Technical Report 2



Rendering provided by DCS Design

Kingstowne Section 36A 5680 King Center Drive Kingstowne, VA 22315

James Chavanic Structural Option Advisor: Dr. Boothby October 12, 2012

TABLE OF CONTENTS

TABLE OF CONTENTS	2
EXECUTIVE SUMMARY	3
BUILDING INTRODUCTION	4
STRUCTURAL OVERVIEW	5
FOUNDATIONS	5
GARAGE LEVELS	6
OFFICE LEVELS	8
ROOF SYSTEM	10
DESIGN CODES	11
MATERIAL PROPERTIES	12
GRAVITY LOADS	13
DEAD LOADS	13
LIVE LOADS	13
FLOOR SYSTEM ANALYSIS	14
TWO-WAY FLAT SLAB WITH DROP PANELS	15
PRECAST, PRE-TENSIONED DOUBLE-TEES ON PRECAST, PRESTRESSED GIRDERS	16
COMPOSITE STEEL DECK ON COMPOSITE BEAMS AND GIRDERS	18
ONE-WAY CONCRETE PAN JOISTS WITH WIDE BEAMS	20
STEEL FORM DECK ON OPEN-WEB STEEL JOISTS AND WIDE FLANGE GIRDERS	22
SUMMARY COMPARISON	24
CONCLUSION	25
APPENDIX: A	26
APPENDIX: B	31
APPENDIX: C	36
APPENDIX: D	43
APPENDIX: E	45
APPENDIX: F	48
APPENDIX: G	51
APPENDIX: H	55

EXECUTIVE SUMMARY

Kingstowne Section 36A (KT36A) is a 200,000 SF mixed use building currently being constructed in Fairfax County Virginia. When completed, the lower half of the building will serve as a parking garage serving the office tenants of the upper half of the building. The parking garage levels utilize flat slab concrete construction while the office levels use a composite steel construction. A more thorough description of the existing structure can be found in the first half of this report.

The purpose of Technical Report 2 is to analyze the existing floor systems of KT36A and perform a procon study on three alternative floor systems that are believed to be possible candidates for consideration in the building. The alternative floor systems must be schematically designed so that an accurate comparison considering, strength, deflections, structure depth, system weight, lateral system impacts, foundation impacts, and costs can be made. A summary of the system comparison can be found in Figure 17 on page 25 of this report. The floor systems considered for comparison were:

- Two-way Flat Slab With Drop Panels (Garage Existing)
- Precast, Pretensioned Double Tees on Precast, Pretensioned Support Girders
- Composite Steel Deck on Composite Steel Beams and Girders (Office Existing)
- One-way Concrete Pan Joists With Wide Beams
- Steel Form Deck on Open-web Steel Joists and Wide Flange Girders

After conducting the analyses of the systems, it was clearer why a split structure was chosen for the building. Concrete was a good choice for the parking levels due to the minimal structural depth and the durability of concrete when exposed to a wet and salty environment. The composite steel construction in the office levels allowed large open bays for maximum flexibility of the office space. Of the alternative systems considered, the open web steel joist system seems to be the most probable alternative to the existing office level framing. Changing to this system would have virtually no impact on the existing systems since the weight is about the same and the braced and moment frames can still be used for the lateral system at the office levels. The precast double tee system is a possible alternative for the garage levels. Use of this system would allow for two lines of columns to be removed at grid lines B and E. However, lateral system impact from this alternative can be quite severe considering the designed lateral system consists of cast in place shear walls which typically frame into the cast in place columns. As for the one way concrete pan joist system, it appears that unless if the bay sizes can be made a little smaller, this system is simply too heavy and bulky to efficient construct the building with.

BUILDING INTRODUCTION

Kingstowne Section 36A (KT36A) is a 200,000 ft², 8 story office building to be located in Fairfax County Virginia. It will contain 4 levels of concrete structure parking garage and 4 levels of composite steel construction office space. Floor space has also been allocated for about 5,000 square feet of retail area on the ground floor (Parking Level 1). KT36A will be 86'-11" in height when measured from the average grade. The reason the building height is measured from average grade is because there is a significant grade elevation change from the south side of the building to the north side, on the order of 26'-8" (See Figure 1). This poses unique challenges in the structural design of the building since the geotechnical report states the soil placing a load of 60psf/ft in depth below grade surface on the structure. This means that there is more than 1600 psf of soil load on the foundation walls at the lowest slab levels. This load alone had enough impact on the building that six 12" thick shear walls had to be constructed at parking level 1 to transfer the loads safely.

When completed, KT36A will be part of a master planned development for retail and office space owned by the Halle Companies. Being a part of a master planned development, the building was designed to match the appearance of the surrounding buildings. This appearance can be characterized by a rectilinear footprint, pink velour brick, aluminum storefront with glass of blue/black appearance, and precast concrete bands around the circumference of the building.





STRUCTURAL OVERVIEW

Kingstowne Section 36A consists of two different primary structural systems; cast-in-place concrete for the lowest four floors of the building and a composite steel system for the remaining four floors. The concrete floors are used for the parking garage and retail space while the steel system is used at the office occupancy levels. Lateral forces in the concrete levels are resisted with 12" thick concrete shear walls of varying height. When the building transitions to steel construction, lateral forces are transferred to the concrete columns and shear walls through concentrically braced frames, eccentrically braced frames, and rigid moment frames. Per sheet S-001, components such as steel stairs and curtain wall/window systems were not included in the scope for the structural design of this building.

FOUNDATIONS

In their report submitted August of 2009, Burgess & Niple, Inc. (B&N) advised that shallow foundations not be used on this project due to settlement concerns based on subsurface conditions. They performed five new soil test borings, ranging from 45 to 100 feet in depth below the grade surface. In addition, they reviewed 14 borings from previous investigations, ranging in depth from 10 to 55 feet below grade surface.



Figure 2: Foundation Plan (Level PO) Showing 48" Thick Mat Foundations Shaded in Red (Source: Cagley & Assoc. Drawing S-200)

Each of the borings found lean clay and fat clay fills with varying amounts of sand, residual soils consisting of lean to fat clay, and clayey to silty sands. Based on the fill materials being encountered between 4 and 48 feet below grade, B&N offered two foundation options. An intermediate foundation system consisting of spread and strip footings bearing on rammed aggregate piers (Geopiers) was chosen for KT36A over the alternate option of a deep system consisting of spread and strip footings bearing on caissons. Geopier diameters typically range from 24 to 36 inches and are compacted using a special high-energy impact hammer with a 45-degree beveled tamper. Per B&N report, footings supported by Geopier elements can be designed using a maximum bearing pressure of 7,000 psf.

Using the information provided by B&N, Cagley & Associates designed spread footings ranging from 27" to 44" in depth to support the columns of KT36A. 48" thick mat foundations bearing on Geopiers are located at the central core of the building to transfer forces in the main shear walls to the soil (See Figure 2). Grade beams (Blue lines in Figure 2) of 30" depth are used throughout level P0 to also transfer forces from the shear walls to the column footings. Foundation walls are supported by continuous wall footings designed for an allowable bearing pressure of 2,500 psf. All foundations are to bear a minimum of 30" below grade unless stated otherwise.

GARAGE LEVELS

FLOOR SYSTEM

As previously mentioned, KT36A utilizes cast-in-place concrete for the support structure in the garage. With the exception of the 5" thick slab on grade, this system consists of 8" thick two-way, flat slab construction with drop panels that project 8" below the bottom of structural slab. The drop panels are continuous between grid lines C and D to help the slab span the increased distance of 36'-6" in this bay, otherwise, they are typically 10'-0" x 10'-0" in size. Due to the need for vehicles to circulate vertically throughout the parking garage levels, the floor is sloped on 3 sides of the central core to achieve this.

Since a two-way, flat plate concrete floor system is subjected to both positive and negative moments, reinforcing steel is required in the top and bottom of the slab. The typical bottom mat of reinforcement in KT36A consists of #4 bars spaced at 12" on center in each direction of the slab. Additional bottom reinforcement in certain middle strips and continuous drop panels is also noted on the drawings. Top reinforcement is comprised of both #5 and #6 bars, both oriented in the same fashion as the bottom mat, with the #6 bars typically being used in the column strips to resist the larger negative moments present there (see Figure 3 for a typical bay layout). A typical bay size for the concrete levels is 28'-6" x 29'-0".





FRAMING SYSTEM

Supporting the floor slabs are cast-in-place concrete columns constructed of 5000 psi concrete. The most common column size is 24" x 24" reinforced with a varying number of #8 bars and either #3 or #4 ties. Columns of this size primarily account for the gravity resisting system of KT36A. The largest columns used are 36" x 30" reinforced with a varying number of #11 bars and #4 stirrups. The larger columns are located at the ends of the large shear walls in the central core of the building. A small number of concrete beams are also present in the project, typically at areas of the perimeter where additional façade support was needed and at large protrusions in the floor slab.

LATERAL SYSTEM

Cast-in-place concrete shear walls resist the lateral forces present in the parking garage levels of KT36A. All of the twelve walls present in the building are 12" thick and cast using 5000 psi concrete. Six of the shear walls (#1 - #6, see Red lines in Figure 4) extend 4-5 stories from the 48" thick mat foundations to office level 1 which is also the 5th elevated floor of the building. Three of the six walls are oriented to resist lateral forces in the N-S direction while the other three walls are oriented in the E-W direction. The remaining six walls (#7 - #12, Green lines in Figure 4) are only one story tall and are oriented to best resist the unique lateral soil load placed on KT36A. This load condition is further detailed in the lateral loads section of this report and will be further analyzed in Technical Report 3.



Figure 4: Foundation Plan (Level P0) Showing Shear Walls (Source: Cagley & Assoc. Drawing S-200)

OFFICE LEVELS

FLOOR SYSTEM

Office level 1 is constructed of the same cast-in-place style of construction as the garage floors below it with the exception of the top of slab elevation being uniform throughout the floor. The remaining floors are constructed using a composite steel system. This system is comprised of 3 ¼" thick lightweight concrete on 2" x 18 gage galvanized composite steel decking. The 3000 psi lightweight concrete (115 pcf) coupled with the decking yields a total slab thickness of 5 ¼". Reinforcement for the slab is provided by 6x6-W2.1xW2.1 welded wire fabric.

According to sheet S-001, all decking should meet the three span continuous condition. The decking typically spans 9'-6" perpendicular to cambered beams of varying size. Shear studes of $\frac{3}{4}$ " diameter placed along the length of the beams make this a composite system capable of more efficiently carrying the loads when compared to a non-composite system. The studes must be minimum length of 3 $\frac{1}{4}$ " but no longer than 4 $\frac{1}{4}$ " to meet designer and code requirements.

FRAMING SYSTEM

The composite floor system mentioned above is supported by structural steel framing comprised of primarily wide flange shapes. W21's and W18's account for most of the beams while the columns range in size from W12x40 to W14x109. A majority of the beams in KT36A are cambered between $\frac{3}{4}$ " and 1 $\frac{3}{4}$ ", a function of the span and load demand on the beams. With the exception of four W30x99 sections cambered 1", most of the girders fall within the same size range as the beams. The four W30x99 girders each span 44'-0" which warrants the use of the camber to satisfy the total deflection criteria. The columns are all spliced just above the 7th floor (office level 3) where they are reduced in size to more economically carry the lighter axial loads. See Figure 5 below for a typical office floor level layout.





LATERAL SYSTEM

Lateral forces at the office levels are transferred to the concrete shear walls through three different frame systems. Concentrically braced (Green Line) and eccentrically braced frames (Purple Lines) work in the north – south direction while ordinary steel moment frames (Orange Lines) resist the loads in the east – west direction. See Figure 6 for their location and orientation within the building. The eccentrically braced frames were necessary to maintain enough clearance for a corridor in that area of the building. Diagonal bracing for the frames consists of either HSS10x10 or HSS9x9 of varying thickness. Moment frames were most likely chosen for the east – west direction so as not to obstruct the occupants view to the exterior and lower lateral loads acting on the building in this direction.



Figure 6: Typical Composite Slab Plan (Level OL3) (Source: Cagley & Assoc. Drawing S-207)

ROOF SYSTEM

The roofing system consists of a white EPDM membrane fully adhered over 6" minimum of R-30 continuous rigid roof insulation. The seams of the membrane must be lapped a minimum of 3" to ensure a watertight seal. Where mechanical equipment is located (see Figure 9), the roofing materials are supported by 2"x 18GA galvanized composite steel deck with a 3.25" thick light-weight concrete topping. The load carrying capacity that this type offers is required to support the four 17,000lb roof top mechanical units needed to condition the air for the building occupants. In all other areas of the roof, the system is supported by 3"x 20GA type N roof deck. Each of the roof types are supported by steel W-shapes that are sloped to achieve proper drainage.







DESIGN CODES

Per sheet S-001, Kingstowne Section 36A was designed in accordance with the following codes:

- > 2006 International Building Code
- > 2006 Virginia Uniform Statewide Building Code (Supplement to 2006 IBC)
- Minimum Design Loads for Buildings and Other Structures (ASCE 7-05)
- Building Code Requirements for Structural Concrete (ACI 318-08)
- > ACI Manual of Concrete Practice, Parts 1 through 5
- Manual of Standard Practice (Concrete Reinforcing Steel Institute)
- Building Code Requirements for Masonry Structures (ACI 530, ASCE 5, TMS 402)
- Specifications for Masonry Structures (ACI 530.1, ASCE 6, TMS 602)
- AISC Manual of Steel Construction, 13th Edition
- Detailing for Steel Construction (AISC)
- Structural Welding Code ANSI/AWS D1.1 (American Welding Society)
- > Design Manual for Floor Decks and Roof Decks (Steel Deck Institute)

Codes / Manuals referenced for the purposes of this report:

- > 2009 International Building Code
- > ASCE 7-10
- ACI 318-11
- > AISC Manual of Steel Construction, 14th Edition
- 2008 Vulcraft Decking Manual

MATERIAL PROPERTIES

Minimum Concrete Compressive Strength				
Location	28 Day f'c (psi)			
Footings	3000			
Grade Beams	3000			
Foundation Walls	5000			
Shear Walls	5000			
Columns	5000			
Slabs-on-Grade	3500			
Reinforced Slabs	5000			
Reinforced Beams	5000			
Elevated Parking Floors	5000			
Light Weight on Steel Deck	3000			

Max. Concrete W/C Ratios				
f'c @ 28 Days (psi) W/C (Max)				
f'c <u><</u> 3500	0.55			
3500 < f'c < 5000	0.50			
5000 <u><</u> f'c	0.45			
Elevated Parking	0.40			

Reinforcement:

- > Deformed Reinforcing Bars ASTM A615, Grade 60
- Welded Wire Reinforcement ASTM A185
- Slab Shear Reinforcement Decon Studrails or Equal

Masonry:

\triangleright	Concrete Masonry Units	Light weight, Hollow ASTM C90, Min. f'c = 1900 psi
\triangleright	Mortar	ASTM C270 – Type M (Below Grade)
		Type S (Above Grade)
\triangleright	Grout	ASTM C476 – Min. f'c @ 28 days = 2000 psi
\triangleright	Horizontal Joint Reinforcement	ASTM A951 – 9 Gage Truss-type Galvanized

Structural Steel:

\triangleright	Wide Flange Shapes and Tees	ASTM A992, Grade 50
⊳	Square/ Rectangular HSS	ASTM A500, Grade B, F _y = 46 ksi
⊳	Base Plates and Rigid Frame	ASTM A572, Grade 50
	Continuity Plates	
≻	All Other Structural Plates	ASTM A36, F _y = 36 ksi
	and Shapes	
⊳	Grout	ASTM C1107, Non-shrink, Non-metallic
		f'c = 5000 psi

GRAVITY LOADS

DEAD LOADS

Superimposed Dead Loads			
Plan Area	Load (psf)		
Office Floors	15		
Roof	30		
Parking Garage Floors	5		

Dead loads resulting from system self-weights were calculated and estimated based on the drawings provided. The loads and the assumptions used in their determination are detailed in Appendix A.

LIVE LOADS

Live Loads						
Plan Area	Design Load (psf)	IBC Load (psf)	Notes			
Lobbies	100	100				
Mechanical	150	N/A	Non-reducible			
Offices	80	80	Corridors used, otherwise 50 psf			
Office Partitions	20	15	Minimum per section 1607.5			
Parking Garage	50	40				
Retail	100	100	Located on first floor			
Stairs and Exitways	100	100	Non-reducible			
Storage (Light)	125	125	Non-reducible			
Roof Load	30	20				

FLOOR SYSTEM ANALYSIS

The typical structural bay for Kingstowne 36A depends on what level of the building is being considered. At the garage levels, the bay size is commonly 27'-6" to 29'-0" by 28'-6" to 29'-0". Smaller bays and larger bays do exist, but this is the most common range. See Figure 10 for the garage bay used for the purposes of this report. As for the office levels, grid lines B and E terminate when the concrete structure is no longer used resulting in a typical bay size of 28'-6" to 29'-0" by 43'-6" to 45'-0". Again, smaller and larger bays do exist, but this is the most typical range. See Figure 11 for the office bay used for the purposes of this report.

Please note that only gravity loads were used for the purposes of this report. In order to properly estimate and understand the proposed floor systems, a lateral analysis for each system would also have to be completed. This, however, was not part of the scope of this report.



TWO-WAY FLAT SLAB WITH DROP PANELS

DESCRIPTION

The existing floor system used for the garage levels consists of an 8 inch thick 2-way flat slab with 8 inch thick drop panels at the columns. The drop panels are typically 10' by 10' and help to increase the punching shear capacity of the slab at the columns. Concrete with a compressive strength of 5000 psi and grade 60 reinforcement were used to construct the cast-in-place structure. Typical reinforcing for the bottom of the slab consists of #4 bars at 12" O.C each way. Top reinforcing for the slab typically consists of #5 and #6 bars.



Figure 12: Typical Section at Column Strip (Source: Cagley & Assoc. Drawing S-410)

ADVANTAGES

Probably the most attractive feature of the flat slab is its ability to carry loads with absolutely minimal structural depth. This allows for a small floor to floor height, even after the mechanical systems are placed below the structure. The flat slab system typically has enough weight to it that vibrations are not a concern. Since there is so much flat surface area with this type of structure, formwork is generally simple and cheap when compared to concrete systems with beams and girders. This also eases constructability thus speeding up the construction time for this type of structure. Thanks to the inherent properties of the concrete, this system does not require additional fire-proofing to meet the 2 hour requirement.

DISADVANTAGES

The two-way flat slab is a significantly heavier system than any typical steel framing floor system. While not having an effect on KT36A, this extra weight could pose an issue at foundations if the flat slab system is being considered to replace a lighter existing system. Additionally, formwork required to cast the concrete is a cost that doesn't directly contribute to the strength of the floor system.

