)^3}{384(29005)(638)} = 0.98" \times 1'$ $\Delta max = \frac{1}{240} = \frac{30(12)}{240} = 1.40" \times 304(29006)(238)$ $\Delta b = \frac{5(1.43)(30)^4(12)^3}{384(29006)(238)} = 1.40" \times 304(29006)(238)$ $= Exterior "Cantilevered" Beam Table 3-20 Amax = 2/860 T = 212in^4 \Delta u = \frac{50217}{38461}Ereg = 249in^2Try W12 \times 22 PNA location 7a = \frac{81.0}{0.95(3)(22)^4(12)^3} = 0.92" \times 0.733\Delta u = \frac{5(1)(22)^4(12)^3}{384(2900)(265)} = 0.92" \times 0.73$	Try W16×31 PNA location 6 $Mn = 2944$ a = 164 a = 164 a = 164 $a = 5(1230)4(12)3 = 0.98" \times 1" \sqrt{384(29000)(638)}$ $\Delta u = 5(1230)4(12)3 = 0.98" \times 1" \sqrt{384(29000)(638)}$ $\Delta max = 4/240 = 30(12)/240 = 1.5"$ $\Delta D + L = 5(1.42)(30)4(12)3 = 1.40" \times 1.5" \sqrt{384(29000)(238)}$ - Exterior "Cantilevered" Beam Table 3-20 $\Delta max = 4/8100 = 28(12)(12)^{2}$ $T = 212in4$ $\Delta u = 5ulf = 5(1)(20)4(12)^{2}$ $Try W12 \times 32$ PNA location 7 $Mn = 153$ 29 = 81.0 a = 81.0 a = 81.0 a = 81.0 $a = 5(1)(23)4(12)^{3} = 0.9a^{11} \times 0.73" \sqrt{384(29000)(263)}$

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	Alternative Slab 2	Composite Steel Deck	Composite Beams
	Design the Gird	ers	
0	Interior Girden Tributary wid	th : worst case 30'	
	beam self-	weight: 31 p.4 (30) = 0.93	
		2(28.2)=57.5K	
	157.5	K 57.5K	
	+ 10' + 16		
	Vn=57 5K Mn=Pa= 5	7.5(10)=575 f4-K	
	Stell Construct W21×68	tion Manual -Table 3. ØMn=600ff-K >Mn=575f	2 +-KJ ØVn=273K > Vn=57.5.K/
	Exterior Girder Tributary wid		
	beam self-w	oright: 31 plf (10) + 22 plf	(11)=0.552K
0		3,1+28.2=52,0K	
	5a.ok	JSa.oK	
	A 10' 10'	10 1	
	Vn= 52.0K		
	Mn = Pa = 5c	2,0(10) = 520 K	
	Steel Constr W21×62 Ø	uction Manual - Table : Mn= 540ft-K>Mn = SeoK J	5-2_ ÓVn=252K>Vn=52.0.K√
	" Cantilevered	" Girder	
	Tributory w	idth: 11	
	beam self-	weight : 22, peg (11) = 0.24	2 K
	0,242(1,2)	+ 28,1 = 23.4K .	
	23.4K	1.23.4K	
	A 10' 10'	V	
\cup	Vn = 23,4 K		
		23.4(10) = 234 Ft-K	
	Steel Const W18×35	ruction Manual - Table 3-2 BMn = 249 FL-K > Mn = 234 FL	2 -KJ ØVn=159K>Vn=23,4KJ

	Alternative Slab 2	Composite Steel Deck	Composite Beams	
	Check Deflec	utions in Girders		
0		er (worstcare 30.)		
	ALL = PL3 = 3	$p_{0} = \frac{30(12)}{360} = 1''$ $\frac{30(30)^{3}(12)^{3}}{28(29000)(1480)} = 1.16'' > 1''$	No!	
	Trya W24 Su= <u>Pl3</u> = 28E1	×68 <u>30(30)³(12)³</u> = D194"<1 28(29600)(1830)	" \	
	DD+1 = PL3.	10 = 30(12)/(240) = 1.5" = 43.9(30)3(12)3 28(29000)(1230) = 1.38"<	1.5″∫	
	Exterior Gird			
	Au = Pl3 -	0 = 30(12)/360 = 1" <u>21.9(30)⁵(12)⁵ =</u> 0.95" < 1" 28(29000)(1330)	1	
0	Dmax = 1/240 DOL = <u>PL3</u> = 2887	= 30 ⁽¹²⁾ /240 = 1.5" 30 <u>15(30)⁵(12)⁵ =</u> 1.32" <1.5" 28(24000)(330)	" J	
	"Cantilevered"	Girder		
	Dmax = l/3c $\Delta u = Pl3 = 38E1$	00 = 30(12)/360 = 1" <u>15 (30)³(12)³</u> = 1.69" ->1" N 28 (29000)(515)	10!	
	Try W 21×50 DUE=PL3 = 2BE1	15(30)3(12)3 = 6,88"<1" 28(2900)(984)	J	
	$Dmax = \frac{1}{2}$ $\Delta D+L = P13$ 28E1	40 = 30(12)/240 = 1.5" = 1 <u>5.9 (30)3(12)3</u> = 0.93". 28(29000)(984)	<1.5″ √	
0				

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	Alternative Slab 2 Composite Steel Deck Composite Beams
	Design Stel Hangers for Contilevers
0	
	12' M Material: Round HSS, A500
	alook fy=42kai
	10:10" 46.1° Fil: 58 Kai
	TROSIL LOODING;
	10-10" 96.6K 4th Floor - (23.4K) aquidens per rod + 1.5K Str Floor - (23.4K) aquidens per rod + 1.5K
	6th Floor - (23.4K) Zanders per rod + 1.5K
	48.5E 7th Floor - will carry itself to the column
	10-10" Total tensile force in top rod
	10'-10" PU=268K
	Stel Construction Manual - Table 5-7
	HSS6.875 × 0.500
	Ag= 9.36in2 DPnyielding=354K>Pu=268KV Ac=0.75Ag=7.02in2 DPn rupture=305K>Pu=268KV
	J (
	If this alternative system gots used, the course
	If this alternative system gets used, the columns should be redesigned in stell and the hanger connections should be checked against the Ac=7.02in ²
	connictions should be checked against the AC=+. 0211"
0	

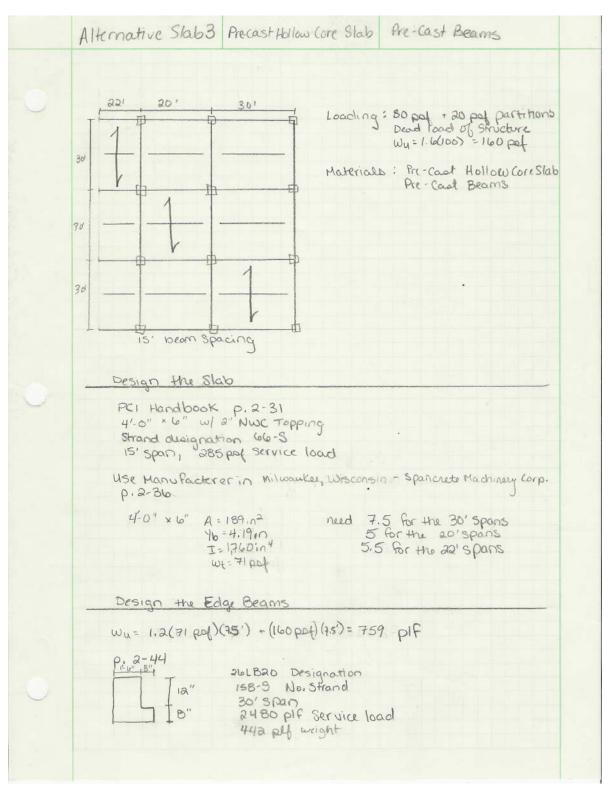
Technical Report 2

House of Sweden Washington, DC

October 24, 2008

APPENDIX D – Pre-Cast Hollow Core Slab on Pre-Cast Beams

Pre-Cast Hollow Core Slab on Pre-Cast Beams



Kimberlee McKitish Structural Option		House of Sweden Washington, DC
Advisor: Dr. Andres Lepage	Technical Report 2	October 24, 2008

Pre-Cast Hollow Core Slab on Pre-Cast Beams

	Alternative Slab3 Pre-Cast Hollow Core Slab Pre-Cast Beams
	Design the Interior Beams
0	Wu = 1.2(71 pop)(30') + (160pop)(30') = 7356 plf
	P' 2-45 1-45 1-45 1-45 1-45 1-45 1-45 1-45 1
	28" 198-5 No. Strand 30' span 16" 7440 plf Service Load
	BIT PIF weight
	Design the "Cantilevered" Beams
	Non - Prismatic Beam Wu = 1.2(7/pop)(30) - (100 pop)(30)=7350 plf
	$Mu_{i} = \frac{We^{2}}{a} = \frac{(7356)(11)^{2}}{a} = 439 \text{ ft-K}$
	$Mu_2 = \frac{100^2}{2} = \frac{7356(20)^2}{2} = 1754$ Ft-K
0	· Estimate size) · Estimate size @
	$20H_{4} = bd^{2} 20(439) = 24d^{2} d = 19.1'' 20(1754) = 24d^{2} d = 38.2'' 20(1754) = 24d^{2} d = 38.2'' 20(1754) = 24d^{2} 20(1754) = 24$
	not considered a deep beam a1'= ln 7 4h= 4(40)= 13.3'
	· Compute Asreq 1) · Compute Asreq 2
	$\begin{array}{rcl} As=Mu &=& \frac{439}{40} = 5.75 \text{ in}^2 & As=Mu = 1754 \\ 4d &=& \frac{439}{40} = 6622 \text{ (i)} = 11.5 \text{ in}^2 \\ 4d &=& \frac{439}{40} = 4622 \text{ (i)} = 11.5 \text{ in}^2 \\ (12) = 922 \text{ (i)} = 922 \text{ (i)} = 1222 \text{ in}^2 \\ (12) = 922 \text{ in}^2 \\ (12)$
	Assume Es > Ey
	$a = \frac{A_5 F_{12}}{f_{12}^2 F_{13}^2 F_{13}^2} = \frac{6(60)}{6(0.75)(24)} = \frac{3.33''}{5.6} = \frac{12(60)}{6(0.75)(24)} = \frac{6.67''}{6(0.75)(24)} = \frac{6.67''}{6(0.75)(24)} = \frac{12(60)}{6(0.75)(24)} = 12($
	$C = \frac{9}{8} = \frac{3.33}{0.75} = 4.44''$ $C = \frac{9}{8} = \frac{6.67}{0.75} = 8.89''$
0	$\frac{e_{s} = e_{u}(d-c) = 0.003(19.1-4.44)}{C} = 0.00991 e_{s} = 0.003(32.2-8.89) = 0.00989$
	\$=0.9 \$

Structural Option Washington, DC Advisor: Dr. Andres Lepage **Technical Report 2** October 24, 2008 Pre-Cast Hollow Core Slab on Pre-Cast Beams Alternative Slab 3 Pre-Cost Hollow Core Slab Pre-Cast Beams 1,1280 (1) to AND. · \$Mn at (2) $\begin{array}{ll} & \phi_{Mn} = \phi_{ASF_{4}} \left(d - \frac{9}{2} \right) \\ & = 0.9 \left(6 \right) \left(6 \right) \left(19.1 - \frac{3}{3}.33 \right) \\ & = 0.9 \left(6 \right) \left(6 \right) \left(19.1 - \frac{3}{3}.33 \right) \\ & = 0.9 \left(12 \right) \left(6 \right) \left(382 - \frac{6 \cdot 67}{2} \right) \\ & = 0.9 \left(12 \right) \left(6 \right) \left(382 - \frac{6 \cdot 67}{2} \right) \\ & = 1883 \ Ft - K > Mu = 1754 \ Ft - K \\ \end{array}$ · As, min () · As, min @ Asmin = 31FC bd = 316000 (24)(19.1) Asmin = (316000 (24)(38.2)-3.55 in 24 $f_{4} = 60000$ $= 1.78in^{2} \leftarrow 60000$ = 20064 = 200(24)(19.1) $= 1.53in^{2}$ 60000 200(24)(38.2) - 3,06in2 60000 Asmin KAS V Asimin < As J · As, max (2) · As, max () fmax = 0.85 B1 (fc/Rj) (tw/62+0,004) = 0.85(0.75) (b/60) (0.003/0.007) = 0.02732 As, max = pmax bd = 0.02732 (24)(38.2) = 25.0in² As max = pmax 60 = 0,02732(24)(9.1) = 12.5.02 AS & As, max J As KASMAK V USC (12) #9 bars at the top of the beam · Shear Reinforcing Vc= 27 JFE bud = 2(1) 16000 (24) (38.2) = 142K @ column = 2(1) 16000 (24) (19.1) = 71.0 K @ midspan \$10=0.5(0.75)(142)=53.3K @ colomn = 0.5(0.75)(71.0)=26.6K @ midopan Vu= 159 K @ column 3 need the reinforcing throughout = 79.7 @ midspon 3 the entire beam

House of Sweden

Kimberlee McKitish

Advisor: Dr. Andres Lepage **Technical Report 2** October 24, 2008 **Pre-Cast Hollow Core Slab on Pre-Cast Beams** Pre-Cast Hollow Core Slab Pre-Cast Beams Alternative Slab 3 VS= VU/B-VC = 159/0.75-53.3 = 159K = 8-16000 (24)(38.2) = 568K/ VS ≤ 4, 5000° (24)(38,2) = 284KJ Smax = {d/a = 38.2/2 = 19.1" ← Use 19" Use # 3 stimupo @ 19" (4 legs Av=0.44in=) S=AV Fyt d/VS= 0.44 (60) (38.2)/159 = 6.34" USE 6" Use (4) #3 stirrups : 1@2", 41@ 6" 45