PRECAST, PRE-TENSIONED DOUBLE-TEES ON PRECAST, PRESTRESSED GIRDERS

DESCRIPTION

Intended to be an alternative for the garage levels of KT36A, this system was sized using a prestressed concrete textbook by Nawy and the PCI Design Handbook. For this alternative system, support along grid line B has been treated as though it is not there. It was decided to do this since the columns along this line terminate when the structure switches to steel construction. Based on hand calculations determining stress only, a 16" deep, 8'-0" wide double tee section with 14 - ½" diameter steel tendons was sized. The harped tendons with an ultimate strength of 270,000 psi required a 9.18 inch eccentricity at the center of the section and a 1 inch eccentricity at each end of the section to meet the stress limits in the tendons and concrete. Based on the double tee load table included in Appendix H of this report, an 8DT24 section appears to be a better solution for the 45'-0" span. The solution calculated by hand is likely governed by some other controlling factor such as deflection, resulting in the design tables conveying an 8DT24 as a more economical member. The double tees are supported by inverted T-beams at interior grid lines and L-beams at exterior grid lines. Using the PCI Design Handbook load tables, the support beams were designed as a 34IT28 with $20 - \frac{1}{2}$ " diameter low relaxation strands for the interior and 20LB28 with $12 - \frac{1}{2}$ " diameter low relaxation strands for the exterior of the bay. All of the precast members were evaluated using concrete with a 5000 psi compressive strength and tendons with an ultimate strength of 270,000 psi. See Figure 13 for a plan view of the system. Hand calculations for this system can be found in Appendix A.

ADVANTAGES

This style of precast, pretensioned sections is a common solution for parking garages. They offer great durability of the concrete since the members are cured under controlled conditions at the casting facility. A byproduct of this the nice, clean finish that the concrete obtains. While the erection procedure for this type of structure can be technical, the actual erecting of the precast members can go very quickly and efficiently. This quick method of construction has the ability to significantly reduce the duration of construction which could greatly reduce the project cost.



Figure 13: Schematic Double Tee Layout (Source: Chavanic)

DISADVANTAGES

As previously mentioned, erection of precast concrete structures can become quite technical. To start, two structural engineers are typically contracted in a precast concrete job, one to design the precast itself and one to design the foundations to support the precast. Precast structures are also poor performers against heavy lateral loads. A large lateral soil load is present in KT36A that would require careful consideration if this system was chosen to be designed. This load also works in conjunction with the controlling wind loads to make for an even more heavily loaded system.

COMPOSITE STEEL DECK ON COMPOSITE BEAMS AND GIRDERS

DESCRIPTION

The existing floor system used for the office levels of KT36A was evaluated using the Vulcraft deck catalog and RAM Structural System. Loads for this system are transferred in a one-way fashion along the load path, from slab deck to beam/joist, beam/joist to girder, and girder to column. As noted earlier, this system consists of a 2 inch 18 gage deck with a 3.25 inch lightweight concrete topping supported with composite steel wide flange members. According to the Vulcraft deck catalog, this slab will satisfy the 2 hour fire-rating. Looking at the bay used for the purposes of this report, the slab deck is supported by W21x44 beams spanning 45'-0" with 45 studs spaced evenly along the length of the beam. This is the most commonly used beam at the office levels. At the interior column line of this bay (column line C), the beams are supported by a W30x99 girder spanning 44'-0" with 44 studs. This is one of four girders spanning 44'-0", which is the largest girder span in the building. In order to satisfy the fire rating for the floor system, the beams and girders are coated with spray fire-proofing. A 3-D model of the bay used for analysis comparison can be seen in Figure 14. Hand calculations used as spot checks in Technical Report 1 and the RAM Structural System design for this system can be found in Appendix B.

ADVANTAGES

Composite deck and steel systems are very efficient in that they take advantage of the inherent compressive strength of the concrete. The composite action of the decking and the concrete allows greater spans between beams which equates to a lower number of beams needed to support the loads. By welding studs to the top of the beams, compressive forces are developed in the concrete which allows more of the steel member to be in tension. This allows a smaller steel section to be used which typically reduces structure depth and cost. When compared to a non-composite system on the same framing, a composite system can have longer span lengths and support more load with the same framing members.



Figure 14: Model of Existing Office Level Bay Framing (Source: Chavanic)

DISADVANTAGES

When compared to a non-composite system, a composite system requires more time, labor, and inspections due to the shear studs being installed after the steel is erected and the deck has been laid down. The slab deck is typically controlled by the required fire rating; however, the supporting beams and girders must also meet this fire rating. In order to achieve this, spray fire-proofing is typically applied to the beams and girders. An alternative to this style of fire-proofing is using a gypsum board ceiling with batt insulation. A similar Underwriters Laboratories assembly can be seen in Appendix G (this assembly uses a steel joist instead of a rolled section).

ONE-WAY CONCRETE PAN JOISTS WITH WIDE BEAMS

DESCRIPTION

Intended as an alternative for the office floors of the building, this system was developed using ACI 318-11 provisions and standard pan joist dimensions. The joists span the 45'-0" long direction of the bay and are formed using 20 inch pans. Choosing a 6 inch joist width yields a 26 inch on center spacing of the joists. To meet the 2 hour fire rating requirement, a 4.5 inch thick one-way slab was chosen as the trial slab size. After checking the minimum thickness required to meet deflection criteria in ACI 318-11 Table 9.5(a), it was determined that a total system depth of 30 inches is needed to adequately span the 45'-0". Due to the standard joist pans being available in a maximum depth of 20 inches, a 10 inch solid slab is needed to make up the required depth of the system. Loads are transferred from the joists to the columns through wide beam girders that were constrained to the same depth of the joist and slab combination. To remain consistent with the design parameters used at the garage levels, concrete with a compressive strength of 5000 psi and grade 60 reinforcement were selected for use in the design.

Assuming one-way action in the slab, joist, and wide beam girder, reinforcement was designed based on the loads seen at the office floors. Analysis of the slab resulted in minimum steel for temperature and shrinkage controlling. For this, 1 #3 bar at 6 inches on center placed at the center of the slab was specified. Reinforcing for the joists was found to be 2 #6 bars and 1 #7 bar at the interior negative moment region, 1 #8 bar at the exterior negative moment region, and 1 #9 bar at the positive moment region of the joist. The interior 44'-0" span girder was designed for this system as it is the controlling girder span present. After a couple of design iterations, a 30 inch deep by 54 inch wide rectangular section was found to carry the loads. Required reinforcement for the girder was found to be 20 #11 bars in 2 layers at the interior negative moment region of the girder, and 20 #9 bars in 2 layers at the positive moment regions of the girder.

Considering the excessive weight of this structural floor system and the significant impacts it would have on the building foundations, it was deemed not feasible for this application. However, with a consideration to reducing bay sizes, this floor system could become an economical option for KT36A. This system could also be a potential alternative at the parking garage levels which also warrants reconsidering its feasibility. A plan view of the proposed layout can be seen in Figure 15. Hand calculations for this system can be found in Appendix C.

ADVANTAGES

A one-way concrete pan joist system can be very effective at spanning large distances, just not ones quite as long as the 45'-0" spans in KT36A. The shear massiveness of the system allows vibration considerations to essentially be ignored. In addition to the voids creating the joists reducing the self-weight of the system, they also allow space for routing mechanical ducts. Since the concrete has inherent fire-proofing, additional spray fire-proofing is not necessary for this type of system, reducing the overall cost of the floor.



Figure 15: Schematic Layout of One-way Concrete Pan Joist System (Source: Chavanic)

DISADVANTAGES

While the massiveness of the system is great for dampening floor vibrations, it causes some major drawbacks with the rest of the building. In order to support all of the weight, concrete columns will have to increase in size and contain heavier amounts of reinforcement. This directly leads to foundation redesign in order to support the increased loads. In the case of KT36A, the intermediate foundation system consisting of spread footings bearing on rammed aggregate piers will most likely have to be changed to a more expensive, deep foundation system. The significant increase in weight will also affect the forces induced on the building from seismic ground motion. Said forces may increase enough to make the seismic loading control over the wind loading which would then affect the design of the lateral system.

STEEL FORM DECK ON OPEN-WEB STEEL JOISTS AND WIDE FLANGE GIRDERS

DESCRIPTION

Intended as an alternative for the office floors of the building, this system was sized using design guides from Vulcraft and Table 3-10 from the Steel Construction Manual. Similar to the existing system, loads are transferred in a one-way fashion along the load path, from slab deck to beam/joist, beam/joist to girder, and girder to column. The major difference with this alternative is that no composite action exists in either the slab or supporting members. In order to maintain the two-hour fire rating required for the office levels, a 1.5 inch 24 gage deck with a 2.5 inch normal-weight concrete topping reinforced with 6x6-W2.9xW2.9 welded wire fabric was chosen.

For the initial design of the floor systems, a 4'-0" spacing of the joists was chosen. Due to the joists spanning in the 45'-0" long direction, a 4'-0" tributary width on them provided too much load per joist to use a K-series joist. Because of this, two sub-options were examined for this alternative. Option one is using 28LH09 series joists at 4'-0" on center. Referencing RSMeans CostWorks, this style of joist costs approximately \$24.89/linear foot (based on linear interpolation of costs between a 28LH06 and 28LH11). Option two is using 26K10 joists at 2'-0" on center. Again using RSMeans CostWorks, this style of joist costs \$15.35/linear foot. Since twice as many K-series joists will be needed, the LH series joist looks to be the more economical option. If this system were to be utilized, a more detailed cost estimate considering price reductions for ordering bulk quantities would be warranted to see if the K-series joists have the chance of being the better option.

Each of the sub-options resulted in the same girder design. While not being the most economical section, a W30x173 with a ¾" camber was chosen for the girder spanning 44'-0" along column line C. This section would be stressed at 95% when subjected to full loading (not considering live load reduction). In order to not impact the architecture of the office levels, this girder was restricted to a 30" depth which resulted in the heavier weight being required. Based on the factors taken into account in Figure 17, this system, when constructed with either of the joist options, proved to be a feasible alternative. Hand calculations for this system can be found in Appendix D.

ADVANTAGES

Steel web joists covered by non-composite deck can economically and lightly span large distances such as those found in the bays of KT36A. When considered throughout a building, the weight savings can lead to decreased loads on footings and reduced seismic loading. For the case of KT36A, this floor system weighs about the same as the existing system, approximately 50 psf when including the distributed weight of the framing. Another advantage of a steel web joist system is that it allows the mechanical equipment in the ceiling to pass through the structure, which can't be done when wideflange beams are being used. Even though the joists are sized deeper than the existing composite beams of KT36A, overall ceiling to floor depth may be decreased due to this feature.



Figure 16: Schematic Layout of Open-web Steel Joist System (Source: Chavanic)

DISADVANTAGES

The lightweight nature of this system can also lend itself to concerns when considering floor vibrations. To help inhibit this, normal weight concrete was chosen for the deck topping as opposed to a lightweight concrete topping. While the deck itself meets the fire rating, the joists supporting the deck need some sort of fire-proofing in order to meet the requirement. A common option for wide flange supports, spray fire-proofing is quite messy when applied to joists. It is also difficult to ensure an even coating over the entire surface area of the joists. Due to the difficulty and expense of the spray fireproofing, a U.L. certified assembly using gypsum board and batt insulation (such as the one in Appendix G) is commonly used with steel web joist floor systems.

SUMMARY COMPARISON

The chart below provides a side-by-side comparison of the existing and proposed alternative systems. In this chart, the final row provides a personal opinion on whether or not the system is feasible for KT36A based on engineering judgment of the information uncovered in this report.

		Systems					
			Office Levels (80 psf LL)		Garage	Levels (40 psf LL)
		Existing	Alternatives		Existing	Alternative	
Consideration		Composite Steel Deck on Composite Beams and Girders	One-way Concrete Pan Joists on Wide Girders	Non-Composito Open W	e Steel Deck on eb Joists	2-Way Flat Slab With Drop Panels	Precast, Prestressed Double Tees on Precast, Prestressed Beams
Sub-	Options	>	>	LH Series Joists (4' O.C.)	K-Series Joists (2' O.C.)	$\left \right\rangle$	
System State	s						
	Slab Weight	44 psf	125 psf	45 psf	45 psf	100 psf	67 psf
	System Weight	49 psf	207 psf	50 psf	52 psf	121 psf	72 psf
	Slab Depth	5.25"	10"	4"	4"	8"	4"
	System Depth	35.25"	30"	39"	36.5"	16"	30"
	Assembly Cost	\$25.38/SF	\$20.97/SF	\$15.32/SF	\$18.89/SF	\$16.60/SF	\$23.25/SF
Architectura	al						
	Bay Size	28'-6" x 45'-0"	28'-6" x 45'-0"	28'-6" x 45'-0"	28'-6" x 45'-0"	28'-6" x 29'-0"	28'-6" x 45'-0"
	Fire Rating	2 HR - UL Assembly	2 HR	2 HR - UL Assembly	2 HR - UL Assembly	2 HR	< 2 HR
	Other	Other Other Other		Increase in floor to floor height, however, may be offset by running mechanical	Increase in floor to floor height, however, may be offset by running mechanical	Smaller bays needed to make system economical	Provides ability to eliminate 2 column lines in the garage levels Increased floor to floor
			to concrete	ioists	ioists		height over existing slab
Structural				101313	101313		
	Gravity System Alterations	No Change	Concrete joists w/ wide beam girders Concrete columns	Beams become open web joists	Beams become open web joists	No Change	Precast beams, girders, and columns
	Lateral System Alterations	No Change	Extend shear walls from garage levels up to office levels	Little to no change	Little to no change	No Change	Little to no change
	Foundation Alterations No Change No Change Deep foundation system may be necessary		Little to no Little to no change change		No Change	May be able to reduce footing sizes due to reduced self-weight	
Construction	า						
	Formwork Required	Minimal	Yes	Minimal	Minimal	Yes	None
	Constructability Technical		Technical	Easy	Easy	Technical	Technical
	Lead Time	Standard	Standard	Standard	Standard	Standard	Long
Serviceabilit	y						
	Vibration Control	Mediocre	Great	Mediocre	Mediocre	Great	Good
Fea	asible	Yes	No	Yes	Yes	Yes	Yes

Figure 17: System Comparison Matrix (Source: Chavanic)

CONCLUSION

After examining Figure 17, the one-way concrete pan joist system was the only alternative considered not feasible for Kingstowne Section 36 A. The spans lengths of 45'-0" found in the end bays are simply too much for this floor system. The long spans yield a system that needs to be 30 inches deep in order to satisfy ACI 318-11 Table 9.5(a). Since pan joists come in a maximum depth of 20 inches, this meant that a 10 inch thick slab had to be chosen to get the total depth to 30 inches. This resulted in a massive system that weighs 4 times the existing system at the office levels! If the owner permitted, bay sizes could be adjusted making this a very plausible system. The remaining alternatives were all deemed feasible and are worthy of being considered for further study. Of special note is the precast double tee system which has the potential to be used in all levels of the building. This would pose an interesting problem to solve regarding the handling of lateral loads. If the columns along grids B and E were permitted to come up through the office levels, continuing the flat slab construction into the office levels levels could become a very probable alternative.

APPENDIX: A

 Alternative #3 Oneway PT Double Tee 5 ames Chavanic	/
- 28'-0" - 16'-0" - Typical Parking Garage Bay Design Precast - Double To Section Assumptions	ee
$Wwc: f'_{c} = 5000psi$ $f'_{ci} = 75\% \text{ of } 28 \text{ day strained}$ $f'_{ci} = 75\% \text{ of } 27\% \text{ of } 28 \text{ day strained}$ $f'_{ci} = 75\% \text{ of } 27\% \text{ of } 28 \text{ day strained}$ $f'_{ci} = 75\% \text{ of } 27\% \text{ of } 28 \text{ day strained}$ $f'_{ci} = 75\% \text{ of } 27\% \text{ of } 28 \text{ day strained}$ $f'_{ci} = 75\% \text{ of } 27\% \text{ of } 28 \text{ day strained}$ $f'_{ci} = 75\% \text{ of } 27\% \text{ of } 28 \text{ day strained}$ $f'_{ci} = 75\% \text{ of } 27\% \text{ of } 28 \text{ day strained}$	3.2 y Text
SH SH SH SH SH SH SH SH SH SH	n
(3) (3) (3) (3) (3) (3) (3) (3) (3) (3)	lan
SIDL: Spst SelfWt: ?? 50pst was used at time of design 2"topping: 25pst Estimate 900 16/ft solfweight, check later - Try design with the 8' wide module	~
$ \begin{aligned} \omega_{u} &= 1,2[(5+25)8+900] + 1,6,40.8 \\ \omega_{u} &= 1880 \ \frac{b}{A4} \\ \underbrace{Superimposed load}_{W_{D}} = 1,2[25.8+900] \\ \omega_{n} &= 1320 \ \frac{b}{A4} \\ \underbrace{Superimposed load}_{W_{N}+L} = 1,2.5.8 + 1,6,40.8 \\ Superimpo$	
$M_{\rm D} = \frac{48b^2}{8} = \frac{1320.4549^2}{8}, 12 M_{\rm StL} = \frac{36016/44}{8} = \frac{56016/44}{8}, 4549^2$ $M_{\rm D} = 4009,500 \text{ in } 16 \qquad M_{\rm StL} = 1701,000 \text{ in } 16$	12
f'i = 0.75.5000 psi = -3,750 psi Stress limitin tondon at mitial prestress V = 105500	
$f_{pi} = 0.7.4p_{u} = 0.7.270,000psi \qquad 0 = 1 - \frac{1}{79i}$ $f_{pi} = 189,000 psi \qquad \qquad$	

Atternative #3	One way PT Double Tre	James Maranic	2
Find required section	m Modulus +;	$= 3 \sqrt{P_{c1}} = 184 psi$	
(top > (1-8)N	$1_0 + (M_{50} + M_{1}) + f_{c}$	$= 0.45 f'_{1} = -2250 pri$	
5	$f_{\pm} - f_{\pm}$ $f_{\pm} =$	= 6.7F' = 424.3psi	
top (1-0.815) (4,009	,500 + 1,701,000 r	$- \rho f f' = -2 \overline{\rho} f \rho a \dot{a}$	
5 2 (1815,184		- 0,0 ° CI 2000 psi	
(100) 109.	3		
5 PZ 44012	In IM	SETI	
S but tom = (1-8) 14	D+/15D+/12	- use 8D116	
4	Otci	$5^{top} = 1630 \text{ in}^3$	
5 bottom > (1-0,815)	(4,009,500+1,701,000)	$\int S_{11} = 556in^3$	
42413	-0,815,-2250	bott - a c "	
Sbottom > 468	1.3	$h = -\frac{16}{100}$ $h = 16''$	
	11)	/ tp = d A =	325in2
		bwbott = 3,75 112 t =66	34in D
	Values from) but op = 5,75" T= a	0,41302
	PCI Design	7 ee = 3,93 Yb = 11,93	
	Hand book	ec = 9,18 Y = 4.07"	
		WY = 539017 690	O OK
Desim of Stronds a	nd check of stresses	/ 40p	
1 - 539 plf		150	
10 - 900+25.8	(4,009,500) = 1,464,6	555 in 16	
spesses at tran	ster		
$\varphi = -\frac{P_i}{P_i}$	(-ect) Mp		
+ Ac ($-\overline{r^2}$ $=$ $\overline{s_t}$ $=$ t_{ti}	=189ps1	
- (184psi + MD).	Ac	(1951) FOCA	
1 ecul	$- = P_{1} P_{1} = -\frac{18}{18}$	4 + 1630 . 325	
$\left(\frac{1-\frac{1}{2}}{r^{2}}\right)$	// //	1-9,18.4,07	
	Mar Di - Cuz	20141	
M. D. M. Att ++	- 543,612	61210	
Max Required that ve	189,000.0.153	= = 18,8 /2 die tenden	5
Try 14 1/2" di	a strands for the s	tandord section	
Aps = 14.0,153 m2	= 2,142in2		
$P_i = 2.142in^2$, 18	9.000 = 404 838 1h	$P_{p} = 2.14210^{2} \cdot 154000 = 329$	8/8/1
			00010

3 Alternative #3 Oneway PT Double Fies Dames Chavanic Analysis of Stresses at service load at Midspan P= = 329,86816 MGFL = 1, 701,000 in+1b Motor = Mp + Mote = 3,665,655 in-16 $\varphi^{+} = -\frac{P_{e}}{A_{c}} \left(1 - \frac{e_{c_{+}}}{r^{2}} \right) - \frac{M_{T}}{5r}$ $= -\frac{3248681b}{325in^2} \left(1 - \frac{9.18.407}{20.41} - \frac{3665,655}{1630}\right)$ ft= -1406 psi < fc = -2250 psi 0.K. $f^{b} = -\frac{Pe}{A_{c}}\left(l + \frac{ec_{b}}{r^{2}} + \frac{MT}{S_{b}}\right)$ $= -\frac{329868/16}{32576^{2}}\left(1+\frac{4.18\cdot11.93}{20.41}\right) + \frac{3665655}{556}$ f^b = 131,7 psi (Tonsion) < 424.3 psi = f+ O.K. Analysis of Streases at Support Section $e_e = 3,93" \qquad f_{+i} = 6\sqrt{F'_c} = 368ps'$ $\Rightarrow simply supported$ $f_{+} = 12\sqrt{F'_c} = 849psi$ At transfer $f^{+} = -\frac{P_{1}}{A_{c}}\left(1 - \frac{ec_{+}}{r^{2}}\right) - 0 = -\frac{4048381b}{325in^{2}}\left(1 - \frac{3193.407}{20141}\right) - 0$ $f^{\dagger} = -269 psi < f_{ci} = -2250 psi _ 0.K,$ $f^{b} = -\frac{P_{i}}{R_{c}} \left(1 + \frac{e_{c_{b}}}{r^{2}} + 0 = -\frac{4048381b}{325in^{2}} \left(1 + \frac{3,93.11,93}{20141} \right) + 0$ f = -4107 psi > -2250 psi = fci N.G.



Kingstowne Section 36A Kingstowne, Virginia

Alternative #3 Oneway PT double Tes James Chavanic 5 a" NWC Topping Degign Support Girders Interior Girders (Inverted T) worst span = 28'-0" Peak a" topping : 25 pst Live Carage : 40 pst Doublet : 42 pst SI DL : 5 pst Trip width = $\left(\frac{45'+36.5'}{2}\right) = 40.75'$ Exterior Loadsi Wu = 1,2. (25+42+5). 40,75 + 1,6.40.40,75 Wy = 6130 16/At Precast members are simply supported $M_{4} = \frac{\omega_{11} b^{2}}{8} = \frac{6.13 k_{44} (28')^{2}}{8}$ From PEI Design Hand book Load Tables USE: $34 \pm 728 \frac{1}{20} \frac{1}{$ Loads! Dead 2"topping: 25pst Live Garage: 40pst Double T: 42pst Trip width = 45' = 22,5' SIDL: 5pst Trip width = 2 = 22,5' $\omega_{u} = 1, 2(25+42+5), 22,5+1,6,40,22,5$ $M_{4} = \frac{w_{u}}{8} \frac{b^{2}}{5} = \frac{3.3844}{8} \frac{16}{(28.5)^{2}}$ From PCI Design Handbook Lood Tables Ma = 344 K. Pf USE! 20LB28 with 12 -1'-8"

APPENDIX: B

Decking Spot Check (1) James Charansa Tech 1 Typical bay at office levels 2-4 deck spon Spon = 4'-6" typical -9'-6"-1 3/4" LWC on 2"x18 GA deck Using 2VLI18 from 2008 Vulcraft Cotolog 5DI Max unshared Clr spon 1 span = 10'-6" 7 4'-6" 2 span = 12'-7" >9'-6" V 3 span = 12'-7" > 9'-6" V Max Superimposed LL = 222pst SILL rea = 7pst + 15 pst + 5pst + 80pst + 85pst Growing GSIPL GMEP Lottice Exportitions GILlreg = 122pst 222pst > 122pst ,' planty string enough Possibly oversized to carry storage loads Concrete thickness needed for fire protection -> Even though 5-001 states that decks shall meet the 3 gpan condition, they still pass it a single span section is needed

Brown Spot Check 62 James Charanic Tech 1 Typical W21×44 beam between Grids A and C at office levels 2-4 -deck span I-Wal ×44 H+×18N H+x 12m PHX IEN B 9'-6" Typical <u>Peod Loads</u> SW: 44 psf SID: 15 psf MEP: 5psf Beam SW: 44 plf A Span: 45'-0" Trib width: 9'-6" $f'_{c} = 3000 \text{ psi LWC}$ $f'_{c} = 3000 \text{ psi LWC}$ f = 5,25'' $A_{s} = 13,01n^{2} f_{y} = 50 \text{ ksi}$ $d = 20.7'' b_{f} = 6.5''$ Portitions : 15 psf minimumLive Lock Reduction $L = L_0 \left(0.25 + \frac{15}{\sqrt{k_{LL} \cdot A_T}} \right)$ $L = 95psf(0.25 + \frac{15}{\sqrt{2.45'.9.5'}})$ BINT. beom L = 73 psf $\omega_{u} = 1.2 \omega_{D} + 1.6 \omega_{L} [LRFD]$ $w_{\rm M} = 1.2[(44+15+5)9.5+44]+1.6.73.9.5$ $W_{u} = 1892 \, l_{b/ff} \approx 1.9 \, k \, l_{ff}$

$$\begin{aligned} \overline{Sames} & (Mo \ vonic \ Tech \ | \qquad Beam \ Spot \ Check \ (and) \\ M_{H} &= \frac{\omega_{H} e^{2}}{8} = \frac{1.9 \ kl^{2} (4594)^{2}}{8} \qquad M_{H} = 481 \ k.44} \\ bett &= \int Trib \ width = 9.5' \rightarrow controls \\ bett &= \int Spon/4 = 45/4 = 11.25' \ bett = 9.5' = 114'' \\ Venax &= 0.85.420 + Usmax = A_{5}.42 \\ Venax &= 0.85.420 + 14'' \\ Simax &= 13.01n^{2}.50 \ kc^{2} \\ Venax &= 1526 \ k \\ Venax &= 1526 \ k \\ Venax &= 650 \ k \\ Same &= 550 \ k \\ Same &= 560 \ k \\ Same &= \frac{17.2 \ k}{2} \ (Tak/shad \ (Tak/c \ 3-21)) \\ Same &= \frac{387 \ k}{2} \ bett &= \frac{Venax - Ed_{n}}{2! \ y' \cdot b_{k}} \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Portioly \ Comparise \\ N/A \ in \ Plang \ Portioly \ Port \ Portioly \ Portioly \ Portioly \ Portioly \ P$$

$$\begin{split} \hline Somes (harmic Tech 1) & Beam Spot Check (cmt) 64 \\ Check deflections \\ & \underline{Wet (cncrete} \\ A_{Wc nox} = \frac{d}{240} = \frac{45' R^{''}}{940} = 2i 25'' T_{w21W4} = 843in^{44} \\ & W_{Wc} = 44pcf. 9, 5' + 444plf = 0.462 klf \\ & J_{Wc} = \frac{5 w \delta^{4}}{384 E T} = \frac{5 \cdot 6.462 kl f. (5:R)^{4}/h}{384 E J} = \frac{1}{384, 29000 kc}; 843in^{44}} = 1.749'' \le 2.25'' \\ & \underline{Live Load} \\ \hline Find T_{LB}, need \overline{y} \quad y_{2} = t - 95 = 5:25'' - \frac{1331}{331} = 4.585''' \\ \hline \overline{y} = \frac{45 \cdot 92 + 5}{7} (\frac{1}{7}y_{2}) = \frac{130in^{3} \cdot 00.7}{2} + \frac{387R}{50ki} (20.7i + 4.585'')} \\ \hline \overline{R}_{5} + \frac{62n}{7} (\frac{1}{7}y_{2})^{2} + \frac{50n}{13in^{2} + \frac{277K}{50ki}} (20.7i + 4.585'') \\ \hline T_{LB} = T_{X} + R_{5} (\overline{y} - \frac{4}{2})^{2} + \frac{50n}{50ki} (\frac{1}{7}y_{2} - \overline{y})^{2} \\ \hline T_{LB} = 1925 in^{4} \\ \Delta_{LL max} = \frac{\theta}{360} = \frac{457i2}{360} = 1.6'' \quad \omega_{LL} = 95pcf.95 = 0.403 klf \\ A_{LL max} = \frac{\theta}{360} = \frac{457i2}{384 \cdot 29} = 1.6'' \quad \omega_{LL} = 95pcf.95 = 0.403 klf \\ A_{LL} = \frac{5wd''}{384 \cdot 21} = \frac{5 \cdot 0.903 klf (2 \cdot (45 \cdot R))''}{384 \cdot 29,000 kc}; 1925in''} = 1.49'' - 1.59'' \\ Check unshored strength \\ \beta/R_{P} = 0.858 klf + 449 \\ (\omega_{n} D_{L} = 1.4 \cdot (441 \cdot 9.5 + 44)) = 0.647 klf \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) + 1.6 (20.9 \cdot 9.5) = 0.8588 klf^{4} \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) + 1.6 (20.9 \cdot 9.5) = 0.8588 klf^{4} \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) + 1.6 (20.9 \cdot 9.5) = 0.8588 klf^{4} \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) + 1.6 (20.9 \cdot 9.5) = 0.8588 klf^{4} \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) + 1.6 (20.9 \cdot 9.5) = 0.8588 klf^{4} \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) + 1.6 (20.9 \cdot 9.5) = 0.8588 klf^{4} \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) = 0.647 klf \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) + 1.6 (20.9 \cdot 9.5) = 0.8588 klf^{4} \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) = 0.647 klf \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) + 1.6 (20.9 \cdot 9.5) = 0.8588 klf^{4} \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) = 0.647 klf \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) = 0.647 klf \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot 9.5 + 44)) = 0.647 klf \\ (\omega_{n} C_{L} = 1.2 \cdot (41 \cdot$$

(D) W1	0x12 (31)	-	W24x5	5 (62) c=1-1	/4"	
W16x26 (37) c=3/4"	W16x31 (37) c=1-1/4"	W16x26 (37) c=3/4"				
© <mark>W1</mark>	4x22 (26)		W 30x	(99 (55) c=1	"	
W18x35 (45) c=1-1/4"	W21x44 (45) c=1-1/4"	W18x35 (45) c=1-1/4"				
A	W21x	44 (28)		W21	x44 (28)	

APPENDIX: C

		, .
	Office Level Alternative One-Way Pan Joist Dames Maranic	1
	44'-0" - Assume Column sizes	
	1 C as flours below 24"x24"	
	136" in this boy	
	- Keep grid spacing to	
	Satisfy arch, requirements	
	Une way O DISTS OLD U.C Building is 204-6" from	
	0 -1 l=42'-0" () to (8) Try 20" pans	
	Stan with 6 ribvidth	
	- 2 Hr fire rating required	
	HALL AND	
-	1"min. cover	
	(5) (2) (2) - max rib depth = 3,5, ribwidth	
	$f_{c} = 5000 \text{ psi}$ (ACI 318-11 = 21 ", use 20"	
	+, = 60,000 psi 8.13,2) deep pans	
\bigcirc	- 10% increase on Ve permitted (ACI 318-11 8.13,8)	
	Loads	
	Selt-weight = 150'b/43.10'' = 125pst T T	
	$-jojst = 150' \frac{1}{2} (43 \cdot \frac{1}{2} \cdot \frac{50'}{2}) \frac{1}{20''}$	
	$\frac{710}{(26''_{12''})} = 72 \text{ pst over}$	
	Veolection Criveria (HUL STORIC TADIE 4.5(A))	
	/18.5 => 45 1/2/18.5 = him = 29.2 Use 30 Total depth	
	SIDL=15pst LL=80pst in need 10 thick slob	
	MEP = 5 pst SW = 12 Eart + 72 - 5 - 197 of VKIL AF < 20 i' NO Live Lood Reduction	
	· · · · · · · · · · · · · · · · · · ·	
\bigcirc		

	OL Alternative #1 One-way PanJoist James Maranic	2
	$\frac{\text{Design I'wide strip of slab}}{W_{\text{m}} = \frac{26''}{12''} \left[1.2(125+15+5) + 1.6\cdot80 \right] = 0.655 \text{ klf}}$ Using ACI 318-11 $M_{\text{m}}^{-} = W_{\text{m}} \frac{l_{\text{m}}^{2}}{l_{\text{m}}^{2}} = 0.655 \left(\frac{9}{12}\right)^{2} = 0.166 \text{ k} \cdot \text{AT}/\text{AU} = 0.655 \left(\frac{9}{12}\right)^{2}$	
	8.3.3 moment II II II OTTOBUL /44 or slab coefficients $M_{u} = \frac{w_{u} k_{h}^{2}}{14} = \frac{0.655 \cdot \left[\frac{9}{2}\right]^{2}}{14} = 0.130 \text{ K} \cdot \text{A} / \text{slab}$ $K = \frac{w_{u} k_{h}^{2}}{14} = \frac{0.655 \cdot \left[\frac{9}{2}\right]^{2}}{14} = 0.130 \text{ K} \cdot \text{A} / \text{slab}$	
	$\begin{array}{l} (\text{ACI 318-11 7,12,2,1}) \\ \text{Shrinkage and Temperature} \\ \text{Shrinkage and Temperature} \\ \text{Fsmin} = 0.0018 \cdot 10''.12'' \\ \text{Remin} = 0.216 \text{ in}^2 = 243 = 0.22\text{ in}^2 \end{array}$	
	Max spacing: (ACT 318-11 1015.4) $S_{rax} = 3t \le 18'' - 3 controls 10'' = 5'$	
0	$q = \frac{A_{5} \cdot f_{1}}{0.85 \cdot f_{1} \cdot b} = \frac{0.22in^{2} \cdot 40000}{0.85 \cdot 5000 \cdot R''} C = \frac{9}{F_{1}} B_{1} = 0.85 - \frac{0.05}{1000} (5000 - 4000)$ $q = 0.259'' C = 0.357''_{100} R_{1} = 0.80$	
	check $\mathcal{E}_{g} > \mathcal{E}_{g}$ assumption $C = 0.324''$ $\mathcal{E}_{g} = \frac{\mathcal{E}_{u}}{C}(d-c) = \frac{0.003}{0.324}(5-0.324)$ $\mathcal{E}_{g} = 0.0433 > 0.005$, $\beta = 0.9$	
	$ \begin{array}{ll} g(M_n = pA_s, f_y(d-g_s) & g(M_n = 4,82k, \forall \neq >0,166k, \forall \neq \\ = 0.22; n^2, 60ksi(5-0.252) \cdot 0.9 & >0.130k, \forall \neq u \\ \end{array} $ $ \begin{array}{ll} \Rightarrow use 10'' deep slob with #3 @ 6'' 0.c. \end{array} $	
	$\frac{\text{Design Joist}}{W_{u} = \frac{26''}{12''}} \begin{bmatrix} 1, 2(147+5+15)+1, 6, 80 \end{bmatrix} = 0, 842 \text{ k/f}$ using ACI 318+11 $M_{u_{10}} = \frac{W_{u} V_{u}^{2}}{11} = \frac{0.842 \text{ k/f}}{11} = 1.35 \text{ k.ff}$	
	8.3.3 moment $M_{u} = t = \frac{w_{u} k_{n}^{2}}{24} = \frac{0.842 k k \cdot (42)^{2}}{24} = 62 k \cdot ft$ $M_{u} = \frac{w_{u} k_{n}^{2}}{14} = \frac{0.842 k l \cdot (42)^{2}}{14} = 106 k \cdot ft$	L

	OL Alternative#1 One-way Pan Joist James Chavanic 7
	$g = \frac{A_{g}}{100 \text{ in}^2} = \frac{1.00 \text{ in}^2}{20.10 + 6(275 - 10)} = 0.0027 = 0.27\% \text{ My} \text{ is}$
	Date slab - U (0 Uslab) 26.10+ 0 (2115-10) + C = 5000psi conservative
	$q = \frac{1.00.60}{2.00} = 0.543''$ $BM_n = PB_5.F_y(4-4/2)$
	$p_n = 0.9 \cdot 1.00 \cdot 60 \left(27.5 - \frac{0.940}{2} \right)$
	$C = \frac{2}{\beta_1} = \frac{0.543}{0.8} = 0.679''$ $M_{\rm H} = 122.5 \text{K} \cdot \text{M} > 106 \text{k} \text{M}$
	$\xi_{+5} = \frac{\xi_{\nu}}{E} \left(d - c \right) = \frac{0.003}{0.57a} \left(27.5 - 0.679 \right)$
	6 = 0.1185 = 0.004 V use 1#7 bor
	70,00548=0,9
	Shear Check
	$V_{1} = \frac{\omega_{1} \beta_{2}}{2} = 0.842 \text{K} \text{I} \hat{f} \cdot 42' = 17.74$
	2 $= 1/1/k$
	1 = 1.1. 1.2. VEC. huid
	AU = 10% increase per ACI 318-11 8,13,8
	<i>P</i> ^v <i>C</i> − 1,1,0,75,2,75000,6",27,5"
\sim	need reinforcing stra
	$V_{c} = \frac{V_{u}}{\sigma} - V_{c} = 17.7 \text{ K/} = -25.7$
	1/2 = -21 - step not required for strength
	Just os a solety measure.
	$V_{5} = 0 \leq 8 \sqrt{f_{c}} b_{w} d v$
	= 4 TF' burd Smgx = min 24"
	$1 = \frac{1}{2} $
	$H_{v_{min}} = \max \left\{ \begin{array}{c} \sum_{i=1}^{n} \frac{1}{2\sqrt{v_{min}}} - \frac{1}{2\sqrt{v_{min}}} \\ \sum_{i=1}^{n} \frac{1}$
	$(3000) \frac{1}{100} \frac{1}{100} = 50.6^{-1} \frac{1}{60,000} = 0.065 \text{ in }^2$
	AUTIN = 0.064 in =7 Use (#3 (one leg) AU=0.11 in 2
	use [#3@ 13" O.C.
	refine to tind when no longer needed
	for fur ther economy