House of Sweden Washington, DC

Kimberlee McKitish

Structural Option

Technical Report 2

October 24, 2008

Pre-Cast Hollow Core Slab on Pre-Cast Beams

								HO		OW-	CO	RE			U	Se Intop		n Pr	opert Top	pped	
Safe loads show psf for untopped topped member Lono-time camb	of stra and (7) wn incl d men rs. Re) lude de nbers a imainde	ad loa and 15 er is ih	psf fo	or 1.	¹ ∕2" €	N 	orm	al We		5	Crete		2" 6"	l y _b y _t S _b S _t wt		254 195	in. ⁴ in. in. ³ in. ³ plf	28 1,64 4.1 3.8 39 42 29	0 in. 4 in. 6 in. 5 in. 5 plf	4 3 3
dead load but do Capacity of sec are similar. Fo hollow-core man	tions o or prec	f other ise val	config	uration	s al	I		fp	f _c = ou = 2	5,000 270,00) psi 00 ps	i			DL V/S		49 1.73	psf in.	,	'4 psi	ſ
Key 444 – Safe sup 0.1 – Estimate 0.2 – Estimate	d camb	per at e	rection,	in.																	
																			41	IC6	
Table of saf	e su	perin	npos	ed s	ervic	e loa	ad (p	sf) a	nd c	ambe	ers (ii	n.)					-	•	No	Тор	ping
Strand Designation-	10	11	12	13	14	15	16	17	18	5 19	20 20	t 21	22	23	24	25	26	27	28	29	30
Code 66-S	444 0.1	382 0.2	333 0.2	282 0.2	238 0.2	203 0.2	175 0.2	151 0.2	131 0.2	114 0.2	100	88 0.2	77 0.1	68 0.0	59 -0.1	52 -0.2 -0.7	46 -0.4 -0.9	40 -0.5 -1.2	-0.7	28	
76-S	0.2	0.2 445 0.2	0.2 388 0.2	0.2 328 0.2	0.3 278 0.3	0.3 238 0.3	0.2 205 0.3	0.2 178 0.3	155 0.3	0.1 136 0.3	0.1 120 0.3	0.0 105 0.3	-0.1 93 0.3	-0.3 82 0.2	-0.5 73 0.1	65 0.1	57 0.0	49 -0.1	42 -0.3	-0.4 -1.6	31 -0.6 -2.0
96-S		0.3 466 0.3	0.3 421 0.3	0.3 386 0.3	0.3 338 0.4	0.3 292 0.4	0.3 263 0.4	0.3	0.3 201 0.5 0.6	0.3 177 0.5 0.6	0.2 157 0.5 0.5	0.1 139 0.5 0.5	0.0 124 0.5 0.4	-0.1 110 0.5 0.3	-0.2 99 0.5 0.2	-0.4 88 0.4 0.1	-0.7 78 0.3 -0.1	68 0.3	60 0.1	53 0.0 -0.9	46 -0.1 -1.3
87-S		0.3 478 0.3 0.4	0.4 433 0.4 0.5	0.4 398 0.4 0.5	0.5 362 0.5 0.6	0.5 322 0.5 0.7	0.5 290 0.6 0.7	0.6 264 0.6 0.7	240 0.7 0.8	212 0.7 0.8	188 0.7 0.8	167 0.7 0.8	149 0.8 0.7	134 0.8 0.7	0.2 119 0.7 0.6	107 0.7 0.5	95 0.7 0.3	-0.5 85 0.6 0.2	76 0.5	68 0.4 -0.3	60 0.3 -0.6
97-S		490 0.4 0.5	445 0.4 0.6	407 0.5 0.6	374 0.5 0.7	346 0.6 0.8	311 0.7 0.8	276 0.7 0.9	242 0.8	220 0.8 1.0	203 0.9 1.0	186 0.9 1.0	166 0.9 1.0	148 0.9 0.9	133 1.0 0.9	119 0.9 0.8	107 0.9 0.7	96 0.9	86 0.8	78 0.7 0.1	70 0.6 -0.2
Table of safe Strand Designation-	e suj	perim		F		e loa	ad (p	sf) a	19		ers (ii pan, f		23	2		in. N	orm	al W	4HC eight	26 + 2 Top	
Code	470	396	335	28	5 24	44 :	210	182	158	136	113	93	75	5	9 4	16	34	21	20	29	30
66-S	0.2 0.2	0.2 0.2 461		. 0.	2 0		02 0.1 248	0.2	0.2 0.0 188	0.2 -0.1 163	0.2 -0.2 137	0.1 -0.3 115	0.1 -0.5 95	0. -0. 7	7 -0		0.2 1.2 50	38	27		
76-S		461 0.2 0.2	0.3	0.	3 0	.3	0.3 0.2	0.3 0.2	0.3 0.1	0.3 0.1	0.3 0.0	0.3 -0.2	95 0.2 -0.3		1 0	.1 -	0.0	-0.1 -1.2	-0.3 -1.5		
	E 97		473		4 0	.4	319 0.5 0.4	279 0.5 0.4	245 0.5 0.4	216 0.5 0.3	186 0.5 0.3	160 0.5 0.2	137 0.5 0.1	11 0. -0.	5 0	.4	82 0.3 0.5	68 0.3 -0.7	55 0.1 -1.0	43 0.0 -1.4	33 -0.1 -1.7
96-S			0.4	0.	4 0	.4	0.4	0.4	0.4	0.9	4.4										
96-S 87-S	_		0.4 485 0.5 0.5	44 0.	6 4 ⁻ 5 0	15 : .6	21.2	0.4 331 0.7 0.6	292 0.7 0.6	258 0.7 0.5	224 0.7 0.5	195 0.8 0.4	169 0.8 0.4	14	7 12 7 0	27 1 .7	109 0.7 0.1	94 0.6 -0.3	80 0.5 -0.5	67 0.4 -0.8	55 0.3 -1.2

Strength is based on strain compatibility; bottom tension is limited to $7.5\sqrt{f_c^2}$; see pages 2–7 through 2–10 for explanation.

421 0.7 0.7 394 0.7 0.7 357 0.8 0.7

494 0.5 0.6

PCI Design Handbook/Sixth Edition

288 0.9 0.7

251 0.9 0.7 219 0.9 0.6 192 0.9 0.6 168 1.0 0.5 146 0.9 0.4

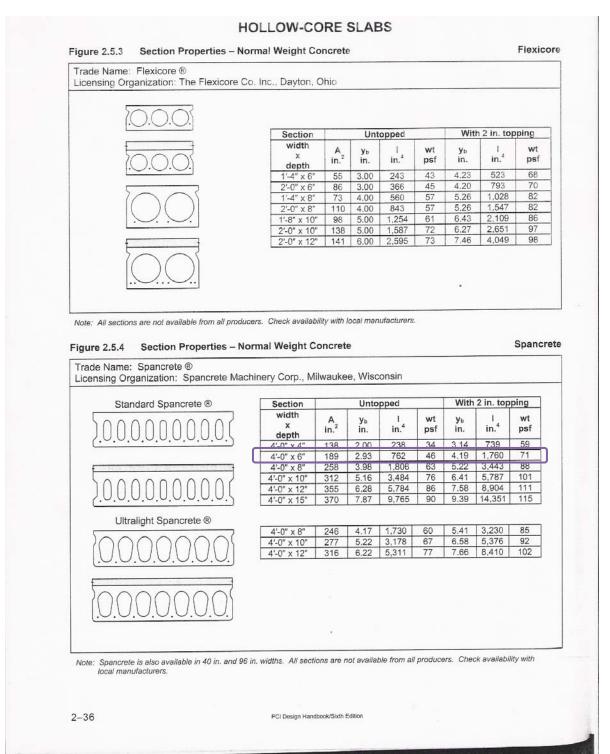
0.8

0.2 0.0

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Pre-Cast Hollow Core Slab on Pre-Cast Beams



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II.

Pre-Cast Hollow Core Slab on Pre-Cast Beams

							L-BE	AMS										
													No	orma	I We	ight	Con	cret
	1'-6"	8"				_			Sec	tion	Proper	ties	÷					
-	-	-			Designa	tion	h in	h1/h; in./in		A n ²	l in ⁴		Уb in	S	b 3	St in 3		wt olf
-		4	4	ſ	26LB2	0	20	12/8		24	14,29	8	9.09		573	1.31		442
					26LB2		24	12/12		28	24,71		10.91		265	1,88		550
	1	h ₁	1		26LB2		28	16/12		00	39,24		12.72		085	2,56		625
			h		26LB3		32	20/12		72	58,53		14.57		017	3.35		700
	L				26LB3		36	24/12		44	83,17		16.45		056	4,25		775
		h ₂	9		26LB4 26LB4		40	24/16		48 20	114,38		18.19 20.05		288	5,24 6.35		883 958
1		112	T		26LB4		48	32/16		92	197.15		21.94	100000	986	7.56		033
1		1			26LB5		52	36/16			250,12		23.83	10,4		8,87	S	108
-	2'-2"	-			26LB5		56	40/16			311,58		25.75	12.1		10,30		183
		5 000 noi			26LB6		60	44/16			382,11		27.67	13,8		11,81		258
		5,000 psi	- 1					for availat								land	000	
		270,000 ps	51					allowed, 1									800 p	si top
		diameter	trand					allowed, i e significa									ing.	
	IOW-I	elaxation s	uanu		1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -	000050	121622-157			1085584					200320		10.585 A	
Key														•				
		fe superimp				plf.												
		timated car																
C	.2 – Es	timated lon	g-time	e cam	ber, in.													
Table	of onfo	unarimna	and a	onio	a load (n	15)	ad an	nhore (- 1									
Table	or sale	superimpo	seu s	ervic	e ioau (p	ii) ai	iu cai	inders (i	n.)			-						
Desig-	No.	y₅(end) in.							Spa	n ft								
		V _a (center)	-					-				-	12221010		11000		_	_
nation	Strand	y₅(center) in.	16	18	20 22	24	26	28 30	32	34	36	38	40	42	44	46	48	50
nation	Strand	in.	16 9672		20 22		26 3428 2					38		42 1080	44 950	46	48	50
26LB20		in. 2.67	9672 0.4	7563 (0.5	6054 4938 0.6 0.7	4089 0.8	3428 2 1.0	903 2480 1.1 1.2	2134 1.4	34 1847 1.5	1607 1.6	403	1230 1.8	1080 1.9	950 1.9	46	48	50
		in.	9672	7563 0.5 0.3	0.6 0.7 0.3 0.4	4089 0.8 0.4	3428 2 1.0 0.5	903 2480 1.1 1.2 0.5 0.6	2134 1.4 0.6	34 1847 1.5 0.7	1607 1.6 0.7	403 1.7 0.7	1230 1.8 0.7	1080 1.9 0.7	950 1.9 0.6			
26LB20	158-S	in. 2.67 2.67 2.67	9672 0.4	7563 0.5 0.3	6054 4938 0.6 0.7 0.3 0.4 9165 7493	4089 0.8 0.4 6221	3428 2 1.0 0.5 5231 4	903 2480 1.1 1.2 0.5 0.6 445 3811	2134 1.4 0.6 3293	34 1847 1.5 0.7 2863	1607 1.6 0.7 2503	403 1.7 0.7 198	1230 1.8 0.7 1938	1080 1.9 0.7 1714	950 1.9 0.6 1520	1350	1202	1070
	158-S	in. 2.67 2.67	9672 0.4	7563 0.5 0.3	6054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5	4089 0.8 0.4 6221 0.6	3428 2 1.0 0.5 5231 4 0.7	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9	2134 1.4 0.6	34 1847 1.5 0.7	1607 1.6 0.7 2503 2 1.2	403 1.7 0.7	1230 1.8 0.7	1080 1.9 0.7	950 1.9 0.6			
26LB20	158-S	in. 2.67 2.67 2.67 2.67	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2	903 2480 1.1 1.2 0.5 0.6 445 3811	2134 1.4 0.6 3293 1.0 0.3	34 1847 1.5 0.7 2863 1.1	1607 1.6 0.7 2503 1.2 0.3	403 1.7 0.7 198 1.3 0.3	1230 1.8 0.7 1938 1.3 0.3	1080 1.9 0.7 1714 1.4	950 1.9 0.6 1520 1.5 0.2	1350 1.5 0.1	1202 1.5	1070
26LB20	158-S	in. 2.67 2.67 2.67 2.67 3.33	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8	2134 1.4 0.6 3293 1.0 0.3 4511 0.9	34 1847 1.5 0.7 2863 1.1 0.3 3935 1.0	1607 1.6 0.7 2503 1.2 0.3 3452 1.1	403 1.7 0.7 198 1.3 0.3 3043 1.2	1230 1.8 0.7 1938 1.3 0.3 2694 1.3	1080 1.9 0.7 1714 1.4 0.2 2394 1.3	950 1.9 0.6 1520 1.5 0.2 2134 1.4	1350 1.5 0.1 1907 1.5	1202 1.5 0.1 1707 1.5	1070 1.5 0.0 1532 1.6
26LB20 26LB24	158-S	in. 2.67 2.67 2.67 2.67	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3	2134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3	34 1847 1.5 0.7 2863 1.1 0.3 3935 1.0 0.3	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3	403 1.7 0.7 198 1.3 0.3 3043 1.2 0.3	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3	1350 1.5 0.1 1907 1.5 0.3	1202 1.5 0.1 1707 1.5 0.2	1070 1.5 0.0 1532 1.6 0.2
26LB20 26LB24 26LB28	158-S 158-S 188-S	in. 2.67 2.67 2.67 2.67 3.33	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809	2134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912	34 1847 1.5 0.7 2863 1.1 0.3 3935 1.0 0.3 5169	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545	403 1.7 0.7 198 1.3 0.3 3043 1.2 0.3 0.3	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3 2844	1350 1.5 0.1 1907 1.5 0.3 2551	1202 1.5 0.1 1707 1.5 0.2 2294	1070 1.5 0.0 1532 1.6 0.2 2067
26LB20 26LB24	158-S 158-S 188-S	in. 2.67 2.67 2.67 2.67 3.33 3.33	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7	2134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8	34 1847 1.5 0.7 2863 1.1 0.3 3935 1.0 0.3 5169 0.9	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545	403 1.7 0.7 2198 1.3 0.3 0.3 0.3 0.3 0.3 1.2 0.3 1.2 0.3 1.1	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3 2844 1.3	1350 1.5 0.1 1907 1.5 0.3 2551 1.4	1202 1.5 0.1 1707 1.5 0.2 2294 1.5	1070 1.5 0.0 1532 1.6 0.2 2067 1.5
26LB20 26LB24 26LB28	158-S 158-S 188-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3	2134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3	34 1847 1.5 0.7 2863 1.1 0.3 3935 1.0 0.3 5169 0.9 0.3	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 1.0 0.4	403 1.7 0.7 198 1.3 0.3 3043 1.2 0.3 1.2 0.3 1.1 0.4	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3	1070 1.5 0.0 1532 1.6 0.2 2067 1.5 0.3
26LB20 26LB24 26LB28	158-S 158-S 188-S 218-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 8722	2134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3	34 1847 1.5 0.7 2863 1.1 0.3 3935 1.0 0.3 5169 0.9 0.3	1607 / 1.6 0.7 2503 2 1.2 0.3 3452 2 1.1 0.3 4545 4 1.0 0.4 5854 3	403 1.7 0.7 198 1.3 0.3 3043 1.2 0.3 1.2 0.3 1.1 0.4	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3	1070 1.5 0.0 1532 1.6 0.2 2067 1.5
26LB20 26LB24 26LB28 26LB32	158-S 158-S 188-S 218-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3	2134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585	34 1847 1.5 0.7 2863 1.1 0.3 3935 1.0 0.3 5169 0.9 0.3 6643	1607 / 1.6 0.7 2503 / 1.2 0.3 3452 / 1.1 0.3 4545 / 1.0 0.4 5854 / 0.9	403 1.7 0.7 2198 1.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002	1070 1.5 0.0 1532 1.6 0.2 2067 1.5 0.3 2715
26LB20 26LB24 26LB28 26LB32 26LB36	158-S 158-S 188-S 218-S 248-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8	34 1847 1.5 0.7 2863 1.1 0.3 3935 1.0 0.3 5169 0.9 0.3 6643 0.9 0.3	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 1.0 0.4 5854 0.9 0.4	403 1.7 0.7 2198 1.3 0.3 0.3 0.3 0.4 0.3 0.4 0.18 1.1 0.4 0.4 0.4 0.4	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4	1070 1.5 0.0 1532 1.6 0.2 2067 1.5 0.3 2715 1.5
26LB20 26LB24 26LB28 26LB32	158-S 158-S 188-S 218-S 248-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 5.11	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.4 5854 0.4 7246 0.9	403 1.7 0.7 2198 1.3 0.3 8043 1.2 0.3 8043 1.2 0.3 0.18 1.1 0.4 1.86 1.0 0.4 9426 0.9	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 5726 1.0	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 5123 1.1	950 1.9 0.6 1.520 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 3699 1.3 0.4 4601 1.2	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 1.2	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3	1070 1.5 0.0 1532 1.6 0.2 2067 1.5 0.2 2715 1.5 0.4 3392 1.4
26LB20 26LB24 26LB28 26LB32 26LB36	158-S 158-S 188-S 218-S 248-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372	34 1847 1.5 0.7 2863 1.1 0.3 3935 1.0 0.3 5169 0.9 0.3 6643 0.9 0.3 8216	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 1.0 0.4 5854 0.9 0.4 7246 0.9 0.3	403 1.7 0.7 2198 1.3 0.3 3043 1.2 0.3 5043 1.2 0.3 5018 1.1 0.4 5186 1.0 0.4 5426 0.9 0.4	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 5726 1.0 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 5123 1.1 0.4	950 1.9 0.6 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 3699 1.3 0.4 4601 1.2 0.4	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 1.2 0.4	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 0.4	1070 1.5 0.0 1532 1.6 0.2 2067 1.5 0.2 2715 1.5 0.4 3392 1.4 0.4
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40	158-S 158-S 188-S 218-S 248-S 278-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 5.11	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 1.0 0.4 5854 0.9 0.4 7246 0.9 0.3 8992 7	403 1.7 0.7 2198 1.3 0.3 3043 1.2 0.3 3043 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.4 1.4 0.4 0.4 0.9 0.4 986	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 5726 1.0 0.4 7127	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 4125 5123 1.1 0.4 6388	950 1.9 0.6 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 3699 1.3 0.4 4601 1.2 0.4 5748	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 1.2 0.4 5189	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 0.4 4698	1070 1.5 0.0 1532 1.6 0.2 2067 1.5 0.2 2715 1.5 0.4 3392 1.4 0.4 4266
26LB20 26LB24 26LB28 26LB32 26LB36	158-S 158-S 188-S 218-S 248-S 278-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 5.11 5.11	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.4 7246 0.9 0.3 8992 0.8	403 1.7 0.7 2198 1.3 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.4 305 1.2 0.4 1.5 0.4 1.5 0.4 1.5 0.4 1.5 0.4 1.5 0.4 1.5 0.4 1.5 0.4 1.5 0.4 1.5 0.4 1.5 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 3568 1.2 0.4 4615 1.1 0.4 5726 1.0 0.4 7127 0.9	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 5123 1.1 0.4 6388 1.0	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 3699 1.3 0.4 4601 1.2 0.4 5748 1.0	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 4 4145 1.2 0.4 5189 1.1	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 0.4 4698 1.2	1070 1.5 0.0 1532 1.6 0.2 2067 1.5 0.2 2715 0.4 3392 1.4 0.4 4266 1.2
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40	158-S 158-S 188-S 218-S 248-S 278-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.00 4.50 4.50 5.11 5.11 5.29 5.29	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.4 3043 1.2 0.4 3048 1.1 0.4 3048 1.2 0.4 3048 1.2 0.4 3048 1.2 0.4 3048 1.2 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 4615 1.1 0.4 5726 0.0 4 7127 0.9 0.3	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 5123 1.1 0.4 6388 1.0 0.3	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 3699 1.3 0.4 3699 1.3 0.4 5748 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 1.2 0.4 5189 1.1 0.3	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 0.4 4698 1.2 0.3	1070 1.5 0.2 1532 1.6 0.2 2067 1.5 0.2 2715 1.5 0.4 3392 1.4 0.4 4266 1.2 0.3
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40	158-S 158-S 188-S 218-S 248-S 278-S 288-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 5.11 5.11 5.11 5.29 5.29 5.75	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.3 3043 1.2 0.4 3043 1.2 0.4 3048 1.1 0.4 3048 1.2 0.4 3048 1.2 0.4 3048 1.2 0.4 3048 1.2 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 5726 1.0 0.4 5726 1.0 0.4 7127 0.9 0.3 8609	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 5123 1.1 0.4 6388 1.0 0.3	950 1.9 0.6 1520 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 3699 1.3 0.4 3699 1.3 0.4 5748 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 1.2 0.4 5189 1.1 0.3	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 0.4 4698 1.2 0.3	1070 1.5 0.2 1532 1.6 0.2 2067 1.5 0.2 2715 1.5 0.4 3392 1.4 0.4 4266 1.2 0.3
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40 26LB44	158-S 158-S 188-S 218-S 248-S 278-S 288-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.00 4.50 4.50 5.11 5.11 5.29 5.29	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 5726 1.0 0.4 5726 1.0 0.4 5726 1.0 0.4 8509 0.3 8609	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 1.1 0.3 1.2 0.4 1.2 0.4 1.1 0.4 1.2 0.3 1.2 0.3 1.2 0.4 1.2 0.3 1.2 0.4 1.1 0.3 1.2 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	950 1.9 0.6 1.520 1.520 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 4601 1.2 0.4 5748 1.0 0.3 6961 1.0 1.2 1.2 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 1.2 0.4 5189 1.1 0.3 6294 1.1	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 0.4 4698 1.2 0.3 5708 1.2	1070 1.5 0.0 1532 1.6 0.2 2067 1.5 0.2 2715 1.5 0.4 3392 1.4 0.4 4266 1.2 0.3 5191 1.3
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40 26LB44 26LB48	158-S 158-S 188-S 218-S 248-S 278-S 288-S 328-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 5.11 5.11 5.29 5.29 5.75 5.75	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 4615 1.1 0.4 4615 1.1 0.4 7127 0.9 0.3 8609 0.4 0.9 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 6388 1.0 0.3 7726 1.0 0.4 9137	950 1.9 0.6 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 4601 1.2 0.4 5748 1.0 0.3 0.4 5748 1.0 0.3 0.4 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 1.5 0.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 1.2 0.4 5189 1.1 0.3 6294 1.1 0.3 7459	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 0.4 4698 1.2 0.3 5708 1.2 0.4 6773	107(1.5 0.0 1532 1.6 0.2 2067 1.5 0.4 3392 1.4 0.4 4266 1.2 0.3 5191 1.3 0.4 6167
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40 26LB44	158-S 158-S 188-S 218-S 248-S 278-S 288-S 328-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 4.50 5.11 5.11 5.29 5.29 5.75 5.75 5.75 6.29	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 4615 1.1 0.4 4615 1.1 0.4 7127 0.9 0.3 8609 0.4 0.9 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 5123 1.1 0.4 6388 8.10 0.3 7726 0.4 9137 0.9	950 1.9 0.6 1.5 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 3699 1.3 0.4 1.5 0.2 2134 1.4 1.5 0.2 2134 1.5 0.2 2134 1.5 0.2 2134 1.5 0.2 2134 1.5 0.4 3699 1.3 0.4 1.5 0.4 3699 1.3 0.4 1.5 0.5 0.4 1.5 0.5 0.4 1.5 0.5 0.4 1.5 0.5 0.4 1.5 0.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 0.5 1.5 1.5 0.5 1.5 1.5 0.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 5189 0.4 5189 0.4 1.1 0.3 6294 1.1 0.3 7459 1.1	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 0.4 4698 1.2 0.3 5708 1.2 0.4 4673 1.2 0.4 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.5 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.2 0.3 0.4 1.5 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	1070 1.5 0.0 1532 1.6 0.2 2065 1.5 0.4 3392 1.4 0.4 4266 1.2 0.3 5191 1.3 0.4 6167 1.2
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40 26LB44 26LB48	158-S 158-S 188-S 218-S 248-S 278-S 288-S 328-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 5.11 5.11 5.29 5.29 5.75 5.75	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 4615 1.1 0.4 4615 1.1 0.4 7127 0.9 0.3 8609 0.4 0.9 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 7726 1.0 0.3 7776 1.0 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0	950 1.9 0.6 1.520 1.520 1.520 2.134 1.4 0.3 2.2134 1.4 0.3 0.4 3.699 1.3 0.4 4.601 1.2 0.4 4.601 1.2 0.4 4.601 1.2 0.4 0.4 3.6961 1.3 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 5189 1.1 0.4 5189 1.1 0.4 7459 1.1 0.4	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 0.4 4698 1.2 0.3 5708 1.2 0.4 6773 1.1 0.4	1070 1.5 0.2 2067 1.5 0.2 2715 1.5 0.4 3392 1.4 0.4 4266 1.2 0.3 5191 1.5 0.4 4266 1.2 0.3 5191 1.5 0.4 0.2 0.5 0.2 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.5 0.4 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40 26LB44 26LB48	158-S 158-S 188-S 218-S 248-S 278-S 288-S 328-S 358-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 4.50 5.11 5.11 5.29 5.29 5.75 5.75 5.75 6.29	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 4615 1.1 0.4 4615 1.1 0.4 7127 0.9 0.3 8609 0.4 0.9 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 7726 1.0 0.3 7776 1.0 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0	950 1.9 0.6 1.520 1.520 1.520 1.520 1.2 0.2 1.4 0.3 22134 1.3 0.4 1.3 0.4 3699 1.3 0.4 4601 1.2 0.4 4601 1.2 0.4 5748 4601 1.2 0.4 6961 1.0 0.4 86961 1.0 0.4 1.0 1.5 1.2 0.4 1.3 0.3 0.3 0.4 1.3 0.3 0.4 1.3 0.3 0.4 1.3 0.3 0.4 1.3 0.3 0.4 1.0 0.0 1.0 0.0 0	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 1.2 0.4 5189 1.1 0.3 6294 1.1 0.4 7459 1.1 0.4 88641	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 2294 1.5 0.3 3002 1.4 0.4 4698 1.2 0.3 5708 1.2 0.4 6773 1.1 0.4 7853	1070 1.5 0.0 2067 1.5 0.2 2715 1.5 0.4 33902 1.4 4266 1.2 0.3 5191 1.3 0.4 4266 1.2 0.3 5191 1.5 0.4 3392 1.4 0.4 3392 1.5 0.4 3392 1.5 0.4 3392 1.5 0.4 3392 1.5 0.4 3392 1.5 0.4 3392 1.5 0.4 3392 1.5 0.4 3392 1.5 0.4 3392 1.5 0.4 3392 1.5 0.4 3392 1.5 0.5 1.5 0.4 3392 1.5 0.4 35 1.5 0.4 35 1.5 0.4 35 1.5 0.4 35 1.5 0.4 35 1.5 0.4 35 0.4 35 1.5 0.4 35 1.2 0.5 35 1.2 0.5 35 1.2 0.5 35 1.2 0.5 35 1.2 0.5 35 1.2 0.5 1.2 0.5 1.2 0.5 1.2 0.5 1.2 0.5 1.2 0.5 1.2 0.5 1.2 0.5 1.2 0.5 1.2 0.5 1.2 0.5 1.2 1.5 1.2 0.5 1.2 1.5 1.2 0.5 1.2 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40 26LB44 26LB48	158-S 158-S 188-S 218-S 248-S 278-S 288-S 328-S 358-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 5.11 5.11 5.29 5.29 5.75 5.75 6.29 6.29	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 3452 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 4615 1.1 0.4 4615 1.1 0.4 7127 0.9 0.3 8609 0.4 0.9 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 7726 1.0 0.3 7776 1.0 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0	950 1.9 0.6 1.520 1.520 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 4601 1.2 0.4 5748 1.0 0.4 5748 1.0 0.4 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.4 0.4 1.5 0.4 0.4 1.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 4145 5189 1.1 0.4 4145 5189 1.1 0.4 4145 5189 1.1 0.4 4145 5189 1.1 0.4 4145 518 6294 1.1 0.4 1.5 518 1.1 1.1 1.5 518 1.2 518 1.3 518 1.3 518 1.4 518 518 518 518 518 518 518 518	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 0.4 3745 1.3 3002 1.4 0.4 3745 1.3 0.4 4698 1.2 0.3 5708 1.2 0.4 6773 1.1 1.0 77853 1.1	1070 1.5 0.0 1532 1.6 0.2 2067 1.5 0.4 22067 1.5 0.4 22067 1.5 0.4 22067 1.5 0.4 22067 1.5 0.4 22067 1.5 0.4 2057 1.5 0.4 2057 1.5 0.4 2057 1.5 0.4 2057 1.5 0.4 2057 1.5 0.4 2057 1.5 0.4 2057 1.5 0.4 2057 1.5 0.4 2057 1.5 0.4 2057 1.5 0.4 2057 1.5 0.5 1.5 0.5 1.5 1.5 0.5 1.5 1.5 0.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40 26LB44 26LB48	158-S 158-S 188-S 218-S 248-S 278-S 288-S 328-S 358-S	in. 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 5.11 5.11 5.29 5.29 5.29 5.75 5.75 6.29 6.29 7.00 7.00	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 34525 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 4615 1.1 0.4 4615 1.1 0.4 7127 0.9 0.3 8609 0.4 0.9 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 7726 1.0 0.3 7776 1.0 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0	950 1.9 0.6 1.520 1.520 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 4601 1.2 0.4 5748 1.0 0.4 5748 1.0 0.4 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.4 0.4 1.5 0.4 0.4 1.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 0.4 3328 1.3 0.4 4145 5189 1.1 0.3 6294 1.1 0.3 6294 1.1 0.4 8641 1.0 0.4	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 4698 1.2 0.3 5708 1.2 0.4 6773 1.1 0.4 7853 1.1 0.4	1070 1.5 0.0 2067 1.5 0.2 20715 1.5 0.4 3392 1.4 0.4 4266 1.2 0.3 5191 1.3 0.4 6167 1.5 0.4 1.6 0.2 1.5 0.4 1.6 0.2 1.5 0.4 1.5 1.5 0.4 1.5 1.5 0.4 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5
26LB20 26LB24 26LB28 26LB32 26LB36 26LB40 26LB44 26LB48 26LB52	158-S 158-S 188-S 218-S 248-S 278-S 288-S 328-S 358-S 378-S	in. 2.67 2.67 2.67 2.67 3.33 3.33 4.00 4.00 4.50 4.50 5.11 5.11 5.29 5.29 5.75 5.75 6.29 6.29 7.00	9672 0.4	7563 0.5 0.3	3054 4938 0.6 0.7 0.3 0.4 9165 7493 0.5 0.5 0.2 0.2	4089 0.8 0.4 6221 0.6 0.2 8437 0.6 0.2	3428 2 1.0 0.5 5231 4 0.7 0.2 7170 6 0.6 0.2 9265 7 0.6	903 2480 1.1 1.2 0.5 0.6 445 3811 0.8 0.9 0.3 0.3 056 5207 0.7 0.8 0.3 0.3 906 6809 0.7 0.7 0.3 0.3 0.3 8722 0.7	2 134 1.4 0.6 3293 1.0 0.3 4511 0.9 0.3 5912 0.8 0.3 7585 0.8 0.3 9372 0.7	34 1847 1.5 0.7 2863 1.1 0.3 3935 5169 0.9 0.3 6643 0.9 0.3 8216 0.8	1607 1.6 0.7 2503 1.2 0.3 34525 1.1 0.3 4545 4545 0.9 0.4 7246 0.9 0.3 8992 0.3 8992 0.3	403 1.7 0.7 2198 1.3 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.2 0.3 0043 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1230 1.8 0.7 1938 1.3 0.3 2694 1.3 0.3 3568 1.2 0.4 4615 1.1 0.4 4615 1.1 0.4 4615 1.1 0.4 7127 0.9 0.3 8609 0.4 0.9 0.4	1080 1.9 0.7 1714 1.4 0.2 2394 1.3 0.3 3180 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 4125 1.2 0.4 7726 1.0 0.3 7776 1.0 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0	950 1.9 0.6 1.520 1.520 0.2 2134 1.4 0.3 2844 1.3 0.4 3699 1.3 0.4 4601 1.2 0.4 5748 1.0 0.4 5748 1.0 0.4 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.2 0.4 1.5 0.4 0.4 1.5 0.4 0.4 1.5 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	1350 1.5 0.1 1907 1.5 0.3 2551 1.4 4.4 3328 1.3 0.4 3328 1.3 0.4 3328 1.4 0.4 3328 1.5 1.5 0.3 2551 1.5 0.3 2551 1.4 4 1.5 5.189 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.5 5.189 1.1 5.189 1.2 0.4 4 1.2 0.4 4 1.2 0.4 8 6294 1.1 0.4 8 6294 1.1 0.4 8 6294 1.1 0.4 8 6294 1.1 0.4 9 904 9904	1202 1.5 0.1 1707 1.5 0.2 2294 1.5 0.3 3002 1.4 4698 1.2 0.3 5708 1.2 0.4 6773 1.1 0.4 7853 1.1 0.4	1070 1.5 0.0 1532 2067 1.5 0.2 20715 1.5 0.4 22715 1.5 0.4 4266 1.2 0.3 5191 1.3 0.4 6167 1.5 0.4 6167 1.2 0.5 1.1 0.4 8217 1.5 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 1.5 0.4 8217 8217 1.5 0.4 8217 1.5 0.4 8217 8217 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5