OL Alternative #1 One-way Pan Joist Sames Chavanic 5
Prign Girder (Interior)
Interior girder (Interior)
Interior girder (Interior)
Interior girder (Interior)
Interior girder (Interior)
Say Girder is same depth as joist/club cystem and
is 36" wide
salt weight = 1501/gs : 22.7% = 11251k/ft
Dettection criteria (ACI 318-11 Table 9.500)
hmin = 1/8,5 = 49:07 = 28.5": 30" good
Wu = 1.2(197+545).(5+355-3)+1.2+115+1.6+80.45
Wu = 1.2(197+545).(5+355-3)+1.2+115+1.6+80.45
Wu = 1.2(197+545).(5+355-3)+1.2+1125+1.6+80.45
Mu = 1.2(197+545).(5+355-3)+1.2+1125+1.6+80.45
Mu = 1.2(197+545).(5+355-3)+1.2+1125+1.6+80.45
Mu = 1.2(197+545).(5+355-3)+1.2+1125+1.6+80.45
Mu = 26.7 - 0.5" - 0.5" - 1200 = 27.5"
A_5 = 40 = 24525 = 24.44 m = > Try 16 # 11 bars A_5 = 24.96 m²
A_5 = 40 = 24525 = 26.13 m = Try 16 # 11 bars A_5 = 24.96 m²
A_5 = 40 = 24525 = 26.13 m = Try 16 # 11 bars A_5 = 24.86 m²
A_5 = 40 = 24525 = 26.13 m = Try 18 # 11 bars A_5 = 24.86 m²
A_5 = 40 = 24525 = 26.13 m = Try 18 # 11 bars A_5 = 24.88 m²
check max # of bars for a single layer in 36" wide been
b - 26c - 2d m > 0.45 (-1).5c
Mu = 10.76 bars = 7 max allowed = 10 bars
Ubars < 4 parts / and ~ 2.10 bars
Joining (I Approxed control
S =
$$\frac{28.08 m^2}{36''' 3546''} = 0.304'' = 3.0476 = 7 A_5 = \frac{44}{44} may not mark & 400 + 10.76 bars = 7 max allowed = 10 bars
Ubars < 4 parts / and ~ 2.10 bars
Joining = 0.304 = 3.0476 = 7 A_5 = \frac{44}{44} may not mark & 400 + 3.0476 = 7 A_5 = \frac{44}{44} may not mark & 400 + 3.0476 = 7 A_5 = \frac{44}{44} may not mark & 400 + 3.0476 = 3.0476 = 3.0478 = 3.0478 = 3.0478 = 3.0478 = 3.0478 = 3.0478 = 3.0478 = 3.0478 = 3.0438 = 0.0043 =$$

				-
	OLAlternative #1	One - way Pan Joist	Sames Chavamic	/
	Since Mut and M	" ext are nearly v	he same, I will just do	
	one design that	will cover both		
	Assume 2 lay	vers of bars will b	penceded = $7d \approx 25.66''$	
	$A_{s} = \frac{M_{u}}{4d} = \frac{1890}{4000}$	== 18,41 in 2 -> T	ry 20 #9 bars As = 20 in?	2
	max # of # 11	bars allowed in single !	oyer	
	54"-2.115"-	2.0,5">n.1,56+(n-1)1.56	
	n	16,5 bors =7 max	allowed = 16 #11	
	$\mathcal{G} = \frac{\pi s}{bd} = \frac{\pm 0}{54"}$	25.66'' = 0.0144 = 1.44	1% My should be close	-
	Acity	20.60 FC = 500	0 psi 44	c al
	a= 0.85 fc b =	0.85.5.54	$E_{ts} = \frac{c_0}{c} \left(d_t - c \right) = \frac{c_0}{6.536} \left(c_{0.5,00} - c_{0.5,00} \right)$	61226)
	4=5,22	$A'' C = \frac{a}{B_1} = \frac{1000}{0.8}$	Etz = 0,00878 -0.0040 20,005 0	=0,9
		C = 6.536''	9	
	$p M_n = p H_s \cdot y (d - 12)$	$= 0.9.20.60(25.66 - \frac{1}{2})$	USP 20 #9 bors	
\bigcirc	$pm_{h} = 2074 k$. AF > 1890 K. AF V	in 2 layers	
	shear Check (wa	arst case @ interior	- Foce)	
	Vy = 400 Kips	=7 from same tra	me analysis used to tind	
		id a 3	$#4 = 7 P_5 = 0.6 in^2$	
	= 0.75.2.75000.	54". 25,66" (T	ry 4# in As=	0,8in2
			S= Av · fyt · d/v.	
	Vu CO, SPVC X	need steel	C = A R . (D . 25.66'')	
	$V_{\rm S} = \frac{V_{\rm P}}{P} - V_{\rm C} = \frac{400}{70}$	75 - 196K	338k	
	$V_s = 338 Kips$,	S=3.64	
	check Vs = 8 Vfc brid	4	i use 3	
	E 40F1, bui	d = 392K Use	#4@3	0.6
	1. Smax = min/d/2 = 25.642	= 12,83"	efine to find when no la	iger
\bigcirc	(24" Smax = 12"		needed for fur ther economy	y
	ATT. = 0.75 UFC. buis	=0.5728in2		
	50 bwis = 1,	54 in 2		
	tyt of			

APPENDIX: D

OL Alternative#2 Non-Comp. on bar joists James Maranic - wide flange Girder (Designed) 2 Hour Aire rating needed to match existing system Deck Say Gypsum Board Protection BanJoiste to avoid spray fiber fire proofing on joists (messy) Nee 21/2 NWC K-Series 7 On 1.5C Conform deck > used Vulcraft deck catalog to determine -Wide Flange Girder Say joists will be 4'-0" O.C. Say 24 GA. Deak (1.5624) w=43pst for concrete weight Max, Construction clear spons Loods Deck = 1,44pst say 2pst 1span = 5'-1" >4' Concrete =43pst 2 span = 6'-9" > 4' SIDL = 15pst 3 span = 6'-10">4'V MEP=Spst LL = 80pst Total = 145 pst Fb = 36,000 LL = 80pst Det = 1/240 Allowable Uniform Load (1.5C24 1 span @4'-0" 198 pst (total load) > 145 pst / check deflection criteria (1.5C24 1 span @4'-0" 140 pst (Pett= \$40) > 80 pst LL - 2 and 3 span conditions have even higher capacities 1. 1.5024 deck is good USE 1.5 C24 deck with 21/2" NWC topping (dutod = 4.0") with WWF 6×6-W2,9×W2,9 to meet ACI criteria for temp, and Shrinkage

Kingstowne Section 36A Kingstowne, Virginia

01 Atternative #2 Non-Comp. on barjoist James Chavanic 2 Size Joist $\omega_{LL} = 80.470$ $\omega_{LL} = 3201b/44$ Trib with = 4'-0" LL=80 pst Loads Deck = 2 pst concrete=43pst SIDL = 15 pstMEP = 5 pst -DL=70pst Joist self wit + 6WB+Insulation = 5pst Wu=1,2DL+1.6LL Wu = 212psf. 4++ Wu = 848 16/At () options : li Use LH series joist >no k-series joist 2. Reduce joist spacing to 2-0 o.c. optim 1 $\omega_{+L} = 848 \ 1b/At$ using SDI $\omega_{+L} = 2i2pst. 2dt = 424 \ 1b/At$ $\omega_{+L} = 848 \ 1b/At$ using SDI $\omega_{+L} = 2i2pst. 2dt = 424 \ 1b/At$ $\omega_{+L} = 320 \ 1b/At$ catalog $\omega_{+L} = 2i2pst. 2dt = 160 \ 1b/At$ $\omega_{+L} = 320 \ 1b/At$ catalog $\omega_{+L} = 80.2At = 160 \ 1b/At$ $28 \ LH09 \ wt = 21 \ 1bs/At < 879 \ TL$ Still good once correctedfor joist self wt, $<math>4'26 \ K10 \ wt = 13.8 \ 1bs/At < 486 \ TL$ $V24 \ K12 \ wt = 16 \ 1bs/At < 580 \ TL$ $199 \ LL$ Adjust for actual self weight2. Reduce joist spacing to 2'-0" o.c. Size Girder (check for both options) option 2 optionl Idealize as distributed load I dealize as distributed load $l_b = joist spacing = 4'-0''$ $l_b = joist spacing = 2'-0''$ $DL = 75 \text{ psf} \Rightarrow adjusted for DL = 75 \text{ psf} LL = 80 \text{ psf}$ original low alloware $W_{u} = 8.89 \text{ k/H}$ $LL = 80 \text{ psf} \qquad \text{of Joist selfut,} \qquad M_{u} = 2150 \text{ k.H}$ W307173 &Mn = 2280 k. At $\omega_{u} = [1, 2.75 + 1.680] \left(\frac{45 + 36.5}{2}\right)$ Deflection check Wn = 8,89 K/ff Dmax = 1/240 = 44. 2/240 = 2.2" $M_{u} = \frac{w_{u}l^{2}}{8} = \frac{8.89.44^{2}}{8} = 2150 \text{ k.ff}$ More Stringent Omax = 1/50 = 40 = 1.47" W30×173 ØMn = 2280 kitt A= 1,152" < 1,47" $Deflection check \qquad \omega_{LL} = 3,26 k/fd$ $\Delta_{L} = 5 w B^{4} = 5 \cdot 3,26 \cdot (44 f + (2 \cdot 1/k))$ $\Delta_{L} = 784 EI = 384 \cdot 29,000 \cdot 8230 m^{4}$ $A_{TL} = \frac{5w_{11} l^{4}}{384EI} = \frac{5.6.316.444}{384.29,000.8230m^{4}} = 2.23''. comber girder ³/4''$ use W30×173 with 3/4" Comber

APPENDIX: E

Note: All tables and figures in this appendix were obtained from RSMeans CostWorks website.

Assembly B10102506150

Based on National Average Costs

Floor, concrete, slab form, open web bar joist @ 2' OC, on W beam and column, 25'x30' bay, 29" deep, 100 PSF superimposed load, 145 PSF total load

Description	Quantity	Unit	Material	Installation	Total
Welded wire fabric, sheets, 6 x 6 - W1.4 x W1.4 (10 x 10) 121 lb. per C.S.F., A185, incl	0.01000	C.S.F.	0.15	0.36	0.51
Structural concrete, ready mix, normal weight, 3000 psi, includes local aggregate, san	0.21000	C.F.	0.87	0.00	0.87
Structural concrete, placing, elevated slab, pumped, less than 6" thick, includes strike	0.21000	C.F.	0.00	0.32	0.32
Concrete finishing, floors, for specified Random Access Floors in ACI Classes 1, 2, 3 an	1.00000	S.F.	0.00	0.86	0.86
Concrete surface treatment, curing, sprayed membrane compound	0.01000	C.S.F.	0.08	0.09	0.17
Structural steel project, apartment, nursing home, etc, 100-ton project, 1 to 2 stories,	4.36800	Lb.	6.03	1.83	7.86
Open web bar joist, K Series, 40-ton job lots, 30' to 50' spans, shop fabricated, incl sh	5.70000	Lb.	4.73	1.48	6.21
Metal decking, steel, slab form, galvanized, 9/16" D, 28 gauge, type UFS	1.02000	S.F.	1.32	0.75	2.07
Total			\$13.20	\$5.69	\$18.89



Slab form is 28 gauge galvanized. Column costs in table are for columns to support 1 floor plus roof loading in a 2story building; however, column costs are from ground floor to 2nd floor only. Joist costs include appropriate bridging. Deflection is limited to 1/360 of the span. Screeds and steel trowel finish.

Design Loads	Min.	Max.
S.S. & Joists	6.3 PSF	15.3 PSF
Slab Form	1.0	1.0
2-1/29 Concrete	27.0	27.0
Ceiling	3.0	3.0
Misc.	5.7	1.7
	43.0 PSF	48.0 PSF

Cost Estimate Report

Year 2012

Prepared By: James Chavanic Penn State University

Date: 11-Oct-12						Penn State University
Line Number		Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 05 Metals						
052116502320		Longspan joist, LH Series, 40-ton job lots, 28LH06, 16 plf, spans to 96', shop fabricated, incl shop primer, bolted cross bridging	1	L.F.	\$19.73	\$19.73
052116502340		Longspan joist, LH Series, 40-ton job lots, 28LH11, 25 plf, spans to 96', shop fabricated, incl shop primer, bolted cross bridging	1	L.F.	\$28.33	\$28.33
052119100640		Open web bar joist, K Series, 40-ton job lots, 26K10, 13.8 plf, 30' to 50' spans, shop fabricated, incl shop primer, horizontal bridging	1	L.F.	\$15.35	\$15.35
Division 05 Metals S	ubto	otal				\$63.41

Unit Detail Report

Assembly B10102568000

Based on National Average Costs

Floor, composite metal deck, shear connectors, 5.5" slab, 35'x40' bay, 29.5" total depth, 125 PSF superimposed load, 171 PSF total load

Description	Quantity	Unit	Material	Installation	Total
Welded wire fabric, sheets, 6 x 6 - W1.4 x W1.4 (10 x 10) 121 lb. per C.S.F., A185, incl	0.01100	C.S.F.	0.17	0.40	0.56
Structural concrete, placing, elevated slab, pumped, less than 6" thick, includes strike	0.33300	C.F.	0.00	0.51	0.51
Structural concrete, ready mix, lightweight, 110 #/C.F., 3000 psi, includes local aggre	0.33300	C.F.	2.41	0.00	2.41
Concrete finishing, floors, for specified Random Access Floors in ACI Classes 1, 2, 3 an	1.00000	S.F.	0.00	0.86	0.86
Concrete surface treatment, curing, sprayed membrane compound	0.01000	C.S.F.	0.08	0.09	0.17
Weld shear connector, 3/4" dia x 4-7/8" L	0.15300	Ea.	0.11	0.31	0.42
Structural steel project, apartment, nursing home, etc, 100-ton project, 3 to 6 stories,	8.34000	Lb.	11.68	3.59	15.26
Metal floor decking, steel, non-cellular, composite, galvanized, 3" D, 18 gauge	1.05000	S.F.	2.88	1.10	3.98
Metal decking, steel edge closure form, galvanized, with 2 bends, 12" wide, 18 gauge	0.02700	L.F.	0.11	0.07	0.17
Sprayed fireproofing, cementitious, normal density, beams, 1 hour rated, 1-3/8" thick	0.65400	S.F.	0.38	0.65	1.03
Total			\$17.80	\$7.58	\$25.38



Description: Table below lists costs (\$/S.F.) for a floor system using composite steel beams with welded shear studs, composite steel deck, and light weight concrete slab reinforced with W.W.F. Price includes sprayed fiber fireproofing on steel beams.

- Design and Pricing Assumptions: Structural steel is A36, high strength bolted.
 - Composite steel deck varies from 22 gauge to 16 gauge, galvanized.

Shear Studs are 3/4". W.W.F., 6 x 6 - W1.4 x W1.4 (10 x 10) Concrete f'c = 3 KSI, lightweight. Steel trowel finish and cure. Fireproofing is sprayed fiber (nonasbestos).

Spandrels are assumed the same as interior beams and girders to allow for exterior wall loads and bracing or moment connections.

Assembly B10102224000

Based on National Average Costs

Flat slab, concrete, with drop panels, 8.5" slab/8.5" panel, 20" column, 25'x25' bay, 125 PSF superimposed load, 243 PSF total load

Description	Quantity	Unit	Material	Installation	Total
C.I.P. concrete forms, beams and girders, exterior spandrel, plywood, 12" wide, 4 use	0.03400	SFCA	0.03	0.35	0.38
C.I.P. concrete forms, elevated slab, flat slab with drop panels, to 15' high, 4 use, incl	0.99400	S.F.	1.27	5.81	7.09
Reinforcing Steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for acc	3.87600	Lb.	2.17	1.67	3.84
Structural concrete, ready mix, normal weight, 3000 psi, includes local aggregate, san	0.78700	C.F.	3.27	0.00	3.27
Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes strike of	0.78700	C.F.	0.00	1.02	1.02
Concrete finishing, floors, for specified Random Access Floors in ACI Classes 1, 2, 3 an	1.00000	S.F.	0.00	0.86	0.86
Concrete surface treatment, curing, sprayed membrane compound	0.01000	C.S.F.	0.08	0.09	0.17
Total			\$6.80	\$9.80	\$16.60



General: Flat Slab: Solid uniform depth concrete two-way slabs with drop panels at columns and no column capitals.

Design and Pricing Assumptions:
Concrete f'c = 3 KSI, placed by concrete pump.
Reinforcement, fy = 60 KSI.
Forms, four use.
Finish, steel trowel.
Curing, spray on membrane.
Based on 4 bay x 4 bay structure.