Technical Report 2

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PCI Design Handbook/Sixth Edition

October 24, 2008

Pre-Cast Hollow Core Slab on Pre-Cast Beams

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	98-S	in. 2.44 2.44 2.73	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0	89 271 0.4 0. 0.1 0. 882 403 0.4 0.	1 2262 5 0.5 1 0.1 4 3374 4 0.5	1905 1617 0.6 0.7 0.0 0.0 2850 2427 0.6 0.6	32 381 1 0.7 0.0 2081 1 0.7	34 36 186 1022 0.7 0.8 0.0 -0.1 795 1555 0.7 0.7	135 0.	1 1178 8 0.8	1029 0.8	44 4	6 48	50
	98-S	in. 2.44 2.44 2.73 2.73	6511 5 0.2 0.1 9612 7	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0.	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1	1905 1617 0.6 0.7 0.0 0.0 2850 2427 0.6 0.6 0.1 0.1	32 381 1 0.7 0.0 2081 1 0.7 0.7 0.1	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.1 0.0	135 0. 0.	1 1178 8 0.8 0 -0.1	1029 0.8 -0.2	44 4 352 119		
81724	98-S	in. 2.44 2.44 2.73 2.73 3.08	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0	89 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0.	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5	1905 1617 0.6 0.7 0.0 0.0 2850 2427 0.6 0.6 0.1 0.1 4031 3451 0.5 0.6	32 381 1 0.7 0.0 2081 1 0.7 0.1 2976 2 0.6	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.1 0.0 2582 2252 0.7 0.7	135 0. 0. 197 0.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8	1029 0.8 -0.2 1530 13 0.8	352 119 0.9 0.	7 1061	3
81724	98-S 188-S	in. 2.44 2.44 2.73 2.73 3.08 3.08	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0 0.1 0.1 0	89 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0.	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1	1905 1617 0.6 0.7 0.0 0.0 2850 2427 0.6 0.6 0.1 0.1 4031 3451 0.5 0.6 0.1 0.7	32 381 1 0.7 0.0 2081 1 0.7 0.1 2976 2 0.6 0.1	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.1 0.0 2582 2252	135 0. 0. 197 0. 0.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0	1029 0.8 -0.2 1530 13 0.8 0.0 -	352 119 0.9 0. 0.1 -0. 376 167	7 1061 8 0.8 2 -0.2 3 1496	3 2 5 1337
81T24 81T28	98-S 188-S	in. 2.44 2.44 2.73 2.73 3.08 3.08 3.08 3.47	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 382 403 0.4 0. 0.1 0. 322 565 0.3 0. 0.1 0. 0.1 0. 0.1 0. 0.1 0. 0.3 0. 0.49 752 0.3 0.	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4	1905 1617 0.6 0.7 0.850 2427 0.6 0.6 0.1 0.1 4031 3451 0.5 0.6 0.1 0.1 5389 4628 0.5 0.5	32 381 1 0.7 0.0 2081 1 0.7 0.1 2976 2 0.6 0.1 4006 3 5 0.6	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.1 0.0 2582 2252 0.7 0.7 0.1 0.1 3490 3057 0.6 0.7	135 0. 0. 197 0. 0. 269 0.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8	1029 0.8 -0.2 1530 13 0.8 0.0 - 2110 18 0.8	352 119 0.9 0. 0.1 -0. 376 167 0.9 0.	7 1061 8 0.8 2 -0.2 3 1496 9 0.9	3 2 5 1337 9 0.9
81T24 81T28	98-S 188-S 138-S	in. 2.44 2.73 2.73 3.08 3.08 3.08 3.47 3.47	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 022 565 0.3 0. 0.1 0. 0.1 0. 0.22 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0.	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4 1 0.1	1905 1617 0.6 0.7 0.0 0.0 2850 2427 0.6 0.6 0.1 0.1 4031 3451 0.5 0.6 0.1 0.7 5389 4628 0.5 0.5 0.1 0.7	32 381 1 0.7 0.0 2081 1 0.7 0.1 2976 2 0.6 0.1 4006 3 5 0.6 0.1	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.1 0.0 2582 2252 0.7 0.7 0.1 0.1 2582 2252 0.7 0.7 0.1 0.1 3490 3057	135 0. 0. 197 0. 0. 269 0. 0.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1	1029 0.8 -0.2 1530 13 0.8 0.0 - 2110 18 0.8	352 119 0.9 0. 0.1 -0. 376 167 0.9 0. 0.0 0.	7 1061 8 0.8 2 -0.2 3 1495 9 0.9 0 0.0 1 2040	3 2 3 1337 9 0.9 0 -0.1 0 1836
281T24 281T28 281T32	98-S 188-S 138-S	in. 2.44 2.73 2.73 3.08 3.08 3.08 3.47 3.47 3.50	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 022 565 0.3 0. 0.1 0. 0.1 0. 0.22 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0.	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4 1 0.1 2 8295 3 0.4	1905 1617 0.6 0.7 0.0 0.0 2850 2427 0.6 0.6 0.1 0.1 4031 3457 5389 4622 0.5 0.6 0.1 0.1 7075 6092 0.4 0.3	32 381 1 0.7 0.0 2081 1 0.7 0.1 2976 2 0.6 0.1 4006 3 5 0.6 0.1 2 5287 4 5 0.5	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.2582 2252 0.7 0.1 0.4 0.1 3490 3057 0.6 0.7 0.1 0.1 4619 4060 0.6 0.6	135 0. 0. 197 0. 0. 269 0. 0. 358 0.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 7 3183 7 0.7	1029 0.8 -0.2 1530 12 0.8 0.0 - 2110 18 0.8 0.1 2835 28 0.8	352 119 0.9 0. 0.1 -0. 376 167 0.9 0. 0.0 0. 534 227 0.8 0	7 1061 8 0.8 2 -0.2 3 1495 9 0.9 0 0.0 1 2040	3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
281T24 281T28 281T32	98-S 188-S 138-S 158-S	in. 2.44 2.43 2.73 2.73 3.08 3.08 3.08 3.47 3.47 3.47 3.50 3.50	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4 1 0.1 2 8295	1905 1617 1005 1617 0.6 0.7 0.0 0.0 2850 2427 0.6 0.6 0.1 0.1 4031 3451 0.5 0.6 0.1 0.7 5389 4622 0.5 0.5 0.1 0.7 7075 6092 0.4 0.4 0.1 0.1	32 381 1 0.7 2081 1 0.7 0.1 2976 2 0.6 0.1 4006 3 5 0.6 0.1 25287 4 5 0.5 0.1	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.1 0.0 2582 2252 0.7 0.7 0.1 0.1 3490 3057 0.6 0.7 0.1 0.1 4619 4060	135 0. 197 0. 269 0. 0. 358 0. 0.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 7 3183 7 0.7 1 0.1	1029 0.8 -0.2 1530 13 0.8 0.0 - 2110 18 0.1 2835 29 0.8 0.1	352 119 0.9 0. 0.1 -0. 376 167 0.9 0. 0.0 0. 534 227 0.8 0	7 1061 8 0.8 2 -0.2 3 1495 9 0.9 0 0.0 1 2040 9 0.8 0 0.0	3 3 3 3 3 3 3 3 3 3 3 2 2 3 3 3 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3
281724 281728 281732 281736	98-S 188-S 138-S 138-S 158-S 168-S	in. 2.44 2.73 2.73 3.08 3.08 3.47 3.47 3.50 3.50 3.50 4.21	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4 1 0.1 2 8295 3 0.4	1905 1617 1905 1617 2850 2427 2850 2427 0.1 0.1 4031 3457 0.1 0.1 5389 4628 0.5 0.6 0.1 0.1 7075 6099 0.4 0.1 0.4 0.2 0.4 0.4 0.4 0.4	32 381 1 0.7 0.0 2081 1 0.7 0.1 2976 2 0.6 0.1 2976 2 0.6 0.1 25287 4 5.0.5 0.5 0.5 0.5 0.5 0.5 0.5 0	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.1 0.0 0.582 2252 0.7 0.7 0.1 0.1 3490 3057 0.6 0.7 0.1 0.1 1.1 4619 4060 0.6 0.1 0.1 56647 4966 0.6 0.6	135 0. 0. 197 0. 0. 269 0. 0. 258 6 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 7 3183 7 0.7 1 0.1 0 3898 7 0.7	1029 0.8 -0.2 1530 12 0.8 0.0 -0.2 2110 18 0.8 0.1 2835 28 0.1 3474 3 0.8	352 119 0.9 0. 0.1 -0. 376 167 0.9 0. 0.0 0. 534 227 0.8 0 0.0 0 107 278 0.8 0	7 1061 8 0.8 2 -0.2 3 1495 9 0.9 0 0.0 1 2040 1 2040 1 2050 8 0.9	5 1337 9 0.9 0 -0.1 0 1836 9 0.9 0 -0.1 5 2258 9 0.9
281724 281728 281732 281736	98-S 188-S 138-S 138-S 158-S 168-S	in. 2.44 2.43 2.73 2.73 3.08 3.08 3.08 3.47 3.47 3.47 3.50 3.50	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4 1 0.1 2 8295 3 0.4	1905 1617 0.6 0.7 0.0 0.0 2850 2422 2850 2423 0.5 0.6 0.1 0.5 0.5 0.5 0.5 0.5 0.1 0.7 7075 8092 0.4 0.3 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.1	32 1381 10.7 0.0 2081 1 0.7 0.0 2081 1 0.7 0.1 2976 1 0.1 2976 1 0.1 2976 1 0.1 2976 1 0.1 2976 1	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.1 0.8490 3057 0.6 0.6 0.1 0.1 0.6 0.6 0.1 0.1 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0.6	135 0. 0. 197 0. 0. 0. 269 0. 0. 0. 358 5 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 7 3183 7 0.7 1 0.1 0 3898 7 0.7 1 0.1	1029 0.8 -0.2 1530 13 0.8 0.0 -2110 18 0.8 0.1 2835 25 0.8 0.1 3474 3 0.8 0.1	352 119 0.9 0. 376 167 0.9 0. 376 167 0.376 0. 0.376 167 0.376 0. 0.0 0. 0.376 0.77 0.8 0 0.8 0 0.1 0	7 1061 8 0.8 2 -0.2 3 1495 9 0.9 0 0.0 1 2040 9 0.9 0 0.0 37 2506 8 0.9 1 0.1 5 316	3 5 1337 9 0.9 0 -0.1 0 1836 9 0.9 0 -0.1 5 2258 9 0.9 1 0.1 2 2859
281724 281728 281732 281736 281740	98-S 188-S 138-S 158-S 168-S 198-S	in. 2.44 2.44 2.73 2.73 3.08 3.08 3.08 3.47 3.47 3.47 3.50 3.50 4.21 4.21 4.21 4.21	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4 1 0.1 2 8295 3 0.4	1905 1617 0.6 0.7 2850 2427 0.6 0.6 0.1 0.1 4031 345' 0.5 0.6 0.1 0.7 5389 4622 0.5 0.6 0.1 0.7 7075 6097 0.4 0.1 0.2 0.6 0.4 0.1 0.1 0.1 7075 6097 0.4 0.1 0.1 0.1 9.1 0.1 0.2 0.1 0.3 0.1 0.4 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.2 0.3 9.8 9.8	32 381 0.7 0.0 2081 0.7 0.0 2081 0.7 0.1 2976 0.6 0.1 4006 0.1 25287 5 5 0.1 5460 5 5 0.1 5 5 0.1 5 0.5 0.1 5 0.5 0.5	34 36 34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 5647 4966 0.6 0.6 0.1 0.1 5697 6165 0.5 0.5	135 0. 197 0. 269 0. 0. 2558 0. 0. 0. 3588 0. 0. 0. 5546 50.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 7 3183 7 0.7 1 0.1 0 3898 7 0.7 1 0.1 0 3898 7 0.7 1 0.1 1 0.1	1029 0.8 -0.2 1530 13 0.8 0.1 2110 18 0.8 0.1 2835 29 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1	352 119 0.9 0. 0.1 -0. 376 167 0.9 0. 0.0 0. 534 227 0.8 0 0.0 0 107 278 0.8 0 0.1 0 896 350 0.7 0	7 1061 8 0.8 2 -0.2 3 1496 9 0.9 0 0.0 1 2040 9 0.5 0 0.0 1 2040 9 0.5 0 0.0 1 2040 9 0.5 0 0.0 1 2040 9 0.5 0 0.0 1 2040 1 2040 200 200 200 200 200 200 200 200 200	3 5 1337 9 0.9 00.1 0 1836 9 0.9 00.1 3 2258 9 0.9 1 0.1 2258 9 0.9 0.9 00.1 0 10.9 0.9 00.1 0 10.9 0.9 00.1 0 10.9 0.9 00.1 0 10.9 0.9 00.1 0 10.9 0.9 0.9 0.9 00.1 0 10.9 0.9 00.1 0 10.9 0.9 00.1 0 10.9 0.9 00.1 0 10.9 0.9 00.1 0 10.9 0.9 0.9 00.1 0 10.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9
281724 281728 281732 281736 281740	98-S 188-S 138-S 158-S 168-S 198-S	in. 2.44 2.44 2.73 2.73 3.08 3.08 3.08 3.47 3.47 3.50 3.50 4.21 4.21	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4 1 0.1 2 8295 3 0.4	1905 1617 0.6 0.7 2850 2427 0.6 0.6 0.1 0.5 0.5 0.4 0.5 0.6 0.1 0.7 5389 4622 0.5 0.5 0.1 0.7 7075 6092 0.4 0.3 0.4 0.4 0.4 0.4 0.1 0.7 8638 7444 0.4 0.3 918 918	32 381 1 0.7 0.0 2081 1 0.7 0.1 2976 2 0.6 0.1 2976 2 0.6 0.1 0.1 2976 2 0.6 0.1 2976 2 0.6 0.1 2976 2 0.6 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.1 0.1 1459 0.6 0.1 0.1 14619 4060 0.6 0.6 0.1 0.1 15647 4966 0.6 0.6 0.1 0.1 5697 6165 0.5 0.6 0.5 0.5 0.5 0.6 0.5 0.6	135 0. 0. 197 0. 0. 269 0. 0. 2358 0. 0. 358 0. 0. 5469 0. 0. 5469 0. 0. 3667	1 1178 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 7 3183 7 0.7 1 0.1 0 3898 7 0.7 1 0.1 2 4861 6 0.7 1 0.1 2 4861	1029 0.8 -0.2 1530 13 0.0 -2110 18 0.8 0.1 2835 24 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 4344 30 0.7 0.1 5330 4	352 119 0.9 0. 0.1 -0. 5376 167 0.9 0. 0.0 0 534 227 0.8 0 0.0 0 107 278 0.8 0 0.1 0 896 350 0.7 0 0.1 0 0.1 0 791 437	7 1061 8 0.8 2 -0.2 3 1495 9 0.5 0 0.0 1 2040 9 0.5 0 0.0 7 2506 8 0.3 1 0. 5 316 .8 0.3 1 0. 20 390	3 3 3 3 3 3 3 3 3 3 3 3 3 3
281724 281728 281732 281736 281740 281744	98-S 188-S 138-S 158-S 168-S 198-S	in. 2.44 2.73 2.73 3.08 3.08 3.47 3.47 3.50 3.50 4.21 4.21 4.40 4.40 4.55	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4 1 0.1 2 8295 3 0.4	1905 1617 0.6 0.7 2850 2427 0.6 0.6 0.1 0.1 4031 345' 0.5 0.6 0.1 0.7 5389 4622 0.5 0.6 0.1 0.7 7075 6097 0.4 0.1 0.2 0.6 0.4 0.1 0.1 0.1 7075 6097 0.4 0.1 0.1 0.1 9.1 0.1 0.2 0.1 0.3 0.1 0.4 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.2 0.3 9.8 9.8	32 381 1 0.7 0.0 2081 1 0.7 0.1 2081 1 0.7 0.1 2086 2 0.6 0.1 2086 2 5 0.6 0.1 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.1 0.1 14619 4060 0.6 0.6 0.1 0.1 15647 4966 0.6 0.6 0.1 0.1 5697 6165 0.5 0.5	135 0. 0. 197 0. 0. 269 0. 0. 3588 6. 0. 5546 50. 0. 5546 50. 0. 0. 5546 50. 0. 5546 50. 0. 0. 5546 50. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 7 3183 7 0.7 1 0.1 02 3898 7 0.7 1 0.1 102 4861 1.6 0.7 1 0.1 16 5953 6 0.6	1029 0.8 -0.2 1530 13 0.8 0.0 -2110 18 0.8 0.1 2835 29 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 3474 3 0.7 0.3 0.8 0.1 0.5 0.8 0.1 0.8 0.1 0.8 0.1 0.8 0.1 0.8 0.1 0.8 0.1 0.8 0.1 0.5 0.8 0.1 0.8 0.1 0.8 0.1 0.8 0.1 0.8 0.1 0.7 0.8 0.1 0.7 0.8 0.7 0.8 0.7 0.8 0.7 0.8 0.7 0.8 0.7 0.7 0.8 0.7 0.7 0.7 0.8 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	352 119 0.9 0. 0.1 -0. 376 167 0.9 0. 0.9 0. 0.376 127 0.8 0 0.0 0 107 278 0.8 0 0.1 0 896 350 0.1 0 896 350 0.1 0 791 432 0.7 0	7 1061 8 0.6 2 -0.2 3 1495 9 0.9 0 0.0 7 2040 9 0.9 0 0.0 7 2506 9 0.9 1 0.0 7 2506 8 0.9 1 0.5 5 316 .1 0.7 2 500 0 390 0 390 .8 0.6	3 5 1337 0 0.9 0 -0.1 0 1836 3 0.9 0 -0.1 3 2258 9 0.9 1 0.1 2 2859 8 0.8 1 0.0 7 3542 8 0.9
81724 81728 81732 81736 281740 281744	98-S 188-S 138-S 158-S 168-S 198-S 208-S	in. 2.44 2.73 2.73 3.08 3.08 3.08 3.47 3.47 3.50 3.50 4.21 4.21 4.21 4.40 4.40	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 4 0.5 1 0.1 1 5333 4 0.4 1 0.1 2 8295 3 0.4	1905 1617 0.6 0.7 2850 2427 0.6 0.6 0.1 0.1 4031 345' 0.5 0.6 0.1 0.7 5389 4622 0.5 0.6 0.1 0.7 7075 6097 0.4 0.1 0.2 0.6 0.4 0.1 0.4 0.2 8638 7444 0.4 0.2 918 918	32 381 1 0.7 0.0 2081 1 0.7 0.1 2081 1 0.1 25287 - 0 5 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.1 0.6 0.5 0.5 0.5 0.5 0.1 0.7 0.7 0.7 0.1 0.7 0.7 0.1 0.7 0.1 0.7 0.1 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.4 0.6 0.6 0.6 0.1 0.1 0.2582 2252 0.7 0.7 0.7 0.7 0.7 0.1 0.6 0.6 0.1 0.1 0.2582 2252 0.5 0.6 0.1 0.1 0.256 0.5 0.5 0.5 0.5 0.5 0.5 0.5	135 0. 0. 197 0. 0. 0. 358 5 0. 0. 0. 358 5 0. 0. 0. 5546 5 0. 0. 0. 3 5667 5 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 7 3183 7 0.7 1 0.1 7 3183 7 0.7 1 0.1 0 3898 87 0.7 1 0.1 2 4861 6 0.6 6 0.6 1 0.1	1029 0.8 -0.2 1530 12 0.8 0.0 -2110 18 0.8 0.1 2835 28 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 3374 4 0.7 0.1 5330 4 0.7 0.1	352 119 0.9 0.1 -0. 376 167 0.9 0. 0.0 0 534 227 0.8 0 0.0 0 534 227 0.8 0 0.1 0 896 350 0.7 0 0.7 0 0.7 0 0.7 0 0.1 0	7 1061 8 0.8 2 -0.2 3 1499 9 0.9 0 0.0 1 204(9 0.5 3 1490 9 0.9 0 0.0 0 0.0 1 204(9 0.5 3 160 8 0.9 .1 0. 20 3900 .8 0.1 .1 0.	3 5 5 5 1337 9 0 -0.1 1836 9 0.9 0 -0.1 5 2255 9 0.9 1 0.1 22859 8 0.8 1 0.1 22859 8 0.8 1 0.1 22859 8 0.8 1 0.1 22859 8 0.8 0.9 1 0.1 22859 8 0.8 0.9 1 0.1 22859 8 0.8 0.9 1 0.1 22859 8 0.8 0.9 1 0.1 22859 8 0.8 0.9 1 0.1 22859 8 0.8 0.9 1 0.1 2859 1 0.0 1 0.1 0 0.9 1 0.1 1 0.1 0 0.9 1 0.1 0 1 0.1 0 0.9 1 0.1 0 1 0.0 0 0.9 1 0.1 0 0.9 0 0.9 1 0.1 0 0.9 0 0.9 1 0.1 0 0.9 0 0.9 1 0.1 0 0 0 0 0 0 0 0 0 0 0 0 0
281724 281728 281732 281736 281740 281744 281748	98-S 188-S 138-S 158-S 168-S 198-S 208-S 228-S	in. 2.44 2.44 2.73 2.73 3.08 3.08 3.08 3.47 3.47 3.50 3.50 4.21 4.21 4.21 4.40 4.40 4.55 4.55 5.17	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 1 0.1 1 5333 4 0.4 4 0.5 1 0.1 1 5333 4 0.4 2 2295 3 0.4 1 0.1	1905 1617 0.6 0.7 0.0 0.0 2850 2422 0.5 0.6 0.1 0.7 5389 4628 0.5 0.5 0.4 0.1 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	32 381 1 0.7 0.0 2081 1 0.7 0.1 2081 1 0.1 25287 - 0 5 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.1 0.6 0.5 0.5 0.5 0.5 0.1 0.7 0.7 0.7 0.1 0.7 0.7 0.1 0.7 0.1 0.7 0.1 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.8 0.7 0.7 0.1 1.4 0.1 1.4 0.6 0.1 0.1 0.4 0.1 0.5 0.6 0.1 0.1 5647 4966 0.6 0.6 0.1 0.1 5627 522 0.5 0.5 0.1 0.1 5997<6165	135 0. 0. 197 0. 0. 269 0. 0. 358 6 0. 0. 358 6 0. 0. 0. 3 667 5 0. 0. 0. 3 783 5 0.	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.0 1 2379 7 0.7 0 3898 7 0.7 0 3898 7 0.7 1 0.1 0 3898 7 0.7 1 0.1 0 3898 6 5953 6 0.6 1 0.1 1 0.1	1029 0.8 -0.2 1530 12 0.8 0.0 -2110 18 0.8 0.1 2835 29 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 -3474 3 0.8 0.1 -3474 3 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	352 119 0.9 0. 0.76 167 376 167 363 227 0.8 0 0.0 0 0.77 167 0.8 0 107 27£ 0.8 0 0.1 0 994 33 0.7 0 0.7 0 0.1 0 647 414 0.7 0	7 1061 2 -0.2 3 1495 9 0.9 0 0.0 7 2506 8 0.9 7 2506 8 0.2 7 2506 9 0.2 7 2506 8 0.2 7 2506 8 0.2 7 2506 8 0.2 7 2506 8 0.2 7 2506 9 0.2 7	5 1337 5 1337 9 0.9 0 -0.1 0 1836 9 0.9 0 -0.1 3 2258 9 0.9 1 0.1 2 2859 8 0.8 1 0.0 7 3542 8 0.9 1 0.1 9 4196 8 0.8
81724 81728 81732 281736 281746 281744 281748	98-S 188-S 138-S 158-S 168-S 198-S 208-S	in. 2.44 2.73 2.73 3.08 3.08 3.08 3.47 3.47 3.50 3.50 3.50 4.21 4.21 4.21 4.40 4.40 4.55 4.55 5.17	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 1 0.1 1 5333 4 0.4 4 0.5 1 0.1 1 5333 4 0.4 2 2295 3 0.4 1 0.1	1905 1617 0.6 0.7 2850 2427 0.6 0.6 0.1 0.1 4031 345' 0.5 0.6 0.1 0.7 5389 4622 0.5 0.6 0.1 0.7 7075 6097 0.4 0.1 0.2 0.6 0.4 0.1 0.4 0.2 8638 7444 0.4 0.2 918 918	32 381 1 0.7 0.0 2081 1 0.7 0.1 2081 1 0.1 25287 - 0 5 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.1 0.6 0.5 0.5 0.5 0.5 0.1 0.7 0.7 0.7 0.1 0.7 0.7 0.1 0.7 0.1 0.7 0.1 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	34 36 186 1022 0.7 0.8 0.0 -0.1 795 1555 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.8 0.6 0.7 0.1 1.4419 0.057 0.6 0.6 0.1 0.1 105647 4966 0.6 0.6 0.1 0.1 18525 7523 0.5 0.5 0.1 0.1 9987 8822	135 0. 0. 197 0. 0. 269 0. 0. 0. 358 50. 0. 5546 50. 0. 5546 50. 0. 0. 5546 50. 0. 0. 5546 50. 0. 0. 5546 50. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	1 1178 8 0.8 0 -0.1 1 31735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 7 3183 1 0.1 7 3183 1 0.1 1 0.1 1 0.1 1 0.1 1 0.1 1 0.1 1 0.1 1 0.1 1 0.1 1 0.1 0 3888 6 0.6 8 1 0.1 1 0.1	1029 0.8 -0.2 1530 12 0.8 0.0 -2110 18 0.8 0.1 2835 25 0.8 0.1 3474 3 0.7 3474 3 0.8 0.1 4344 3 0.7 0.1 5330 4 0.7 0.1 6274 5 0.6 0.1 6274 5 0.6 0.1 6274 5 0.6 0.1 6274 5 0.6 0.1 6274 5 0.6 0.1 6274 5 0.6 0.1 6274 5 0.6 0.1 6274 5 0.6 0.1 6274 5 0.6 0.1 6274 5 0.7 0.7 0.8 0.1 0.1 0.8 0.1 0.7 0.1 0.7 0.6 0.1 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	352 119 0.9 0. 0.7 167 376 167 0.9 0. 0.37 167 0.9 0. 0.0 0 0.34 227 0.8 0 0.1 0 0.88 0 0.1 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.4 0.7	7 1061 8 0.8 2 -0.2 3 1499 9 0.9 0 0.0 0 0.0 1 2040 9 0.9 7 2500 8 0.0 1 0.0 5 316 8 0.0 1 0.0 8 0.0 1 0.0 8 0.0 1 0.0 8 0.0 1 0.0 8 0.0 1	3 2 3 3 3 3 3 3 3 3 3 3 3 3 3
81724 81728 81728 81732 81732 81736 281740 281744 281748	98-S 188-S 138-S 158-S 168-S 198-S 208-S 228-S 248-S	in. 2.44 2.73 2.73 3.08 3.08 3.08 3.47 3.47 3.50 3.50 4.21 4.21 4.21 4.40 4.40 4.55 4.55 5.17 5.17 5.17 5.23	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 1 0.1 1 5333 4 0.4 4 0.5 1 0.1 1 5333 4 0.4 2 2295 3 0.4 1 0.1	1905 1617 0.6 0.7 0.0 0.0 2850 2422 0.5 0.6 0.1 0.7 5389 4628 0.5 0.5 0.4 0.1 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	32 381 1 0.7 0.0 2081 1 0.7 0.1 2081 1 0.1 25287 - 0 5 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.1 0.6 0.5 0.5 0.5 0.5 0.1 0.7 0.7 0.7 0.1 0.7 0.7 0.1 0.7 0.1 0.7 0.1 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.8 0.7 0.7 0.1 1.4 0.1 1.4 0.6 0.1 0.1 0.4 0.1 0.5 0.6 0.1 0.1 5647 4966 0.6 0.6 0.1 0.1 5627 522 0.5 0.5 0.1 0.1 5997<6165	135 0. 197 0. 269 0. 0. 3588 50. 0. 3586 50. 0. 0. 3667 50. 100 3783 500 100 3783 500 100 3783 500 100 3783 500 100 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	1 1178 8 0.8 0 -0.1 3 1735 8 0.8 1 0.1 1 2379 1 0.1 1 31735 1 0.1 1 31735 1 0.1 1 31735 1 0.1 1 0.1	1029 0.8 -0.2 1530 12 0.8 0.0 -2110 18 0.8 0.1 2835 24 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 3474 3 0.7 0.1 5330 4 0.7 0.1 5330 4 0.7 0.1 1530 4 0.8 0.1 1530 12 0.8 0.1 1530 12 0.8 0.1 15330 4 0.7 0.1 15330 4 0.1 15330 4 1546 0.1 1546 0.	352 119 0.9 0. 0.76 167 376 167 376 167 376 167 300 0 0.9 0. 0.0 0 334 227 0.8 0 0.1 0 0.1 0 0.1 0 0.1 0 0.1 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0 0.7 0	7 1061 8 0.8 2 -0.2 3 1495 9 0.9 0 0.0 0 0.0 1 204(9 0.5 1 204(9 0.5 1 204(1 204(9 0.5 1 204(1 204(1)	3 5 1337 9 0.9 0 -0.1 0 1836 9 0.9 0 -0.1 2 2258 9 0.9 1 0.1 2 2859 8 0.8 1 0.0 7 3542 8 0.9 1 0.1 9 4196 8 0.8 1 0.1 4 5026
281752	98-S 188-S 138-S 158-S 168-S 198-S 208-S 228-S	in. 2.44 2.73 2.73 3.08 3.08 3.47 3.47 3.50 3.50 3.50 4.21 4.21 4.21 4.40 4.40 4.55 4.55 5.17 5.17 5.17	6511 5 0.2 0.1 9612 7 0.2	076 4049 32 0.3 0.4 0 0.1 0.1 0 504 5997 48 0.3 0.3 0 0.1 0.1 0 8353 68 0.3 0.3 0 0.1 0.1 0 90	189 271 0.4 0. 0.1 0. 082 403 0.4 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.2 565 0.3 0. 0.1 0. 0.49 752 0.3 0. 0.1 0. 983 983	1 2262 5 0.5 1 0.1 4 3374 4 0.5 1 0.1 7 4750 1 0.1 1 5333 4 0.4 4 0.5 1 0.1 1 5333 4 0.4 2 2295 3 0.4 1 0.1	1905 1617 0.6 0.7 0.0 0.0 2850 2422 0.5 0.6 0.1 0.7 5389 4628 0.5 0.5 0.4 0.1 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	32 381 1 0.7 0.0 2081 1 0.7 0.1 2081 1 0.1 25287 - 0 5 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.7 0.1 0.1 0.6 0.5 0.5 0.5 0.5 0.1 0.7 0.7 0.7 0.1 0.7 0.7 0.1 0.7 0.1 0.7 0.1 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	34 36 186 1022 0.7 0.8 0.0 -0.1 1795 1555 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.8 0.7 0.7 0.1 1.4 0.1 1.4 0.6 0.1 0.1 0.4 0.1 0.5 0.6 0.1 0.1 5647 4966 0.6 0.6 0.1 0.1 5627 522 0.5 0.5 0.1 0.1 5997<6165	135 0. 197 0. 269 0. 0. 3588 50. 0. 3586 50. 0. 0. 3667 50. 100 3783 500 100 3783 500 100 3783 500 100 3783 500 100 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	1 1178 8 0.8 0 -0.1 1 31735 8 0.8 1 0.0 1 2379 7 0.8 1 0.1 1 3183 7 0.7 1 0.1 1 0.1 0 3898 6 0.6 6 0.6 6 0.6 6 0.9 8 6998 6 0.9 1 0.1 1	1029 0.8 -0.2 1530 12 0.8 0.0 -2110 18 0.8 0.1 2835 24 0.8 0.1 2835 24 0.8 0.1 3474 3 0.8 0.1 3474 3 0.8 0.1 3474 3 0.7 0.1 5330 4 0.7 0.1 5330 4 0.7 0.1 5330 4 0.7 0.1 5330 4 0.7 0.8 0.1 1540 4 0.8 0.1 1540 4 0.1 1540 4 1540 4 154	352 119 0.9 0. 376 167 378 167 374 227 375 2427 376 367 377 378 378 227 379 38 370 374 371 374 377 378 377 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379 371 379	7 1066 8 0.8 2 -0.2 3 1495 9 0.9 0 0.0 1 2040 7 2506 8 0.9 1 2040 7 2506 8 0.9 1 2040 1 2040	3 2 5 1337 3 0 0 1836 3 0 0 0 0 0 0 0 0 0 0 0 0 0