Assembly B10102269800

Based on National Average Costs

Joist slab, cast-in-place concrete, multi-span, 20" deep rib, 28" column, 40'x45' bay, 125 PSF superimposed load, 234 PSF total load

Description	Quantity	Unit	Material	Installation	Total
C.I.P. concrete forms, beams and girders, exterior spandrel, plywood, 12" wide, 4 use	0.16700	SFCA	0.15	1.71	1.86
C.I.P. concrete forms, beams and girders, interior, plywood, 12" wide, 4 use, includes	0.13900	SFCA	0.15	1.17	1.32
C.I.P. concrete forms, elevated slab, floor, with 1-way joist pans, 4 use, includes shori	0.92300	S.F.	2.96	5.86	8.82
C.I.P. concrete forms, elevated slab, edge forms, alternate pricing, to 6" high, 1 use, i	0.01000	SFCA	0.01	0.06	0.07
Reinforcing Steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for acc	2.88000	Lb.	1.61	1.24	2.85
Structural concrete, ready mix, normal weight, 4000 PSI, includes local aggregate, sa	0.91000	C.F.	3.80	0.00	3.80
Structural concrete, placing, elevated slab, pumped, over 10" thick, includes strike off	0.91000	C.F.	0.00	1.23	1.23
Concrete finishing, floors, for specified Random Access Floors in ACI Classes 1, 2, 3 an	1.00000	S.F.	0.00	0.86	0.86
Concrete surface treatment, curing, sprayed membrane compound	0.01000	C.S.F.	0.08	0.09	0.17
Total			\$8.75	\$12.22	\$20.97



General: Combination of thin concrete slab and monolithic ribs at uniform spacing to reduce dead weight and increase rigidity. The ribs (or joists) are arranged parallel in one direction between supports.

Square end joists simplify forming. Tapered ends can increase span or provide for heavy load.

Costs for multiple span joists are provided in this section. Single span joist costs are not provided here. Design and Pricing Assumptions:
Concrete f'c = 4 KSI, normal weight placed by concrete pump.
Reinforcement, fy = 60 KSI.
Forms, four use.
4-1/29 slab.
309 pans, sq. ends (except for shear req.).
69 rib thickness.
Distribution ribs as required.
Finish, steel trowel.
Curing, spray on membrane.
Based on 4 bay x 4 bay structure.

Assembly B10102393100

Based on National Average Costs

Precast double T, 2" topping, on precast beams, 38" deep, 25'x30' bay, 75 PSF superimposed load, 168 PSF total load

Description	Quantity	Unit	Material	Installation	Total
C.I.P. concrete forms, elevated slab, bulkhead with keyway, 2 piece, 1 use, includes s	0.01000	L.F.	0.02	0.06	0.08
C.I.P. concrete forms, elevated slab, edge forms, to 6" high, 4 use, includes shoring, e	0.03700	L.F.	0.01	0.15	0.16
Welded wire fabric, sheets, 6 x 6 - W1.4 x W1.4 (10 x 10) 121 lb. per C.S.F., A185, incl	0.01000	C.S.F.	0.15	0.36	0.51
Structural concrete, ready mix, normal weight, 3000 psi, includes local aggregate, san	0.17000	C.F.	0.71	0.00	0.71
Structural concrete, placing, elevated slab, pumped, less than 6" thick, includes strike	0.17000	C.F.	0.00	0.26	0.26
Concrete finishing, floors, for specified Random Access Floors in ACI Classes 1, 2, 3 an	1.00000	S.F.	0.00	0.86	0.86
Concrete surface treatment, curing, sprayed membrane compound	0.01000	C.S.F.	0.08	0.09	0.17
Precast concrete beam, 5000 psi, T-shaped, 25' span, 12" x 36"	0.03100	L.F.	6.32	0.45	6.78
Precast concrete beam, 5000 psi, L-shaped, 25' span, 12" x 28"	0.02100	L.F.	2.86	0.27	3.13
Precast tees, double, roof, 30' span, 16" x 8' wide, prestressed	0.00412	Ea.	8.96	1.65	10.62
Total			\$19.10	\$4.15	\$23.25



General: Beams and double tees priced here are for plant produced prestressed members transported to the site and erected.

The 2" structural topping is applied after the beams and double tees are in place and is reinforced with W.W.F.

Design and Pricing Assumptions: Prices are based on 10,000 S.F. to 20,000 S.F. projects and 50 mile to 100 mile transport. Concrete for prestressed members is f'c 5 KSI.

Concrete for topping is f'c 3000 PSI and placed by pump.

Prestressing steel is fy = 250 or 300 KSI.

W.W.F. is 6 x 6 - W1.4 x W1.4 (10x10).

APPENDIX: F







APPENDIX: G

BXUV.G559 - Fire Resistance Ratings - ANSI/UL 263

Page 1 of 4



Design No. G559 BXUV.G559 Fire Resistance Ratings - ANSI/UL 263

Page Bottom

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Listed or Classified products, equipment, system, devices, and materials.
 Authorities Having Jurisdiction should be consulted before construction.

- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with
 applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.

Only products which bear UL's Mark are considered as Classified, Listed, or Recognized.

Fire Resistance Ratings - ANSI/UL 263

See General Information for Fire Resistance Ratings - ANSI/UL 263

Design No. G559

March 19, 2012

Unrestrained Assembly Rating - 2 Hr.

Load Restricted for Canadian Applications – See Guide BXUV7



1. Steel Deck — Min 9/16 in. deep, 22 MSG galv corrugated fluted steel deck. Attached to each joist with #10 3/4 in. long screws at each side joint and no more than 12 in. OC between sides.

2. Floor Topping Mixture* - Compressive strength to be 3500 psi min. Minimum thickness to be 1 in. as measured from the top plane of the deck. Refer to manufacturer's instructions accompanying the material for specific mix design. An ethylene vinyl acetate adhesive may be applied to the steel deck prior to the installation of the floor topping mixture at a maximum application rate of 0.025 lbs./ft².

BXUV.G559 - Fire Resistance Ratings - ANSI/UL 263

Page 2 of 4

UNITED STATES GYPSUM CO - LEVELROCK® Brand ™ CSD or LEVELROCK™ CSD RH

2A. Floor Topping Mixture* — (As an alternate to Item 2, not shown) — Various types of insulating concrete prepared and applied in the thickness indicated below:

A. Vermiculite Concrete — 6 cu ft of Vermiculite Aggregate* to 94 lbs. of Portland cement and 0.5 lb. of air entraining agent. Min 2-1/2 in. thickness above top plane of steel deck when no foamed plastic insulation boards (Item 9) are used. When foamed plastic insulation boards are used, min thickness above foamed plastic is 2 in. and min thickness between the top plane of the steel deck and the foamed plastic is 1/8 in. The max vermiculite concrete thickness shall be determined by job site conditions.

SIPLAST INC

THE STRONG CO INC

VERMICULITE PRODUCTS INC

B. Cellular Concrete — Roof Topping Mixture* — Foam concentrate mixed with water and Portland cement per manufacturer's specifications. Cast dry density and 28-day compressive strength of min 190 psi as determined in accordance with ASTM C495-66. Thickness of cellular concrete topping to be 2-3/4 in. min above top plane of steel deck when no foamed plastic insulation boards (Item 9A) are used. When foamed plastic is used, a 1/8 in. min slurry coat of cellular concrete, as measured to the top of the steel form unit corrugations, shall be employed. The cellular concrete topping thickness above foamed plastic, shall be 2 in. min.

 ${\rm CeLCORE\ INC}$ — Type Celcore with cast dry density of 31 (+ or - 3.0) pcf or Type Celcore MF with cast dry density of 29 (+ or - 3.0) pcf.

CELLULAR CONCRETE L L C - Cast dry density 37 (+ or -) 3.0 pcf.

ELASTIZELL CORP OF AMERICA — Type II. Mix #1 of cast dry density 39 (+ or -) 3.0 pcf, Mix #2 of cast dry density 40 (+ or -) 3.0 pcf, Mix #3 of cast dry density 47 (+ or -) 3.0 pcf.

LITE-CRETE INC — Cast dry density of 29 (+ or -) 3.0 pcf.

C. **Perlite Concrete** — Mix consists of 6 cu ft of Perlite Aggregate* to 94 lb of Portland cement and 1-1/2 pints of air entraining agent. Min 2-1/2 in. thickness above top plane of steel deck when no foamed plastic insulation boards (Item 9B) are used. When foamed plastic boards are used, min thickness above foamed plastic is 2 in. and min thickness between the top plane of the steel deck and the foamed plastic is 1/8 in.

See **Perlite Aggregate** (CFFX) category in Fire Resistance Directory for names of Classified companies.

D. Cellular Concrete — Roof Topping Mixture* — Foam Concentrate mixed with water, Portland Cement and UL Classified Vermiculite Aggregate per manufacturer's application instructions. Cast dry density of 33 (+ or -) 3.0 pcf and 28-day compressive strength of min 250 psi as determined in accordance with ASTM C495-86. A 1/8 in. min slurry coat shall be employed below the foamed plastic (Item 9A or 9B). The cellular concrete topping thickness, above the foamed plastic, shall be 1 in. min.

CELLULAR CONCRETE L L C - Mix #3.

SIPLAST INC - Mix #3.

2B. Lightweight Concrete — (As an alternate to Items 2 and 2A, not shown) -- Lightweight concrete, expanded shale or slate aggregate by rotary-kiln method or expanded clay aggregate by rotary-kiln or sintered-grate method, 107 - 113 pcf unit weight, 3000 psi compressive strength, vibrated, 4 to 7 per cent entrained air. Min. thickness as measured from the top plane of the steel deck, 2-1/2 in.

3. **Structural Steel Members*** — The proprietary joists are channel-shaped, 9-1/4 in. min depth. Joists are fabricated from min No. 16 MSG galv steel. Joists spaced max 24 in. OC. Joists attached to rim joist with three #10 3/4 in. long self-drilling screws at the rim track clip to the outside of the web joist, and a #10 1/2 in. long screw through the top and bottom flange of the joists to the top and bottom flange of the rim track. At rim joist splices bearing on supports, rim joists are connected using an overlapping section of a 12 in. long splice plate (a joist piece), with six 3/4 in. long self-drilling #10 screws to each rim piece.

BXUV.G559 - Fire Resistance Ratings - ANSI/UL 263

Page 3 of 4

CALIFORNIA EXPANDED METAL PRODUCTS CO - Type SSCJ floor joists, SSRT rim joists

4. Joist Bridging — Not shown — Installed immediately after joists are erected and before construction loads are applied. The structural bridging, Type CEMCO Sure Bridging, consisting of No. 18 MSG galv steel, 2-1/2 in. wide by 25-1/2 in. long with 1-5/16 in. long legs structural bridging staggered between the steel joists and attached to the bottom joist flange with two #10 1/2 in. long self-drilling screws at each end tab of bridging. Solid bridging consisting of cut to length joist sections placed between outer joists and at center joist with 8 ft OC max spacing. Solid bridging is seated in the structural bridging and is screw-attached at joist web using Type CEMCO Sure-Support Clips (1-1/2 in. by 1-1/2 in. by 7 in. long, 16 MSG, min 50 ksi support Clips (4 in. by 1-1/2 in. by 1-1/2 in. by 1-1/2 in. by 3/4 in. long self-drilling screws per leg on one side and the other side with Type CEMCO drilling screws per leg.

5. Resilient Channels — 1/2 in. deep, formed of 25 MSG galv steel, spaced 12 in. OC perpendicular to joists. Channel splices overlapped 4 in. beneath steel joists. Channels secured to each joist with 1/2 in. Type S-12 low profile screws. Channels oriented opposite at wallboard butt joints (spaced 5-1/2 in. OC) as shown in the above illustration.

5A. Alternate Steel Framing Members — (Not Shown) - As an alternate to Item 5, main runners, cross tees, cross channels and wall angle as listed below:

a. Main Runners — Nom 10 or 12 ft long, 15/16 in. or 1-1/2 in. wide face, spaced 4 ft. OC. Main runners suspended by min 12 SWG galv steel hanger wires spaced 48 in. OC. Hanger wires to be located adjacent to main runner/cross tee intersections. Hanger wires inserted through holes drilled through web of joists and twist-tied.

b. Cross Tees — Nom 4 ft long, 1-1/2 in. wide face, installed perpendicular to the main runners, spaced 16 in. OC. Additional cross tees or cross channels used at 8 in. from each side of butted gypsum panel end joints. The cross tees or cross channels may be riveted or screw attached to the wall angle or channel to facilitate the ceiling installation.

c. Cross Channels — Nom 4 or 12 ft long, installed perpendicular to main runners, spaced 16 in. OC.

d. Wall Angle or Channel — Painted or galv steel angle with 1 in. legs or channel with 1 in. legs, 1-9/16 in. deep attached to walls at perimeter of ceiling with fasteners 16 in. OC. To support steel framing member ends and for screw-attachment of the gypsum panel.

CGC INC - Type DGL or RX.

USG INTERIORS LLC — Type DGL or RX.

6. **Gypsum Board*** — Nom 5/8 in. thick, 48 in. wide gypsum panels. When resilient channels (Item 5) are used, gypsum panels installed with long dimension perpendicular to resilient channels. Gypsum panels secured with 1 in. long Type S bugle-head screws spaced 8 in. OC in both the field and the perimeter, and 1-1/2 in. from side edges of the board. When Steel Framing Members (Item 5A) are used, gypsum panels installed with long dimension perpendicular to cross tees with side joints centered along main runners and end joints centered along cross tees. Panels fastened to cross tees with 1 in. long Type S bugle-head screws spaced 8 in. OC in the field and along end joints. Panels fastened to main runners with 1 in. long Type S bugle-head screws spaced midway between cross tees. Screws along sides and ends of panels spaced 3/8 to 1/2 in. from panel edge. End joints of panels shall be staggered with spacing between joints on adjacent panels not less than 2 ft OC.

CGC INC - Types C, IP-X2, IPC-AR

UNITED STATES GYPSUM CO - Types C, IP-X2, IPC-AR

USG MEXICO S A DE C V - Types C, IP-X2, IPC-AR

7. Batts and Blankets* — Glass fiber insulation, min 3-1/2 in. thick, bearing the UL Classification Marking for Surface Burning Characteristics and/or Fire Resistance. Insulation fitted in the concealed space, draped over the resilient channel/gypsum panel ceiling membrane. See Batts and Blankets (BKNV or BZJZ) Categories for names of Classified companies.

8. Joint System — Not Shown — Vinyl, dry or premixed joint compound, applied in two coats to joints and screw heads; paper tape, 2 in. wide, embedded in first layer of compound over all joints.

9. Foamed Plastic* — Optional — For vermiculite concrete applications — Foamed plastic insulation boards with holes and/or slots. Nom 24 by 48 in. size. Thickness 1 in. to max 8 in.

VERMICULITE PRODUCTS INC

BXUV.G559 - Fire Resistance Ratings - ANSI/UL 263

D			C I	
Page	4	01	- 4	Ļ.

9A. Foamed Plastic* — Nom 24 by 48 in., 48 by 48 in. or 30 by 60 in. by max 8 in. thick polystyrene foamed plastic insulation boards with holes symmetrically placed having a max density of 2.0 pcf. For use only with cellular concrete roof topping mixture.

STARRFOAM MFG INC

9B. Foamed Plastic* — Nominal 24 by 48 by max 8 in. thick polystyrene foamed plastic insulation boards having a density of 1.0 + 0.1 pcf encapsulated within cellular or perlite concrete topping (Item 3B or 3C). Each insulation board shall contain six nom 3 in. diameter holes oriented in two rows of three holes each with the holes oriented in two rows of three holes each with the holes spaced 12 in. OC, transversely and 16 in. OC longitudinally.

See Foamed Plastic* (BRYX) category in Building Materials Directory or Foamed Plastic* (CCVW) category in Fire Resistance Directory for list of manufacturers.

*Bearing the UL Classification Mark

Last Updated on 2012-03-19

Questions?	Print this page	Terms of Use	Page Top	
				© 2012 ULLIC

When the UL Leaf Mark is on the product, or when the word "Environment" is included in the UL Mark, please search the <u>UL Environment database</u> for additional information regarding this product's certification.

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Listed and covered under UL's Follow-Up Service. Always look for the Mark on the product.

UL permits the reproduction of the material contained in the Online Certification Directory subject to the following conditions: 1. The Guide Information, Designs and/or Listings (files) must be presented in their entirety and in a non-misleading manner, without any manipulation of the data (or drawings). 2. The statement "Reprinted from the Online Certifications Directory with permission from UL" must appear adjacent to the extracted material. In addition, the reprinted material must include a copyright notice in the following format: "© 2012 UL LLC".