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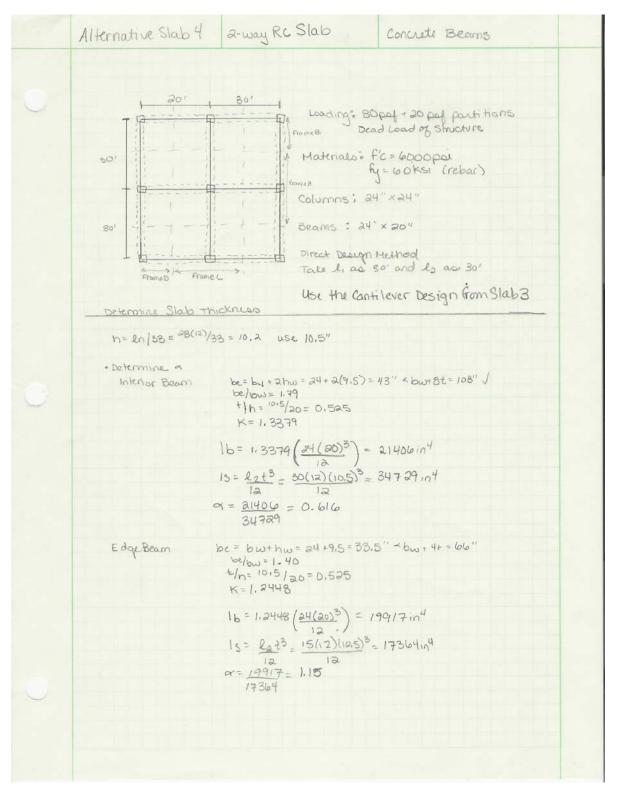
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APPENDIX E – Two-Way Reinforced Concrete Slab