APPENDIX: H



	arted-Tee	Bea	m Loa	ad Ta	bles	(con	t.)											
3.11 Inve	enteu-ree																	
														No	rmalv	reigh	t Co	ncre
8"	1'-6" 8				in allo			-		Section	Pro	pertie	es	-	S.	S.		Wt
	2	-		0	Designa	tion	h in.	h	in.	A in. ²	i	n.4	in.		in. ³	in.	3	Ib/ft
L L			1 1	-	34IT2	0	20	1	12/8	488	16	6,082	8.4	13	1908 2741	139	90	650
	922 C 4 64 1	h	1		34IT2	4	24	11	2/12 6/12	624 696	44	4,130	11.	79	3743	27	22	72
000			t h		34112	32	32	2	0/12	768	65	5,856	13.	50	4878	35	60 14	80
		-	1	01.0	34IT3	36	36	2	4/12	840	93	8,616	15.	85	7635	55	58	101
1995		h	1		34IT4	10	40	2	8/16	1048	17	1,157	18.	58	9212	67	33	109
			1 1		34114	44 48	48	2	23/16	1120	22	1,906	20.	34	10,910	80	23	116
	0' 10"	01.0	20.00	100	34IT	52	52	3	36/16	1192	28	9 623	22.	78	17,053	12,1	847	139
-	2-10	-		L	34IT	60	60	4	14/16	1336	143	3,023	20.		12.50	Red O	103	
$f'_c = 5$	5000 psi			1	2. Check 2. Safe lo	local area ads show	a for avai	ability of a 50% s	superimple	osed dead	load an	top reinfe	ve load orceme	l. ent is ree	quired.			
f = 1	270 000 psi	i			800 ps	i top tens ads can l	sion has b be signifi	cantly in	ncreased	by use of	structur	ral compo	osite top	pping.				
i _{pu} = i	diameter			great land														
1/2-in.	-diameter,																	
low-r	elaxation st	trand																
Key 7820 - Safe	superimposed s	service lo	ad, lb/ft															
0.4 - Estin	nated camber at	t erection,	, in.															
0.1 - Estin	nated long-time	camber,							-									
								ers. II										
Table of	safe superin	mpose	d servi	ce loa	d, Ib/ft	, and c	campe			Snan f	+			The	y. (en	bee	IN IN	
Table of Desig-	safe superin Number	y _s	d servi	ce loa	d, Ib/ft	, and c	campe			Span, f	t 24	36	38	40	42	44 4	16	48
Desig- nation	safe superin Number strand	y _s in.	d servi	ce loa	d, Ib/ft	, and 0	26	28	30	Span, 1 32	it 34 70 16	36	38	40 230 1	42	44 4	16	48
Table of Desig- nation	safe superin Number strand	y _s in.	d servi 16 78	ce loa 18 2 20 625	d, lb/ft	24 4200 3	26 3520 2 0.7	28 2970 2 0.8	30 2530 2 0.9	Span, 1 32 2170 18 1.0	it 34 70 16	36 620 14	38 10 1: 1.2	40 230 1 1.2	42 1080 1.2	44 4	16	48
Table of Desig- nation 34IT20	Number strand	<i>y_s</i> in. 2.29	16 78	18 2 20 625 0.4 0.	d, lb/ft 0 22 0 5090 5 0.6 2 0.2	24 4200 3 0.7 0.2	26 3520 2 0.7 0.2	28 2970 2 0.8 0.2	30 2530 2 0.9 0.2	Span, 1 32 2170 18 1.0 0.2	it 34 70 16 1.1 0.2	36 520 14 1.1	38 10 12 1.2 0.2	40 230 1 1.2 0.1	42 1080 1.2 0.1	44 4	16	48
Table of Desig- nation 34IT20	Safe Superin Number Strand 14	y _s in. 2.29	16 78 (18 2 20 625 0.4 0. 0.1 0. 922	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520	24 4200 0.7 0.2 6230	26 3520 2 0.7 0.2 5220 4	28 2970 2 0.8 0.2 4430	30 2530 2 0.9 0.2 3780 3	Span, 1 32 2170 18 1.0 1 0.2 (0 3260 28	it 34 70 16 1.1 0.2 20 24	36 520 14 1.1 0.2 0 460 21	38 10 12 1.2 0.2 150 1	40 230 1 1.2 0.1 880 1 1.2	42 080 1.2 0.1 1660 14 1.2	44 4 60 129	16 90 11	48 140 10 1.3
Table of Desig- nation 34IT20 34IT24	Number strand 14 17	y _s in. 2.29 2.59	16 78 (18 2 20 625 0.4 0. 0.1 0. 922 0.	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 4 0.5	24 4200 3 0.7 0.2 6230 0.6	26 3520 2 0.7 0.2 5220 4 0.7 0.7	28 2970 2 0.8 0.2 4430 2 0.7 0.3	30 2530 2 0.9 0.2 3780 3 0.8 0.3	Span, 1 32 2170 18 1.0 1 0.2 0 3260 28 0.9 0.3	it 34 70 16 1.1 0.2 20 24 1.0 0.3	36 520 14 1.1 0.2 0 460 21 1.1 0.3	38 10 12 1.2 0.2 150 1 1.1 0.3	40 230 1 1.2 0.1 880 1 1.2 0.2	42 080 1.2 0.1 1660 14 1.2 0.2	44 4 160 129 1.2 1 0.2 0	16 90 11 1.3 0.1	48 140 10 1.3 0.0 -
Table of Desig- nation 34IT20 34IT24	Safe Superin Number Strand 14 17	y _s in. 2.29 2.59	16 78 (18 2 20 625 0.4 0. 0.1 0. 922 0. 0. 0 0 0 0 0 0 0 0 0 0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 4 0.5 .2 0.2	24 4200 3 0.7 0.2 6230 0.6 0.2 8640	26 3520 2 0.7 0.2 5220 4 0.7 0.2 7270	28 2970 2 0.8 0.2 4430 2 0.7 0.3 6180	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300	Span, 1 32 2170 18 1.0 1 0.2 0 3260 28 0.9 0 0.3 0 4580 39	it 34 70 16 1.1 20 24 1.0 0.3 990 3	36 620 14 1.1 0.2 460 21 1.1 0.3 490 30	38 10 12 1.2 0.2 150 1 1.1 0.3 070 2	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2	42 080 1.2 0.1 1660 14 1.2 0.2 2400 21	44 4 160 129 1.2 1 0.2 (0 130 19	90 11 1.3 0.1	48 140 10 1.3 0.0 - 690 1
Table of Designation 34IT20 34IT24	Safe superin Number strand 14 17	ys 2.29 2.59 3.00 3.00	16 78 (18 2 20 625 0.4 0. 922 0. 0 0 0 0 0 0 0 0 0 0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 4 0.5 .2 0.2	24 4200 3 0.7 0.2 6230 0.6 0.2 8640 0.5	26 3520 2 0.7 0.2 5220 4 0.7 0.2 7270 0.6	28 2970 2 0.8 0.2 4430 2 0.7 0.3 6180 0.7	30 2530 2 0.9 0.2 3780 3 0.8 0.8 0.3 5300 0.7	Span, 1 32 2170 18 1.0 1 0.2 0 3260 28 0.9 0.3 4580 39 0.8 39	t 34 70 16 1.1 20 24 1.0 0.3 990 3 0.9	36 520 14 1.1 0.2 0 460 21 1.1 0.3 490 30 1.0	38 10 12 1.2 0.2 150 1 1.1 0.3 070 2 1.0	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.2	42 080 1.2 0.1 1660 14 1.2 0.2 2400 2 ⁻¹ 1.2 0.3	44 4 160 129 1.2 1 0.2 (0 130 19 1.2 1 0.3 (0	90 11 1.3 0.1 1.3 0.1 1.3 0.2	48 140 10 1.3 0.0 - 690 1 1.3 0.2
Table ofDesignation34IT2034IT2434IT28	safe superin Number strand 14 17 20	ys 2.29 2.59 3.00 3.00	16 78 (18 2 20 625 0.4 0. 0.1 0. 922 0. 0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 4 0.5 .2 0.2	24 4200 : 0.7 0.2 6230 0.6 0.2 8640 0.5 0.2	26 3520 2 0.7 0.2 5220 4 0.7 0.2 7270 0.6 0.2	28 2970 2 0.8 0.2 4430 2 0.7 0.3 6180 0.7 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3	Span, 1 32 2 170 18 1.0 0.2 0 3260 28 0.9 0.3 4580 39 0.8 0.8 0.9 0.3 0.8 0.9 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	it 34 70 16 1.1 20 24 1.0 0.3 990 3 0.9 0.3	36 520 14 1.1 0.2 0 460 21 1.1 0.3 490 30 1.0 0.3	38 10 12 1.2 0.2 150 1 1.1 0.3 070 2 1.0 0.3 120 3	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.3 3650	42 080 1.2 0.1 1660 14 1.2 0.2 2400 2 ⁻¹ 1.2 0.3 3250 2 ⁻¹	44 4 60 12 1.2 1 0.2 0 130 19 1.2 1 0.3 0 900 25	90 11 1.3 0.1 00 16 1.3 0.2 590 25	48 140 11 1.3 0.0 - 690 1 1.3 0.2 320 2
Table ofDesignation34IT2034IT2434IT28	Safe superin Number strand 14 17 20	ys 2.29 2.59 3.00	16 78 (18 2 20 625 0.4 0. 0.1 0. 922 0. 0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 .4 0.5 .2 0.2	24 4200 3 0.7 0.2 6230 0.6 0.2 8640 0.5 0.2	26 3520 2 0.7 0.2 5220 0 0.7 0.2 7270 0.6 0.2 9580 0.2	28 2970 2 0.8 0.2 4430 2 0.7 0.3 6180 0.7 0.2 8170	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 7030 0.7	Span, 1 32 2170 2170 1.0 0.2 3260 28 0.9 0.3 4580 0.3 6090 0.8 0.3 6090 0.8 0.8	it 34 70 16 1.1 20 24 1.0 0.3 0.9 0.3 320 4 0.8	36 520 14 1.1 0.2 460 21 1.1 0.3 490 30 1.0 0.3 670 4 0.9	38 10 12 1.2 0.2 150 1 1.1 0.3 070 2 1.0 0.3 120 3 1.0	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.3 3650 1.0	42 080 1.2 0.1 1660 14 1.2 0.2 2400 2 ⁻¹ 1.2 0.3 3250 2 ⁻¹ 1.1	44 4 1.2 1 1.2 1 1.2 0 1.30 19 1.2 0 0.3 0 900 25 1.2	90 11 1.3 0.1 1.3 0.2 590 2: 1.2	48 140 10 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3
Table of Desig- nation 34IT20 34IT24 34IT28 34IT28	safe superin Number strand 14 17 20 23	ys in. 2.29 2.59 3.00 3.48	16 78 (ce loa 18 2 20 625 0.4 0. 0.1 0. 922 0. 0 0 0 0 0 0 0 0 0 0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 4 0.5 .2 0.2	24 4200 3 0.7 0.2 6230 0.6 0.2 8640 0.5 0.2	26 3520 2 0.7 0.2 5220 4 0.7 0.2 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 4430 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 7030 0.7 0.3	Span, 1 32 2170 18 1.0 1 0.2 0 3260 28 0.9 0.3 0 4580 39 0.3 0 4580 39 0.3 0 6090 50 0.8 0.3	it 34 70 16 1.1 0.2 20 24 1.0 0.3 0.9 0.3 0.9 0.3 320 4 0.8 0.3	36 520 14 1.1 0.2 0 460 21 1.1 0.3 490 30 1.0 0.3 670 4 0.9 0.3	38 10 12 1.2 0.2 150 1 1.1 0.3 070 2 1.0 0.3 120 3 1.0 0.3	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.3 3650 1.0 0.3	42 080 1.2 0.1 1660 14 1.2 0.2 2400 2 ⁻¹ 1.2 0.3 3250 2 ⁻¹ 1.1 0.3	44 4 160 129 1.2 1 0.2 0 130 19 1.2 0 0.3 0 900 25 1.2 0.3 0	90 11 1.3 0.1 1.3 0.2 590 23 1.2 0.3	48 140 10 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3 0.3
Table ofDesignation34IT2034IT2434IT2834IT28	safe superin Number strand 14 17 20 23	ys in. 2.29 2.59 3.00 3.48	16 78 (ce loa 18 2 20 625 0.4 0. 0.1 0. 922 0. 0 0 0 0 0 0 0 0 0 0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 4 0.5 .2 0.2	24 4200 : 0.7 0.2 6230 0.6 0.2 8640 0.5 0.2	26 3520 2 0.7 0.2 5220 4 0.7 0.2 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 4430 2 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 7030 0.7 0.3 9220	Span, 1 32 2170 18 1.0 1 0.2 0 3260 28 0.9 0 3260 28 0.9 0 4580 38 0.3 0 4580 38 0.3 0 6090 55 0.8 0.3 80.3 7	t 34 70 16 1.1 20 24 1.0 0.3 990 3 0.9 0.1 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	36 620 14 1.1 0.2 0 460 21 1.1 0.3 490 30 1.0 0.3 670 4 0.9 0.3 6170 5	38 10 12 1.2 0.2 150 1 1.1 0.3 0.70 2 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.3 3650 1.0 0.3 4860	42 080 1.2 0.1 1660 14 1.2 0.2 2400 2 ⁻¹ 1.2 0.3 3250 2 ⁻¹ 1.1 0.3 4330 3 1.2	44 4 60 129 1.2 1 0.2 0 130 19 1.2 0 900 25 1.2 0.3 0 880 34	16 90 11 1.3 0.1 1.3 0.2 590 23 1.2 0.3 490 3	48 140 10 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3 0.3 1.40 2 1.2
Table of Designation 34iT20 34iT20 34iT24 34iT28 34iT32	safe superin Number strand 14 17 20 23 23	ys in. 2.29 2.59 3.00 3.48 3.50	16 78 (ce loa 18 2 20 625 0.4 0. 0.1 0. 922 0 0 0 0 0 0 0 0 0 0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 0 7520 0 7520 2 0.2	24 4200 : 0.7 0.2 6230 0.6 0.2 8640 0.5 0.2	26 3520 2 0.7 5220 4 0.7 0.2 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 4430 3 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 7030 0.7 0.3 9220 0.6	Span, 1 32 32 32 32 37 32 37 32 37 32 37 32 37 37 37 37 37 37 37 37	t 34 70 16 1.1 220 24 1.0 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.0 0.0 0.0 0.0 0.0 0.0 0.0	36 620 14 1.1 0.2 (0 460 21 1.1 0.3 490 30 1.0 0.3 670 4 0.9 0.3 6170 5 0.8 0.2	38 110 11 1.2 0.2 150 1 1.1 0.3 070 2 1.0 0.3 120 3 1.0 0.3 460 4 0.9 0.2	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.3 36500 1.0 0.3 48600 0.9 0.2	42 080 1.2 0.1 1660 14 1.2 0.2 2400 2 ⁻¹ 1.2 0.3 3250 2 ¹ 1.1 0.3 4330 3 1.0 0.2	44 4 60 129 1.2 1 0.2 0 130 19 1.2 0 130 19 1.2 0 1.2 0 1.2 0 1.2 0 1.2 0 1.2 0 1.2 1 0.3 0 0.3 0 1.2 1 0.3 0 0.3 0 0.3 0 0.3 0 0.3 0 0.3 0 0.3 0 0.3 0 0.4 0 0.5 0	16 90 11 1.3 0.1 000 16 1.3 990 22 1.2 0.3 490 3 1.1 0.2	48 140 10 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3 0.3 1.40 2 1.2 0.2
Table of Designation 34IT20 34IT24 34IT28 34IT32 34IT36	safe superin Number strand 14 17 20 23 3 3 24	ys 2.29 2.59 3.00 3.48	16 78 (ce loa 18 2 20 625 0.4 0. 0.1 0. 922 0 0 0 0 0 0 0 0 0 0	d, lb/ft, 0 22 0 5090 5 0.6 2 0.2 0 7520 0 7520 0 7520	24 4200 : 0.7 6230 0.6 0.2 8640 0.5 0.2	26 3520 2 0.7 0.2 5220 0 0.7 0.2 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 0.3 0.7 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 7030 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 18 1.0 1 0.2 00 3260 28 0.9 0.3 0 4580 39 0.3 0 4580 39 0.3 0 6090 50 0.8 0.3 8010 7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0 0.7 0.8 0 0.9 0 0.7 0	t 34 70 16 1.1 20 20 24 1.0 0.3 990 3 0.9 0.3 0.9 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	36 520 14 1.1 0.2 (460 21 1.1 0.3 490 30 1.0 0.3 1.0 0.3 1.0 0.3 5170 5 0.8 0.2 7490 6	38 10 11 1.2 0.2 150 1 1.1 0.3 070 2 1.0 0.3 120 3 1.0 0.3 460 4 0.9 0.2 5630	40 230 1 1.2 0.1 880 1 1.2 0.2 7710 2 1.1 0.3 3650 1.0 0.3 3650 0.3 4860 0.9 0.2 5900	42 080 1.2 0.1 1.2 0.2 2400 2 ⁻¹ 1.2 0.3 3250 2 ⁻¹ 1.1 0.3 4330 3 1.0 0.2 5270 4	44 4 60 129 1.2 1 0.2 0 130 19 1.2 0 900 25 1.2 0 3880 34 1.1 0.2 730 42	46 90 11.3 00.1 1.3 00.1 690 1.3 590 490 1.1 0.2 290 21.2 2.3 490 1.1 0.2 2250	48 140 10 1.3 0.0 - 690 1 1.3 0.2 1.3 0.3 1140 2 1.2 0.2 88830 3