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		Slab	Concrete Beams	
0	· Check the thickness			
	$\approx m Panel 1 = 1.15 + 1.15 + 0.6$	= 110+0.616	0.883	
	~m Parel 2 = 1.15+0.1616+0. 4	1616+0,616	- 0.750	
	$\pi m \text{ Rand } 3 = 0.616+ 0.616+0.44$	1616+0.616=	0,616	
	9 m Panel 4 = 1, 15 + 0, 616 + 4	0.616+0.616	2 = 0.750	
	$t_{min} = \frac{\ln (0.8 + 6) / 200,000)}{36 + 58 (4m - 0.2)}$	B=ln/Sn	$= \left(\frac{30-2}{30-2}\right) = 1$	
	$= \frac{30(0.8 + 40000 / 200,000)}{30 + 5(17(0.616 - 0.2))}$	1		
	= 10.4" < 10.5" assumed Deflection controlled through	n table 9.	5(c)	-
	Distribute the Moments			
	Wu= 1.2(10,5/12 * 150) + 1.6(100)	0		
-	Frame A Mo = 1/8 (0.318) (30) (3 Frame B Mo = 1/8 (0.318) (15) (30 Frame C Mo = 1/8 (0.318) (30) (30 Frame D Mo = 1/8 (0.318) (15) (30	$(2)^2 = 4674$ $(2)^2 = 9356$	57-K	
	Interior span			-
	Negative Factored Moment 0.6 Positive Factored Moment 0.35			
	Exterior Span	10+ 0.70		
	Interior Negative Factored Mom. Positive Factored Moment Exterior Negative Factor Mor	0.5		
	2			
				1
				- 1

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Two-Way	Reinforced	Concrete	Slab
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	Alternative	Slab 4	2-000	J RC S	ilab	Concrete Bed	2075	
0	FR	ame A						
		-150 +5	33 - 655	1-608	+ 327			
	Fra	me B						
		-74.7 +;	266 -327	1-304	+ 163			
	Fra	vie C						
		1-150 +5	033 -655	1-608	+327			
	Fran	ne D				•		
		- 74.7 +2	66 -327	1-304	+ 163			
	Ltem.	bescription			Frame B	Frame C	Frame D	
	1	Total width			180"	360"	180"	
	2 2	CSwidth MSwidth	180		90"	180" 2090"	90" 1090"	
1	3 4	MS WICHT] Torsional Con				19189	15523	
	4	Slab 15 = 2+3/1	2 347		15523 34729	34729	34729	
		Bt= 4215	a 577 0.2		0.22	0.28	0.22	
	7	x, = 10/15	0.6		1.15	0,62	1.15	
	8	lale,	1		1	1	1	
	9	ala/e,	0.62		(15	0.63	1.15	1
	10	Exterior - Mt			97.8	97.2%	97.8	
	11	+ M to CS	69.3		75%	69.3%		
	12	Interior - M			75 %	75 %	75%	
	Fran	ne A						
	Total Mone	nt -150 + 5	33 -655	-608	+327-			
	% in CS		7.3% 75%		69.3%			
	Mincs	-146 +3	69 -499	-456	.+227			
	MINMS		164 -156	-152	+100			
	Fran	neB						
\cup	Total Momen	nt -74,7 +2	66 - 327	- 304	+163			
	% in CS	97.8% 7	5% 75%	75%	75%			
	Mincs	-73.0 +6	200 - 245	-228	+122			
	MinMS	1-1.7 +0	ob -82	-76	+ 41			

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Two-Way Reinforced Concrete Slab
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	ie Slab 4	2-way 1	RC Slab		Concrete Be	zams
Fra	mec					
Total Momo	nt -150 +53	3 - 655	-608	+327		
% in CS	97.2% 69.	3% 75%	75-10	69.3%		
Mines	-146 +36		-456	+ 227		
MinMS	5 -4 +16	4 -156	-152	HDO		
Frai	ne D					
Total Mom			-304	+163		
% in CS			75%	75%		
Mincs		100 - 245	- 228	+122		
MinMs	5 [-1.7 +	66 -82	-76	+41		
De	sign Frame	A and Fra	ame C	Reinfor	cing	
· Desic	an Reinforcing	in CS				
A58	ume # 8 bar	3, 3/4" clea	an cover			
dsl	nort = 10.5 - 3/	4 - 1/2 (1.00)=9.25"			
d lo	ing= 9.25 - 1.	00=8,25	0.1 -		1.11	
	Deservice		ext. s		and the second se	Span M+
	. Description	- <u>Mes</u>	+533	the second s	- 608	+ 327
Item	MOGS					180"
1	Min CS (Swidth	190"		100		.00
12	CSwidth	180" Hh 8.25"				8.25"
1 2 3	CS width effective dep	th 8.25'	8.2.5"	8.25		8.25" + 363
12	CSwidth effectivedep Mn=Mu/ø	167 8.25°	8.25" +592	8.25	" 8ias"	8,25" + 363 356
- 2 0 4	CSwidth effectivedep Mn=Mu/p R=Mu/pbd2	163 Hh 8.25"	8.25" +592 580	8.25 - 728 713	" 8125" - 676 662	+ 363
- 2 つ エ ち	CSwidth effectivedep Mn=Mu/ø	163 Hh 8.25"	8.25" +592 580	8.25 - 728 713	" 8125" - 676 662	+ 363 356
- 2 3 + 6 9 + 8	CSwidth effective dep Mn=Mu/p R=Mu/pbda pfromtable f As=pbd	14 8.25' -167 163 152 0.0028 4.16	8,25" +592 580 2.0103 15.3 3.78	8.25 - 728 713 0.0129 19.2 3.78	" 8125" - 676 662 D.0119 17.7 3.78	+ 363 356 0.0062
1204597	CS width effective dep Mn = Mu/p R = Mu/p bd2 p from table f As = p bd As $min = 0.002b$	14 8.25' -167 163 152 0.0028 4.16 t 3.78	8.25" +592 580 1.0103 15.3 3.78 20	8.25 - 728 713 0.0129 19.2 3.78 25	" 8125" - 676 662 D.019 17.7 3.78 23	+ 303 356 0.0062 9.21 3.78 12
- 2 0 + 0 + 0	CSwidth effective dep Mn=Mu/p R=Mu/pbda pfromtable f As=pbd	14 8.25' -167 163 152 0.0028 4.16 t 3.78	8,25" +592 580 2.0103 15.3 3.78	8.25 - 728 713 0.0129 19.2 3.78	" 8125" - 676 662 D.0119 17.7 3.78	+ 363 356 0.0062 9.21 3.78
0 0 0 4 0 0 F 0 7 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0	CS width effective dep Mn = Mu/p R = Mu/p bda p from table P As = p bd Asmin = 0.002b n=	14 8.25" -167 163 152 0.0028 4.16 t 3.78 6 18 9	8:25" +592 580 0:0103 15:3 3:78 20 9	8.25 - 728 713 0.0129 19.2 3.78 25	" 8125" - 676 662 D.019 17.7 3.78 23	+ 303 356 0.0062 9.21 3.78 12
- 0 0 4 6 0 + 0 8 - 1 + 6 0 +	CS width effective dep Mn=Mu/g R=Mu/g bda p from table f As = p bd Asmin=0.002b n= action of tors n= att nuck dmin "c= 6000 poi	$\begin{array}{rcrc} H & 8.85' \\ & -167 \\ & 163 \\ & 163 \\ & 0.0028 \\ & 4.16 \\ & 4.16 \\ t & 3.78 \\ & 6 \\ & 12 \\ & 9 \end{array}$	8:25" +592 580 0:0103 15:3 3:78 20 9	8.25 - 728 713 0.0129 19.2 3.78 25	" 8125" - 676 662 D.019 17.7 3.78 23	+ 303 356 0.0062 9.21 3.78 12
1 2 3 4 5 5 4 8 9 10	CS width effective dep Mn = Mu/p R = Mu/p bd2 p from table P As = p bd Asmin = 0.002b n= <u>Inverses</u> Omin = 2t neck dmin "c = 6000 poir Pmax = 0.0273	$\begin{array}{rcl} H & 8.85' \\ & -167 \\ & 163 \\ & 0.0028 \\ & 4.16 \\ t & 3.78 \\ & 6 \\ & 12 \\ & 9 \\ \end{array}$	8:25" +592 580 0:0103 15:3 3.78 20 9	8.25 - 728 713 0.0129 19.2 3.78 25	" 8125" - 676 662 D.019 17.7 3.78 23	+ 303 356 0.0062 9.21 3.78 12
1 2 3 4 5 9 7 8 9 10 * 4 5 * 4 * 5	CS width effective dep Mn = Mu/p bda p from table P As = p bd As = 0.002 b n= Exercise of tors As = 0.0273 Au = 0 p fy bd ²	$\begin{array}{rcl} H & 8.85' \\ & -167 \\ & 163 \\ & 0.0028 \\ & 4.16 \\ t & 3.78 \\ & 6 \\ & 12 \\ & 9 \\ \end{array}$	8:25" +592 580 0:0103 15:3 3.78 20 9	8.25 - 728 713 0.0129 19.2 3.78 25	" 8125" - 676 662 D.019 17.7 3.78 23	+ 303 356 0.0062 9.21 3.78 12
1 2 3 4 5 9 7 8 9 10 • 4 5 • 4 5 • 4 5	CS width effective dep Mn = Mu/p R = Mu/p bda p from table f As = p bd Asmin = 0.002b n= incer of form Min = activity of st Naisting st Na	$\begin{array}{rcrcr} & 8.85' & -167 \\ & -167 \\ & 163 \\ & 163 \\ & 0.0028 \\ & 4.16 \\ & 4.16 \\ & 4.16 \\ & 1.16 \\ & $	8:25" +592 580 0:0103 15:3 3:78 20 9	8.25 - 728 713 0.0129 19.2 3.78 25 9	9 8125" - 676 662 0.0119 17.7 3.78 23 9	+ 363 356 0.0062 9.21 3.78 12 9
1234597890 0 + 55 ~ d	CS width effective dep Mn = Mu/p R = Mu/p bda p from table f As = p bd Asmin = 0.002b n= incer of form Min = activity of st Naisting st Na	$\frac{1}{16} = \frac{1}{163}$ $\frac{1}{163}$ $\frac{1}{163}$ $\frac{1}{16}$ $\frac{1}{1$	8.25" +592 500 0.0103 15.3 3.78 20 9 00 poin	8.25 - 728 713 0.0129 19.2 3.78 25 9	" 8125" - 676 662 D.019 17.7 3.78 23	+ 363 356 0.0062 9.21 3.78 12 9