Table of Designation 34IT20 34IT24 34IT28 34IT28 34IT32	safe superin Number strand 14 17 20 23 23 3 24	ys 2.29 2.59 3.00 3.48 3.50	16 78 ()	ce loa 18 2 20 625 0.4 0. 0.1 0. 922 0 0 0 0 0 0 0 0 0 0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 4 0.5 .2 0.2 0 7520 4 0.5 .2 0.2	24 4200 : 0.7 0.2 6230 0.6 0.2 8640 0.5 0.2	26 3520 2 0.7 0.2 5220 0 0.7 0.2 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.8 0.7 0.3 7030 0.7 0.3 9220 0.6 0.2	Span, 1 32 32 32 32 30 32 30 32 30 32 32 32 32 32 32 32 32	t 34 70 16 1.1 0.2 20 24 1.0 0.3 990 3 0.9 0.3 320 4 0.8 0.3 010 6 0.7 0.2 510 7 0.7	36 520 14 1.1 0.2 (460 21 1.1 0.3 490 30 1.0 0.3 670 4 0.9 0.3 5170 5 0.8 0.2 7490 6 0.8	38 110 11 1.2 0.2 150 1 0.3 100 120 3 1.0 0.3 1.0 0.3 460 4 0.9 0.2 5630 0.9	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.3 3650 1.0 0.3 4860 0.9 0.2 55900 0.9	42 080 1.2 0.1 1660 14 1.2 0.2 2400 2 ⁻ 1.2 0.3 3250 2 ⁻ 1.1 0.3 3250 2 ⁻ 1.1 0.3 1.0 0.2 5270 4 1.0	44 4 460 129 1.2 1 0.2 (0 130 19 1.2 0 1.2 0 1.2 0 1.2 0 1.2 0 1.2 0 1.2 1 0.3 0 900 25 1.2 0 1.3 1 900 25 1.2 1 0.3 0 1.1 1 0.2 0 1.3 1 900 25 1.2 1 1.3 1 0.3 0 1.1 1 0.3 0 1.1 1 0.3 0 1.2 1 1.2 1 0.3 0 1.2 1 1.2 1 1.3 1 1.1	90 11 1.3 0.1 00 16 1.3 990 22 1.2 0.3 490 3 1.1 0.2 250 3 1.1	48 140 11 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3 0.3 1.40 2 1.2 0.2 8830 3 1.2 0.4
Table of Designation 34IT20 34IT24 34IT28 34IT28 34IT32 34IT36 34IT36	Number strand141720232324030	ys 2.29 2.59 3.00 3.48 3.50 4.40	16 78 ((ce loa 18 2 20 625 0.4 0. 922 0 0 0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 4 0.5 .2 0.2 0 7520 4 0.5 .2 0.2	24 4200 : 0.7 0.2 6230 0.6 0.2 8640 0.5 0.2	26 3520 2 0.7 0.2 5220 4 0.7 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 7030 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 1.0 0.2 0.3260 0.3 0.3 6090 0.3 6090 0.3 8010 0.7 0.2 9720 0.6 0.3	t 34 70 16 1.1 3.2 220 24 1.0 0.3 990 3 0.9 0.1 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	36 520 14 1.1 0.2 0.460 21 1.1 1 0.3 1400 0.3 1670 0.3 110 0.3 0.3 1070 5 0.8 0.2 7490 6 0.8 0.3	38 110 11: 1.2 0.2 150 1 1.1 0.3 120 3 120 3 1.0 0.3 460 4 0.9 0.2 6630 0.9 0.3 3	40 230 1 1.2 0.1 880 1 1.2 2710 2 1.1 0.3 3650 1.0 0.3 4860 0.9 0.2 55900 0.9 0.4	42 080 1.2 0.1 1660 14 1.2 0.2 2400 2 ⁻ 1.2 0.3 3250 2 ⁻ 1.1 0.3 3250 2 ⁻ 1.1 0.3 1.0 0.2 5270 4 1.0 0.2	44 4 10.2 (1) 11.2 1 10.2 (2) 130 19 1.2 3 1.3 (2) 1.2 3 1.2 3 1.1 3 1.2 3 1.1 3 1.1 3 1.1 3 1.1 3 1.1 1 1.2 4 1.1 3 1.1 3 1.1 1 1.2 4 1.1 3 1.1 1 1.2 4 1.1 1 1.1 1	90 11 1.3 0.1 1.3 0.1 1.3 1.3 90 2: 1.2 90 3 1.1 0.2 250 3 1.1 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	48 140 10 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3 0.3 1140 2 1.2 0.2 0.3 1.40 2 1.2 0.2 0.3 0.3 1.40 2 0.2 0.3 0.3 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4
Table of Designation 34IT20 34IT20 34IT24 34IT28 34IT32 34IT36 34IT36	safe superin Number strand 14 17 20 23 ; 24 ; 24 ; 30	ys in. 2.29 2.59 3.00 3.48 3.50 4.40	16 78 ((18 2 20 625 0.4 0.4 0.4 0.4 0.0 0.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	d, lb/ft 0 22 0 5090 5 0.6 2 0.2 0 7520 .4 0.5 .2 0.2	24 4200 3 0.7 0.2 6230 0.6 0.2 8640 0.5 0.2	26 33520 2 0.7 0.2 5220 0 0.7 0.2 7270 0.6 0.2 95805 0.2 95805 0.2	28 2970 2 0.8 0.2 0.3 6180 0.7 0.2 8170 0.6 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 5300 0.7 0.3 9220 0.6 0.2	Span, 1 32 32 2170 3260 0.2 3260 0.9 0.3 4580 0.8 0.3 6090 0.8 0.3 6090 0.8 0.3 8010 0.7 0.2 9720 0.3 0.3	t 34 70 16 1.1 220 24 1.0 220 24 1.0 0.3 0.9 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	36 520 14 1.1 0.2 0 460 21 1.1 0.3 490 30 0.3 5170 5 0.8 0.2 0.2 0.2 0.3 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	38 10 12 1.2 0.2 150 1 1.1 0.3 070 2 1.0 0.3 0.3 0.3 0.3 0.2 6630 0.9 0.2 6630 0.9 0.3 33000	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.3 3650 0.3 4860 0.9 0.2 5900 0.9 0.4 74000 0.9 0.2 0.9 0.4 0.9 0.2 0.9 0.4 0.9 0.9 0.4 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	42 1080 1.2 0.1 1660 14 1.2 0.2 2.400 2 ⁻¹ 1.2 0.3 3250 2 ¹ 1.1 0.3 4330 3 1.0 0.2 5270 4 1.0 0.4 6630 5 0.9	44 4 460 121 1.2 1 0.2 (30 19 1.2 3 0.3 (900 25 1.2 3 0.3 (900 25 1.2 3 0.3 (900 25 1.2 1 0.3 (900 25 1.1 1 0.2 (900 25) (90 25)	90 111 1.3 0.1 1.3 0.2 1.2 0.3 1.1 0.2 250 3 1.1 0.4 370 4 1.0	48 140 10 1.3 0.0 - 690 1 1.3 0.2 1.3 0.3 1140 2 1.2 0.2 0.3 1.2 0.4 4850 - 1.0
Table of Designation 34IT20 34IT21 34IT22 34IT23 34IT32 34IT32 34IT34 34IT36 34IT40	safe superin Number strand 14 17 20 23 5 24 0 30 4 30	ys in. 2.29 2.59 3.00 3.48 3.50 4.40 4.40 4.40	16 78 ((ce loa 18 2 20 625 .4 0. 0.1 0. 922 0. 0	0 22 0 5090 5 0.6 2 0.2 0 7520 4 0.5 2 0.2	24 4200 3 0.7 0.2 6230 0.6 0.2 8640 0.5 0.2	26 33520 2 0.7 0.2 5220 0 0.7 0.2 7270 0.6 0.2 95805 0.2	28 2970 2 0.8 0.2 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 5300 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 2170 3260 0.2 3260 0.9 0.3 4580 0.8 0.3 6090 0.8 0.3 8010 0.7 0.2 9720 0.3	t 34 70 16 1.1 20 24 20 24 1.0 20 24 0.3 0.9 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	36 520 14 1.1 0.2 0 460 21 1.1 0.3 490 30 0.3 5170 5 0.8 0.2 0.2 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	38 10 11 1.2 0.2 150 1 1.1 0.3 070 2 1.0 0.3 120 3 1.0 0.3 0.3 0.3 0.2 0.2 0.3 0.3 33000 0.7 0.2 0.3 0.3 33000 0.7 0.2	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.3 3650 0.3 4860 0.9 0.2 5900 0.9 0.4 7400 0.8 0.2 0.9 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	42 080 1.2 0.1 1660 14 1.2 0.2 1.2 0.3 3250 2 1.2 0.3 3250 2 1.2 0.3 3250 2 1.2 0.3 1.2 0.3 3250 2 1.2 0.3 1.2 0.3 1.2 0.2 0.3 1.2 0.2 0.3 1.2 0.2 0.3 1.2 0.3 0.3 1.2 0.3 0.3 0.3 0.3 0.3 0.3 0.0 0.3 0.0 0.3 0.0 0.0	44 4 460 121 1.2 1 0.2 (30 19 1.2 3 0.3 (900 25 1.2 3 0.3 (900 25 1.2 3 0.3 (900 25 1.2 3 0.3 (900 25 1.2 1 0.3 (900 25 1.2 1 0.3 (900 25 1.2 3 0.3 (900 25 1.2 3 0.3 (900 25 1.1 3 0.2 (900 25 0.3 (900 25 0.9 (900 25 0.9 (9.9 (9	90 11 1.3 0.0 16 1.3 0.2 90 22 1.2 0.3 1.1 0.2 250 3 1.1 0.4 370 4 1.0 0.3 1.0	48 140 11 1.3 0.0 - 690 1 1.3 0.2 1.3 0.3 1.40 2 1.2 0.2 1.2 0.2 1.3 0.3 1.40 2 1.3 0.3 1.40 2 1.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2
Table of Designation 34IT20 34IT24 34IT28 34IT32 34IT36 34IT40	Safe supering Number strand 14 17 20 23 6 24 0 30 4 30	ys 2.29 2.59 3.00 3.48 3.50 4.40	16 788 ((ce loa 18 2 20 625 .4 0. 0.1 0. 922 0. 0	0 22 0 5090 5 0.6 2 0.2 4 0.5 2 0.2 0.7 2 0.2 0.2 0.2 0.2 0.2	24 4200 3 0.7 6230 0.6 0.6 0.2 8640 0.5 0.2	26 33520 2 0.7 0.2 5220 4 0.7 7270 0.6 0.2 9580 0.5 0.2	28 9970 2 0.8 0.2 4430 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 22530 2 0.9 0.2 3780 3 0.8 0.3 55300 0.7 0.3 7030 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 2170 18 1.0 0.2 3260 280 0.3 0.9 0.3 0.8 0.3 6090 0.3 6090 0.3 8010 7 0.7 9720 0.3	t 34 70 16 1.1 20 24 20 24 20 24 0.3 0.9 0.3 0.9 0.3 0.0 0.3 0.0 0.7 0.7 0.7 0.3 9 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	36 320 14 1.1 0.2 (0 460 21 1.1 0.3 490 30 0.3 3170 5 0.8 0.3 3170 5 0.8 0.3 9360 8 0.3 9360 8 0.7 0.2	38 110 11 1.2 0.2 150 1 150 1 0.70 2 1.0 0.3 120 3 1.0 0.3 0.3 460 0.9 0.2 5630 0.9 0.33 33000 0.7 0.2	40 230 1 1.2 0.1 1.2 0.2 2710 2 1.1 0.3 3650 1.0 0.3 4860 0.9 0.2 5900 0.9 0.4 7400 0.8 0.2 5900 0.9 0.4 7400 0.8 0.2 5900 0.8 0.2 5900 0.8 0.2 5900 0.9 0.4 7400 0.8 8860 0.9 0.2 5900 0.9 0.2 5900 0.9 0.4 7400 0.9 0.9 0.4 8800 0.9 0.2 5900 0.9 0.9 0.9 0.4 8800 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0	42 0080 1.2 0.1 1.2 0.2 2400 2' 1.2 0.3 3250 2' 1.1 0.3 3250 2' 1.1 0.3 3250 2' 1.1 0.3 3250 2' 1.1 0.3 3250 2' 1.1 0.3 3250 2' 1.1 0.3 3250 2' 1.2 0.3 3250 2' 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.2 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	44 4 44 4 460 124 1.2 1 0.2 (0 900 25 1.2 0 900 25 0.3 0 900 25 0.9 0 0.2 0 720 44 1.1 0.2 0 9.2 0 720 46 1.1 0.2 0 9.2 0 720 46 1.1 0 9.2 0 720 46 1.1 0 9.2 0 720 46 1.1 0 1.1 0 1.2 0 1.1 0 1.2 0 1.1 0 1.2 0 1.1 0 1.2 0 1.1 0 1.2 0 1.1 0 1.2 0 1.1 0 1.1 0 1.2 0 1.2 0 1.1 0 1.1 0 1.1 0 1.2	46 90 11 1.3 0.1 000 16 1.3 990 22 0.3 1.1 0.2 250 3 1.1 0.4 370 4 370 4 0.3 1.0 0.4 370 5 370 5	48 140 11 1.3 0.0 - 690 1 1.3 0.2 1.3 0.3 1.40 2 1.2 0.2 1.2 0.3 1.40 2 1.2 0.2 0.3 1.40 2 1.2 0.2 0.4 1.0 0.2 0.2 0.5 910 0 1.3 0.2 0.2 0.3 0.3 0.4 0.4 0.4 0.5 0.4 0.4 0.4 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5
Table of Designation 34IT20 34IT21 34IT22 34IT23 34IT32 34IT32 34IT36 34IT40	Safe supering Number strand 14 17 20 23 6 24 0 30 4	ye in. 2.29 2.59 2.59 3.00 3.48 3.50 4.40 4.40	16 16 78 ((ce loa 18 2 20 625 0.4 0. 0.1 0. 9222 0. 0 0	0 22 0 5090 5 0.6 2 0.2 4 0.5 2 0.2 0 7520 4 0.5 2 0.2 0 7520 4 0.5 2 0.2 0 7520 0 75200 0 75200 0 75200 0 752	24 4200 0 0.7 6230 0.6 0.2 8640 0.5 0.2	26 33520 2 0.7 0.2 5220 4 5220 4 0.7 7270 0.6 0.2 9580 0.5 0.2	28 9970 2 0.8 0.2 4430 0 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 22530 2 0.9 0.2 3780 3 0.8 0.3 55300 0.7 0.3 7030 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 10.2 0.2 0.3 0.4580 0.3 0.45 0.5 0.6 0.3	t 34 70 16 1.1 20 24 20 24 20 24 0.3 0.9 0.3 0.9 0.3 0.0 0.3 0.0 0.7 0.7 0.3 10 0.7 0.7 0.3 10 0.7 0.3 10 0.7 0.7 0.3 10 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.	36 320 14 1.1 0.2 (0 460 21 1.1 0.3 490 30 0.3 3170 5 0.8 0.3 3170 5 0.8 0.3 9360 8 0.3 9360 8 0.7 0.2	38 100 1: 1.2 150 1 1.1 1.0 0.3 120 3 1.0 0.3 120 3 1.0 0.3 120 3 1.0 0.3 120 3 1.0 0.2 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.2 0.2 0.3 1.0 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0	40 230 1 1.2 0.1 880 1 1.2 0.2 2710 2 1.1 0.3 3650 1.0 0.3 4860 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.4 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	42 0080 1.2 0.1 1.2 0.2 2400 2' 1.2 0.3 3250 2' 1.1 0.3 3250 2' 1.1 0.2 2570 2' 1.1 0.3 1.0 0.2 2570 2' 1.0 0.2 2570 2' 1.0 0.2 1.0 0.2 1.0 0.2 1.0 0.2 1.0 0.4 0.4 0.6 0.4 0.2 0.2 0.4 0.4 0.2 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.4 0.4 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.2 0.4 0.4 0.2 0.2 0.2 0.4 0.4 0.2 0.2 0.2 0.4 0.2 0.2 0.2 0.2 0.4 0.2 0.2 0.2 0.4 0.4 0.2 0.2 0.4 0.2 0.2 0.4 0.2 0.2 0.4 0.2 0.2 0.2 0.4 0.2 0.2 0.2 0.2 0.4 0.2 0.2 0.2 0.2 0.4 0.2 0.2 0.2 0.2 0.4 0.2 0.2 0.2 0.2 0.2 0.4 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	44 4 44 4 460 124 1.2 1 0.2 (0 900 25 1.2 0 900 25 0.3 0 900 25 0.3 0 900 25 0.3 0 900 25 0.3 0 900 25 0.3 0 900 25 0.3 0 900 25 0.9 0 0.2 0	46 90 11 1.3 0.1 1.3 990 2: 990 2: 1.1 0.2 990 2: 1.1 0.2 900 3 1.1 0.2 0.3 490 3 1.1 0.2 0.3 1.1 0.3 5300 \$ 1.0 0.2	48 140 11 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3 0.3 0.3 0.3 1140 2 0.2 0.2 0.4 4850 - 1.0 0.2 5910 1.0 0.2 0.2 0.2 0.4 0.4 0.4 0.2 0.2 0.2 0.3 0.3 0.2 0.3 0.3 0.3 0.3 0.1 0.2 0.3 0.3 0.1 0.2 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3
Table of Designation 34IT20 34IT20 34IT24 34IT24 34IT28 34IT32 34IT36 34IT44 34IT44 34IT44	Safe supering Number strand 14 17 20 23 23 24 30 4 30 8 33	ye in. 2.29 2.59 2.59 3.00 3.48 3.50 4.40 4.40 4.73	16 78 ((18 2 20 625 4 0. 922 0 0 0	0 22 0 5090 5 0.6 0 7520 4 0.5 2 0.2	24 4200 0 0.7 6230 0.6 0.2 8640 0.5 0.2	26 33520 2 0.7 5220 4 0.7 5220 4 0.7 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.2 0.2 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.3 5300 0 0.7 0.3 7030 0.7 0.3 9220 0 0.6 0.2	Span, 1 32 2170 18 1.0 0.2 0.3 0.3 0.3 6090 0.3 8010 0.7 0.720 8 0.3 8010 0.7 9720 0.3	t 34 70 16 1.1 220 24 1.0 0.3 320 4 0.3 0.9 0.3 320 4 0.3 0.3 0.9 0.2 0.9 0.3 0.9 0.2 0.9 0.3 0.9 0.2 0.9 0.3 0.9 0.3 0.9 0.9 0.9 0.2 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	36 320 14 0.2 0 460 21 1.1 0.2 4460 21 1.1 0.3 490 30 0.3 0.3 9170 5 0.8 0.2 7490 6 0.3 9360 0.7 0.2	38 10 1: 1.2 0.2 1.0 0.3 1.0 0.2 1.0 0.3 1.0 0.3 1.0 0.2 1.0 0.3 1.0 0.2 1.0 0.3 1.0 0.2 1.0 0.3 1.0 0.2 1.0 0.2 1.0 0.3 1.0 0.2 1.0 0.0 0.2 0.2 0.2 0.2 0.2 0.0 0.2 0.0 0.2 0.0 0.0	40 230 1 1.2 0.1 1.2 0.2 710 2 1.1 0.3 3650 1.0 0.3 3650 0.3 55900 0.9 0.2 55900 0.9 0.4 74000 0.8 0.2 89600 0.8 0.3	42 0080 1.2 0.1 1.2 0.2 22400 2: 1.1 0.3 3250 2: 5270 4 1.0 0.4 1.0 0.2 5270 4 1.0 0.2 5270 4 0.0 0.4 0.9 0.2 0.2 0.2 0.3 0.2 0.2 0.3 0.2 0.3 0.2 0.2 0.3 0.2 0.3 0.2 0.3 0.2 0.3 0.2 0.3 0.2 0.3 0.2 0.2 0.3 0.2 0.3 0.2 0.2 0.3 0.2 0.3 0.2 0.2 0.3 0.2 0.3 0.2 0.2 0.3 0.2 0.2 0.3 0.2 0.2 0.3 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.3 0.2 0.2 0.3 0.2 0.4 0.4 0.6 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	444 4 460 122 1.2 1 0.2 (0 130 19 1.2 - 1.3 0 480 34 1.1 0.2 0.3 (0 900 25 1.2 0.3 (0 900 25 1.2 0.3 (0 900 25 1.2 0.3 (0 900 25 1.2 0.3 (0 900 25 1.2 0.3 (0 900 25 0.3 (0 900 25	90 11 .3 0.1 0.0 16 0.2 900 22 1.2 900 22 1.2 900 22 1.2 900 22 1.3 900 22 1.1 0.2 250 3 1.1 0.2 250 3 1.1 0.3 370 4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	48 140 11 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3 0.3 0.3 1140 2 0.2 0.2 0.4 4850 - 1.0 0.2 5910 1.0 0.3 7020