Technical Report 2

	• Des	sign Reinforcine	1 n MS				
1	As	some = 5 baro,	5 5/4 clea	r cover			
	dsi	hort = 10,5 - 0.75-	1/2 (0.625)	= 9,44 "			
	di	ong = 9,44"-0,0	025" = 8.	· 82''			
		2		ext. spa	0	-	nt. span
	Item	Description	Me	xt M	+ Mint-	M-	H+
	1	MINMS	- L	+ + 164	1 -156	-152	
	2	width of MS	180	o" 180'	" 180"	180'	
	3	effective depth	8.9	32" 8.82		8,82	8.82"
	Ч	MO=MU/0	- 4.4			-169	+ ///
	5	R= Mu/dbda	4	150	149	145	95
	6	p from Table ASa	0,0000			0.0024	
	7	As=pbd	1.11	4.13	3,97	3.81	2,54
	8	Acris = A. AND had	3.18	0.01.01.24		3.18	
	9	h= larger of fors h= width + potrp Mmin > dt	11	14	13	13	11
	10 1	UWIU > OF	9	9	9	9	9
		heck down					
	* CI	Offer willing				0.00	
			1	11 21	- 0-11		1
		12= MU	$d_{min} = \int \frac{16}{22}$	4(12000)	- 2.97"	< 8,82''	1
			$d_{min} = \sqrt{\frac{16}{23}}$	4(12000) 1265	- 2.97"	< 8,82''	J
		12= MU	dmin = <u>16</u> - 7 23	4(12000)1 2615	- 2.97"	< 8,82''	\checkmark
	d	202 - MU 202 615	7 20	ab/5		< 8,82''	J
	d	12= MU	7 20	ab/5		< 8,82''	✓
	Desi	222 bis	y da nd Fram	ab/5		< 8,82"	✓
	Desi • Des	12 = Mu 222 1015 1gn Frame B a	y da n <u>d Fram</u>	2 D Rein		< 8,82''	✓
	Desi • Des	222 bis	y da n <u>d Fram</u>	2 D Rein		< 8,82''	✓
	Desi • Desi Ass dsi	12 = Mu 222615 1gn Frame B en sign Reinfording in sume #8 bors, 3 hort= 9,25"	y da n <u>d Fram</u>	2 D Rein		< 8,82"	✓
	Desi • Desi Ass dsi	12 = Mu 222 615 1gn Frame B en Sign Reinfording in sume #8 bors, 3	7 da nd Framy n CS 1/4" Clear C	<u>e D Rein</u>			
	Desi • Desi Asi dia dia	1 ² = Mu 222 615 Sign Frame B en Sign Reinfording in Sume #8 bars, 3 hort= 9,25" ong = 8,25"	7 da nd Framy n (S 1/4" Clar c e	<u>e D Rein</u> Cover	forcing	int spa	0
	Desi • Desi 453 dia dia	12 = Mu 222 615 sign Frame B an sign Reinfording in sume #8 bars, 3 hort = 9,25" ing = 8,25" Description	nd Frame CS 1/4" Clear c Mext	e D Rein cover wit, span Mt	forcing Mint	int, spa M-	О
	Desi • Desi Asi dia dia dia	1 ² = <u>Mu</u> 222 1015 Sign Frame B en Sign Reinfording in sume #8 bars, 3 hort = 9.25" ing = 8.25" <u>Description</u> <u>M in CS</u>	nd Frame CS 1/4" Clear c <u>Mext</u> -73,0	abis <u>D</u> Rein cover with, span <u>Mt</u> taoo	Mint- + 245	104, Spa M- -228 +	0 <u>M+</u> 122
	Desi • Desi 453 dia dia	12 = Mu 2221615 Sign Frame B an Sign Reinfording in Sume #8 bars, 3 hort = 9,25" ing = 8,25" <u>Description</u> M in CS CS width	7 200 nd Frame D (S 1/4" Clear c e <u>Mext</u> -73,0 90"	2 D Rein 20005 20005 2005 2007 2000 2011	Mint + 245 90"	104; Spa M- -228 + 90"	0 <u>M+</u> 122 90*
	Desi • Desi 45 dis dis dis dis dis 3	12 = Mu 222/015 Sign Frame B a Sume #8 bars, 3 hort = 9,25" ing = 8,25" <u>Description</u> M in CS CS width	7 200 nd Frame D (S 1/4" Clear c 200 <u>Mext</u> -73:0 90" 8.25"	2 D Rein 20005 20005 2005 2005 2007 2007 2007 20	Mint • 245 90" 8.25"	104; Spa M- -228 + 90" 8.25" 8	0 <u>M+</u> 122 90*
	Desi Desi dis dis dis dis dis dis dis d	12 = Mu 222/015 Sign Frame B and Sign Reinforcing in Sume #8 bors, 3 hort = 9.25" ing = 8.25" <u>Description</u> M in CS CS width effective dipth Mn= Mu/a	7 200 nd Frame D (S 1/4" Clear c <u>Mext</u> -73:0 90" 8.25" -81.1	- D Rein Cover 	Mint - 245 90" 8.25"	10+, Spa M- -228 + 90" 8.25" 8 253 +	П <u>М</u> + 1ад 90* 3.25* 13р
	Desi Desi Desi dia dia dia dia dia dia dia dia dia di	12 = Mu 222/015 Sign Frame B and Sign Reinforcing in Sume #8 bors, 3 hort = 9.25" ing = 8.25" <u>Description</u> Min CS CS width effective dipth Mn= Mu/g R=Mu/god2	7 20 nd Frame CS 1/4" Clear c <u>Mext</u> -73,0 90" 8.25" -81,1 159	abis = D Rein aver with span Mt taoo 90" 8.25" + 222 435 5	Mint • 245 90" 8.25" • 272	104, Spa M -228 + 90" 8.25" 8 253 + 496 26	0 <u>M+</u> 122 2.25 136 7
	Desi Desi Asi dia dia dia dia dia dia dia dia dia di	12 = Mu 222 1015 Sign Frame B and Sign Reinforcing in Sume #8 bors, 3 hort = 9.25" ing = 8.25" <u>Description</u> M in CS CS width effective dipth Mn= Mu/god2 p from table A50	7 200 nd Frame CS 1/4" Clear c <u>Mext</u> -73:0 90" 8.25" -81:1 159 0.0027 0	2 D Rein 20005 20005 20005 2000 2000 2000 2000	Mint - 245 90" 8.25" - 272 -	104: Spa M- -228 + 90" 8:25" 8 253 + 1 496 26 2087 0.0	0 <u>M+</u> 122 90* 1320 7 225*
	Desi Desi Asi dia <u>Item</u> 1 2 3 4 5 6 7	12 = Mu 222 1015 Sign Frame B and Sign Reinforcing in Sume #8 bors, 3 hort = 9.25" ing = 8.25" <u>Description</u> Min CS CS width effective dipth Mn=Mu/gbd2 pfrom table A5a As=pbd	7 200 nd Frame CS 1/4" Clear c <u>Mext</u> -73,0 90" 8.25" -81,1 159 0.0027 2.00	abis <u>D</u> Rein cover <u>w</u> t, span <u>M</u> t <u>taoo</u> <u>90"</u> <u>8,25"</u> <u>+ 222</u> <u>435</u> <u>5,0076</u> <u>5,64</u> <u>6</u>	Mint - 245 90" 8.25" - 272 - 272 - 0094 0.98	104, Spa M- -228 + 90" 8.25" 8 253 + 496 26 0087 0.0 0087 0.0 0087 0.0 0087 0.0	n <u>M</u> + 122 90* 1320 7 225* 1320 7 20446 ,42
	Desi Desi Asi dia <u>Item</u> I a 3 4 5 6 7 8	12 = Mu 222 1015 Sign Frame B and Sign Reinforcing in Sume #8 bors, 3 hort = 9.25" ing = 8.25" <u>Description</u> Min CS CS width effective dipth Mn=Mu/gbd2 pfrom table A5a As=pbd	7 201 nd Frame CS 1/4" Clear c <u>Mext</u> -73:0 90" 8.25" -81:1 159 0.0027 0.0027 1.89	2 D Rein 2 D Rein 2 D Rein 2 D Rein 4 35 4 35 5 0076 5 0076 1 00 1 0	Mint - 245 90" 8.25" - 272 - 272 - 0094 0.98 1.89	10+, Spa M -228 + 90" 8.25" 8 253 + 496 26 2087 0.0 ,46 3 1.89 /	n <u>M</u> + 122 90* 136 7 25* 136 7 2046 142 189
	Desi Desi Desi dis dis dis dis dis dis dis d	12 = Mu 222 1015 Sign Frame B and Sign Reinforcing in Sume #8 bors, 3 hort = 9.25" ing = 8.25" <u>Description</u> Min CS CS width effective dipth Mn=Mu/gbd2 pfrom table A5a As=pbd	7 201 nd Frame CS 1/4" Clear c <u>Mext</u> -73:0 90" 8.25" -81:1 159 0.0027 0.0027 1.89 3	2 D Rein 2 D Rein 2 D Rein 2 D Rein 4 200 9 0" 8 25" 4 35 5 5 0076 0 5 0076 0 1 089 8	Mint - 245 90" 8.25" - 272 - 272 - 0094 0.98 1.89 9	10+, Spa M -228 + 90" 8.25" 8 253 + 496 26 2087 0.0 ,46 3 1.89 /	n <u>M</u> + 122 90* 136 7 25* 136 7 2046 142 189
	Desi Desi Asi dia <u>Item</u> I a 3 4 5 6 7 8	12 = Mu 222 1015 Sign Frame B and Sign Reinforcing in Sume #8 bors, 3 hort = 9.25" ing = 8.25" <u>Description</u> M in CS CS width effective dipth Mn= Mu/god2 p from table A50	7 201 nd Frame CS 1/4" Clear c <u>Mext</u> -73:0 90" 8.25" -81:1 159 0.0027 0.0027 1.89	2 D Rein 2 D Rein 2 D Rein 2 D Rein 4 35 4 35 5 0076 5 0076 1 0 8 8 8	Mint - 245 90" 8.25" - 272 - 272 - 0094 0.98 1.89	10+, Spa M -228 + 90" 8.25" 8 253 + 496 26 2087 0.0 ,46 3 1.89 /	n <u>M</u> + 122 90* 1320 7 225* 1320 7 20446 ,42
	Desi Desi Asi dia 1 tem 1 2 3 4 5 6 7 8 9 10	12 = Mu 222 1015 Sign Frame B and Sign Reinforcing in Sume #8 bors, 3 hort = 9.25" ing = 8.25" <u>Description</u> Min CS CS width effective dipth Mn=Mu/gbd2 pfrom table A5a As=pbd	7 201 nd Frame CS 1/4" Clear c <u>Mext</u> -73:0 90" 8.25" -81:1 159 0.0027 0.0027 1.89 3	2 D Rein 2 D Rein 2 D Rein 2 D Rein 4 200 9 0" 8 25" 4 35 5 5 0076 0 5 0076 0 1 089 8	Mint - 245 90" 8.25" - 272 - 272 - 0094 0.98 1.89 9	10+, Spa M -228 + 90" 8.25" 8 253 + 496 26 2087 0.0 ,46 3 1.89 /	n <u>M</u> + 122 90* 136 7 25* 136 7 2046 142 189

Technical Report 2

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P	Iternativ	re Slab 4 2	-way R	c Slat	c Cc	incrute Be	lams	
	• Des As	sign Reinforcing ssume #5 bars,	10 MS 3/4" Clear	Cover				
		hort = 9.82"						
	OK [2	ong = 8.82"						
	Liem	Description		ext. spa	Mint	M-	·Span M+	
	Item	Description MinMS		- M+ +66	- 82	- 76		
	2	width of MS	anil	Quil	0	90"	90"	
	3	effective depth	8.82"	8 92"	8.82"		8.82"	
	J	Mn=Mu/0	-1.9	+73	-91	- 84		
-	5	R=Mu/øbd=	3	126	156	145		
	6	f from Table ASa			0.0026	0.0024		
	7	As=pbd		1.67	2.00	1.91		
	8	Asmin = 0.002 bd		1.59		1.59	1.59	
	9	n= langer of ForB		9		7	6	
	10	Asmin = 0.002 bd n = longer of fors n= longer of fors n= at	5	5	5	5	5	
1	Check Shear Copacity • check Shear Copacity • check Shalo $w_{4} = 1.2(10.5/12.150) + 1.6(100) = 318 pot$ critical section at $d = 8.25^{\circ}$ from face of the beam $N_{1} = (0.318)(1)(15 - \frac{8.25}{12} - \frac{3}{4}) = 4.23K$ $BV_{C} = B2VFC' bd = 0.75(2)T6000^{\circ}(12)(8.25)/1000 = 11.5K > V_{1} = 4.23K$							
	• check punching phean critical section at $d/2$ from column $d = \frac{8 \cdot 25 + 9 \cdot 25}{2} = 8 \cdot 75''$ $V_{U} = (0.318)(30 \cdot 30 - (8 \cdot 73 \cdot 2 \cdot 73)) = 284K$ $b_{0} = 10.92'$							
	$b_{0} = 10.92'$ $b_{0} = 14.976 B_{c} = b^{2}/b_{s} = 1 \forall s = 40$ $V_{c} = 4\sqrt{fc} b_{0} d = 4\sqrt{6000}(131.04)(8.75) = 355K \leqslant \\ V_{c} = (a + 4/b_{c})\sqrt{fc} b_{0} d = (a + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 533K$ $V_{c} = (e^{-5}/w_{0}/d + 2)\sqrt{fc} b_{0} d = (4 + 4/i)\sqrt{fc}(131.0i)(8.75) = 415K$ $\int V_{c} = 0.75(355) = 3666K < V_{0} = 284K$ $N(eed Shear roulo around the columns$							

Technical Report 2

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	Alternative Slab 4 2-way RC Slab Concrete Beams
	Design Beam ReinBreing • Intrior Beam 9.54 K/Pt Mu = Wl = 9.54(30) = 47.7 Ft-K 6 = 6 = 570.4 K-in
	Mu, TBeen = \$ 0,85 f'c b hg (d-hf/2) = 0,9 (0,85) (b) (24) (10,5) (17-10,5/2) = 13591 K-in > My ∴ no T-beam behavior
	$A_5 = \frac{Mu}{4d} = \frac{47.7}{4(17)} = 0.70110^2$ Use $2(\pm 9) = 2.0^2$
	Assume $es>ey a = AsFy = 2(60) = 1.11''f'_{1}B_{1}B_{2} = (6)(0.75)(24)$
0	$C = \frac{9}{8} = \frac{1.11}{0.75} = 1.48^{\circ}$
	$E_5 = E_4(d-c) = 0.003(17-1.48) = 0.0315 > Ey / C 1.48$
	\$=0.9 E5>0.005
	ØMN= ØASFY (d- 9/2) = 0.9(2)(60)(17-11/2) = 1776 K-in = 148 K-ft>Mu=47.7 K-ft/
	Asmin = (31/00 bd = 31/6000 (24)(17) = 1.58 in2
	$Asmin = \begin{cases} 3\sqrt{p_{1}} bd = 3\sqrt{6000} (24)(17) = 1.58 in^{2} \\ 60000 \\ 2000bd = 200(24)(17) = 1.36 in^{2} \\ fy & 60000 \end{cases}$
	AS> Asmin J
	gmax = 0.85 Bi (P'C/Fy) (Eu 10:004) = 0.85(0.75) (600) (0:003) = 0.0273
	Asmax= gmax bd = 0.0273(24)(17)= 11.1102
\cup	AS KASMAX J

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Technical Report 2

Alkrnative Slab 4 2-Way RC Slab Concuto Beams
Alkrnative Slab 4 2-Way RC Slab Concuto Beams

$$a = ASR_4 = a(uo)$$

 $fCR_1 = a(uo)$
 $fCR_2 =$

Technical Report 2



	Alternate Slalo 4	2-way RC Slab	Concrete Beams
0	- Reinforcing La	font	•
		340 340 311 340 312 340 313 340 314 340 315 340 316 340 317 340 318 340 319 340 310 340 311 340 312 340 313 340	
0			