Table of Designation 34IT20 34IT21 34IT22 34IT28 34IT32 34IT32 34IT34 34IT44 34IT44	Safe supering Number strand 14 17 20 23 23 24 30 4 30 8 33	ye in. 2.29 2.59 3.00 3.48 3.50 4.40 4.40 4.73	16 78 ((18 2 20 625 4 0. 922 0 0 0	0 22 0 5090 5 0.6 0 7520 0 7520 4 0.5 2 0.2	24 4200 3 0.7 6230 0.6 6 22 8640 0.5 0.2	26 3520 2 0.7 5220 4 0.7 5220 4 0.7 7270 0.6 0.2 9580 0.2 9580 5.0.2	28 2970 2 0.8 0.2 0.7 0.3 6180 0.7 0.2 8170 0.6 0.7 0.2	30 2530 2 0.9 0.2 3780 3 6.8 0.3 5300 0.7 0.3 7030 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 2170 1.0 0.2 2260 2260 23260 23260 24360 0.3 4580 0.3 6090 0.8 0.3 8010 0.7 0.2 9720 8.0 0.3	t 34 70 16 1.1 220 24 1.0 0.3 320 4 0.3 0.9 0.3 320 4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	36 320 14 320 14 460 21 1.1 490 30 1.0 0.3 490 30 1.0 0.3 1.0 0.3 1.1 670 4 0.9 0.3 0.9 0.3 0.2 7490 6 0.8 0.2 7490 6 0.8 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	38 10 11 1.2 0.2 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.2 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.3 1.0 0.2 1.0 0.3 1.0 0.3 1.0 0.2 1.0 0.3 1.0 0.2 1.0 0.3 1.0 0.2 1.0 0.0 0.2 0.0 0.2 0.0 0.0 0.0 0	40 230 1 1.2 0.1 1.2 0.2 710 2 1.1 0.3 3650 1.0 0.3 4860 0.3 55900 0.9 0.2 55900 0.9 0.4 74000 0.8 0.2 89600 0.8 0.3	42 0.1 1.2 0.2 1.2 0.2 2400 2 2400 2 2400 2 2400 2 25270 4 1.0 0.2 5270 4 1.0 0.2 5270 4 1.0 0.2 5270 4 0.0 8030 3 0.2 8030 3 0.0 8030 3 0.0 8030 3 0.0 8030 3 0.0 8030 3 0.0 8030 3 0.0 8030 3 9500 0 80 8 8030 8 8030 9 9500 0 80 8 8030 8 8000000	44 4 460 122 1 1.2 1 1.1 1 0.2 0 1.2 1 1.1 1 0.2 0 0.4	90 11 .3 .3 .0.1 .3 .0.2 .3 .990 22 .1.3 .3 .1.2 .3 .990 22 .1.1 0.2 .250 3 1.1 0.2 .370 4 1.0 0.3 .5300 1.0 0.3 .3 .7740 0.9	48 140 11 1.3 0.0
Table of Designation 34IT20 34IT20 34IT21 34IT22 34IT22 34IT32 34IT32 34IT34 34IT44 34IT44 34IT44 34IT44	safe supering Number strand 14 17 20 23 23 24 0 30 4 30 8 33 2 36	ye in. 2.29 2.59 3.00 3.48 3.50 4.40 4.40 4.73 5.22 5.22	16 78 ((ce loa 18 2 20 625 0.4 0. 922 0. 0 0	0 22 0 5090 5 0.6 0 7520 0 7520 4 0.5 2 0.2 0 7520 4 0.5 2 0.2	24 4200 3 0.7 6230 0.6 0.2 8640 0.5 0.2	26 33520 2 0.7 0.2 5220 4 0.7 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 5300 0.7 0.3 7030 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 18 1.0 12 2170 18 1.0 12 2020 28 2020 28 0.9 0.3 12 4580 36 0.3 6090 53 0.8 0.3 8010 7 0.7 0.2 9720 8 0.3 0.3	tt 34 70 16 1.1 20 24 1.0 0.3 990 3 320 4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	36 320 14 1.1 0.2 (1460 21) 1.0 0.3 490 3(10) 1.0 0.3 0.3 1.0 0.3 0.3 0.3 0.2 0.4 0.9 0.6 0.8 0.7 0.7 0.8 0.7 0.8 0.7 0.7 0.8 0.7 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 0.8 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	38 10 11 1.2 0.2 150 1 1.1 0.3 0.70 2 1.0 0.3 120 3 1.0 0.3 120 3 1.0 0.3 120 3 1.0 0.3 120 3 0.3 0.2 0.2 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	40 230 1 1.2 0.1 880 1 1.2 0.2 7710 2 1.1 0.3 3650 0.9 0.2 55900 0.9 0.4 7400 0.8 0.9 0.4 7400 0.8 0.9 0.4 0.0 0.3 0.4 0.3 0.9 0.4 0.4 0.3 0.4 0.4 0.5 0.9 0.5 0.9 0.5 0.9 0.9 0.4 0.4 0.3 0.4 0.4 0.3 0.5 0.9 0.9 0.4 0.4 0.3 0.5 0.9 0.9 0.4 0.3 0.5 0.9 0.9 0.4 0.5 0.9 0.5 0.9 0.5 0.9 0.9 0.4 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	42 0.1 1.2 0.2 1.2 0.2 2400 2 2400 2 1.1 1.3 3250 2 1.1 0.3 3250 2 1.1 0.3 4330 3 1.0 0.2 5270 4 1.0 0.2 5270 4 1.0 0.2 6630 5 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	44 4 44 4 460 124 1.2 1 0.2 0 30 19 1.2 0 30 19 1.2 0 30 19 480 34 1.1 0.2 0 880 34 1.1 0.2 0 9950 5 9950 5 0.2 0 9950 5 0.9 0.3 8860 7 0.9 0.9 0.3	46 90 11 1.3 0.0 16 1.3 90 22 0.3 490 3 1.1 0.2 0.3 490 3 1.1 0.2 250 3 1.1 0.4 370 4 0.3 530 5 1.0 0.3 7740 0.9 0.3	48 140 11 1.3 0.0 -690 1 1.3 0.2 320 2 1.3 0.3 1.4 0.2 1.2 0.2 1.2 0.2 1.2 0.2 1.2 0.2 1.3 0.2 0.2 1.3 0.2 0.2 1.3 0.2 0.2 1.3 0.2 0.2 1.3 0.2 0.2 0.2 1.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2
Table of Designation 34IT20 34IT20 34IT21 34IT22 34IT22 34IT32 34IT32 34IT34 34IT40 34IT41 34IT41 34IT42	safe superin Number strand 14 17 20 23 30 4 30 4 33 2 36	ys in. 2.29 2.59 3.00 3.48 3.50 4.40 4.40 4.73 5.22 5.22	16 78 ((ce loa 18 2 20 625 0.4 0. 922 0.0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 22 0 5090 5 0.6 0 7520 4 0.5 2 0.2 0 7520 4 0.5 2 0.2	24 4200 3 6230 0.6 0.6 0.2 8640 0.5 0.2	26 33520 2 5220 0.7 0.2 5220 0.7 0.2 7270 0.6 0.7 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 0.7 0.3 0.3 0.7 0.3 0.7 0.2 8170 0.6 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 2170 1.0 0.2 0.3 0.3 0.3 0.3 6090 0.3 0.7 0.2 9720 0.6 0.3	tt 34 70 16 1.1 20 24 1.0 0.3 990 3 320 4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	36 320 14 1.1 0.2 460 21 1.1 0.3 490 30 0.3 170 5 0.8 0.2 7490 6 0.8 0.2 7490 6 0.3 9360 8 0.7 0.2	38 10 11 1.2 0.2 150 1 1.1 0.3 0.70 2 1.0 0.3 120 3 1.0 0.3 120 3 1.0 0.3 120 3 0.3 120 3 0.3 0.2 0.3 0.3 0.2 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	40 230 1 1.2 0.1 880 1 1.2 0.2 7710 2 1.1 0.3 3650 0.9 0.2 55900 0.9 0.4 7400 0.8 0.9 0.4 7400 0.8 0.9 0.4 0.0 0.3 0.4 0.9 0.4 0.3 0.4 0.3 0.4 0.3 0.5 0.9 0.9 0.4 0.3 0.9 0.4 0.4 0.3 0.4 0.3 0.4 0.3 0.5 0.9 0.9 0.4 0.4 0.3 0.5 0.9 0.9 0.4 0.3 0.5 0.9 0.9 0.4 0.5 0.9 0.9 0.4 0.8 0.2 0.9 0.9 0.4 0.8 0.2 0.9 0.9 0.8 0.2 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	42 080 1.2 0.1 1.2 0.2 2400 2: 1.1 0.3 3250 2: 1.1 0.3 3250 2: 1.1 0.3 4330 3 5270 4 660 5 0.2 8030 6 0.8 0.3 9500 0.8 0.3 9500 0.8 0.3 0.5 0.2 0.2 0.2 0.2 0.3 0.2 0.2 0.2 0.3 0.2 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	44 4 44 4 460 122 1.2 1 0.2 (900 25 1.2 3 880 34 1.1 0.2 1 900 25 1.2 3 880 34 1.1 0.2 1 0.3 0 900 25 1.2 3 1.2 3 1.1 1 0.2 0 0.2 3 1.2 3 1.2 3 1.1 1 0.2 0 0.2 3 1.2 3 0.2 0 0.3 0 0.2 3 0.3 0 0.2 0 0.3 0 0.2 0 0.3 0 0.3 0 0.2 0 0.3 0 0.2 0 0.3 0 0.2 0 0.3 0 0.2 0 0.3 0 0.3 0 0.2 0 0.9 0.0 0 0.9 0.0 0 0.3 0 0.3 0 0.9 0.0 0 0.3 0 0.9 0.0 0 0.3 0 0.9 0.0 0 0.3 0	46 90 11 1.3 0.0 16 1.3 90 21 1.3 990 22 0.3 490 3 1.1 0.2 250 3 1.1 0.2 250 3 1.1 0.4 370 4 1.0 0.3 5530 5 1.0 0.3 7740 0.3	48 140 10 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3 0.3 1.2 0.2 1.2 0.2 1.2 0.4 4850 0 1.0 0.2 5910 1.0 0.0 0.3 82600 1.0 0.2 1.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Table of Designation 34IT20 34IT20 34IT24 34IT24 34IT25 34IT32 34IT32 34IT34 34IT44 34IT4 34IT4 34IT4	safe supering Number strand 14 17 20 23 3 24 0 30 4 30 8 33 2 36	ya Impose ya Impose 2.29 Impose 2.59 Impose 3.00 Impose 3.48 Impose 3.50 Impose 4.40 Impose 4.40 Impose 5.22 Impose	16 78 ((ce loa 18 2 20 625 0.4 0. 922 0 0 0 0 0 0 0 0 0 0 0 0 0	0 22 0 5096 5 0.6 2 0.2 0 7520 4 0.5 2 0.2	24 4200 3 6230 0.6 6230 0.6 0.2 8640 0.5 0.2	26 33520 2 5220 0.7 0.2 5220 0.7 0.7 7270 0.6 0.7 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 18 1.0 <	tt 34 70 16 .1 .20 24 .20 24 .1.0 .20 24 .1.0 .3 .990 3 .0.9 .3 .0.9 .3 .0.9 .3 .0.9 .0.3 .0.5 .0.3 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.5 .0.7 .0.7 .0.7 .0.7 .0.7 .0.7 .0.7 .0.3 .0.9 .0.3 .0.7 .0.7 .0.3 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.3 .0.7 .0.7 .0.3 .0.7 .0.3 .0.7 .0.7 .0.7 .0.3 .0.7	36 320 14 1.1 0.2 460 21 1.1 0.3 490 36 0.9 0.9 0.3 170 5 0.8 0.2 7490 6 0.8 0.3 9360 8 0.7 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	38 10 11: 1.2 0.2 150 1 0.3 0.70 2 1.0 0.3 120 3 120 3 0.9 0.2 5630 0.9 0.2 5630 0.9 0.3 0.9 0.3 0.3 0.9 0.2 0.3 0.3 0.9 0.2 0.3 0.9 0.2 0.3 0.9 0.2 0.3 0.9 0.2 0.9 0.3 0.9 0.2 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.2 0.9 0.3 0.9 0.3 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.3 0.9 0.2 0.9 0.9 0.2 0.9 0.2 0.9 0.9 0.2 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	40 230 1 1.2 0.1 1.2 0.2 2710 2 1.1 0.3 3650 0.9 0.9 0.2 55900 0.9 0.2 55900 0.9 0.2 55900 0.9 0.2 55900 0.9 0.2 55900 0.2 55900 0.8 0.2 55900 0.8 0.2 55900 0.8 0.2 55900 0.8 0.2 0.2 55900 0.8 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	42 080 1.2 0.1 1.2 0.2 2400 2: 1.2 0.3 3250 2: 1.1 0.3 3250 2: 1.1 0.3 4330 3 5270 4 1.0 0.2 5270 4 0.4 6630 5 0.4 0.4 6630 5 0.2 8030 7 0.8 0.3 9500 0.8 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	444 4 444 4 400 12' 1.2 1 1.2 1 1.2 0.3 0 400 25 400 20	90 11 .3 .0.1 .00 16 .3 .0.2 .0.3 .1.0 .0.2 .0.3 .1.1 0.2 .250 3 .1.1 0.4 .0.4 .0.4 .0.3 .530 4 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.3 .0.4 .0.4 .0.5	48 140 10 1.3 0.0 - 690 1 1.3 0.2 320 2 1.3 0.2 320 2 1.3 0.2 1.2 0.2 1.2 0.2 1.2 0.4 4850 0 1.0 0.2 5910 1.0 0.2 3830 3 1.2 0.4 4850 0 1.0 0.2 3830 3 1.2 0.4 4850 0 1.0 0.2 0.4 4850 0 1.0 0.2 0.4 4850 0 1.0 0.2 0.4 1.2 0.4 1.2 0.2 0.4 1.2 0.4 1.2 0.4 1.2 0.4 1.2 0.4 1.2 0.2 0.4 1.2 0.4 1.2 0.2 0.4 1.2 0.4 1.2 0.2 0.4 1.2 0.4 1.0 0.2 0.4 1.0 0.2 0.4 1.0 0.2 0.4 1.0 0.2 0.5 0.1 0.0 0.2 0.0 0.0 0.2 0.0 0.0 0.0
Table of Designation 34IT20 34IT20 34IT24 34IT24 34IT25 34IT32 34IT36 34IT44 34IT4 34IT4 34IT5 34IT5	safe superin Number strand 14 17 20 23 6 24 0 30 4 30 8 33 2 36 37 36	ye in. 2.29 2.59 3.00 3.48 3.50 4.40 4.40 4.73 5.22 5.59	16 78 (((Ce loa 18 2 20 625 .4 0. 922 0 0 0 0	0 22 0 5090 5 0.6 0 7520 0 7520 4 0.5 2 0.2	24 4200 3 6230 6230 0.6 8640 0.5 0.2	26 33520 2 5220 0.7 0.2 5220 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	28 2970 2 0.8 0.2 4430 0.7 0.3 6180 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 18 1.0 0.2 0.3 3260 0.3 6090 0.3 8010 0.2 9720 8 0.3	tt 34 70 16 .1 .20 24 .1.0 .20 24 .1.0 .0.3 .990 3 .0.9 .0.3 .0.7 .0.7 .0.7 .0.3 .0.9 .0.3 .0.9 .0.7 .0.7 .0.3 .0.9 .0.3 .0.9 .0.7 .0.7 .0.3 .0.9 .0.3 .0.9 .0.7 .0.7 .0.3 .0.9 .0.3 .0.9 .0.7 .0.3 .0.9 .0.3 .0.9 .0.7 .0.7 .0.3 .0.9 .0.3 .0.9 .0.7 .0.3 .0.9 .0.3 .0.9 .0.7 .0.7 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.7 .0.3 .0.9 .0.3 .0.9 .0.7 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.7 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9 .0.3 .0.9	36 320 14 1.1 0.2 460 21 1.1 0.3 490 30 0.3 3170 5 0.8 0.3 9360 E 0.7 0.2 9360 E 0.7 0.2	38 10 11 1.2 0.2 150 1 0.3 0.70 2 1.0 0.3 0.70 2 1.0 0.3 0.3 0.3 0.9 0.2 0.9 0.2 0.3 0.9 0.2 0.3 0.3 0.9 0.2 0.3 0.3 0.9 0.2 0.3 0.9 0.2 0.3 0.9 0.2 0.3 0.9 0.2 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	40 230 1 1.2 0.1 8800 1 1.2 7710 2 1.1 0.3 6650 0.3 4860 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.2 5900 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	42 080 1.2 0.1 1.2 0.2 2400 22 1.1 0.3 3250 22 1.1 0.3 1.0 0.2 5270 4 1.0 0.4 6630 5 0.9 0.4 8030 3 9500 0.8 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	444 4 444 4 400 122 1 1.2 1 0.3 0 1.2 0 0.3 0 000 25 0.0 0 1.2 0 0.3 0 000 25 0.9 0.2 0.3 0 0.4 0 0.2 0 0.3 0 0.5 0 0.9 0.3 0 0.3 0 0.5 0 0.9 0.3 0 0.3 0 0.5 0 0.9 0.3 0 0.5	90 11 .3 .0.1 90 11 .3 .0.1 90 2: 1.2 90 2: 1.3 90 2: 1.2 90 2: 1.3 90 2: 1.3 90 2: 1.3 90 2: 1.3 90 2: 1.3 90 2: 1.1 0.2 90 2: 1.1 0.2 90 2: 1.1 0.2 90 2: 1.1 0.2 0.3 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	48 140 11 1.3 0.0 690 1 1.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 0.4 4850 - 1.0 0.2 0.4 4850 - 1.0 0.3 0.2 0.4 4850 - 1.0 0.3 0.2 0.4 4850 - 1.0 0.3 0.2 0.4 4850 - 1.0 0.3 0.2 0.4 1.0 0.3 0.2 0.4 1.0 0.3 0.2 0.4 1.0 0.3 0.2 0.4 1.0 0.3 0.2 0.4 1.0 0.3 0.2 0.4 1.0 0.0 0.3 0.2 0.4 1.0 0.0 0.3 0.2 0.4 1.0 0.0 0.3 0.2 0.4 1.0 0.0 0.3 0.2 0.4 1.0 0.0 0.3 0.2 0.4 1.0 0.0 0.3 0.2 0.4 1.0 0.0 0.3 0.2 0.4 0.0 0.3 0.3 0.0 0.0 0.0 0.3 0.0 0.0
Table of Designation 34IT20 34IT20 34IT24 34IT24 34IT28 34IT32 34IT36 34IT40 34IT4 34IT4 34IT5 34IT5	safe superin Number strand 14 17 20 23 6 24 0 30 4 30 8 33 2 36 37 36	ye in. 2.29 2.59 2.59 3.00 3.48 3.50 4.40 4.40 4.73 5.22 5.59 5.59	16 78 ((((((((((((((((((18 2 18 2 20 625 0.4 0.1 922 0 0 0	0 22 0 5090 5 0.6 0 7520 4 0.5 2 0.2	24 4200 3 0.7 6230 6230 0.6 8640 0.5 0.2	26 33520 2 0.7 0.2 5220 4 0.7 7270 0.6 0.2 9580 0.5 0.2	28 2970 2 0.8 0.2 4430 0.7 0.3 6180 0.7 0.7 0.2 8170 0.6 0.2	30 2530 2 0.9 0.2 3780 3 0.8 0.3 5300 0 0.7 0.3 9220 0.6 0.2	Span, 1 32 2170 10.2 0.2 3260 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 9720 0.3	tt 34 34 37 10 1.1 20 220 220 220 220 220 220 220	36 320 14 1.1 0.2 0.460 21 1.1 0.3 3170 5 0.8 0.3 3170 5 0.8 0.2 7490 6 0.8 0.3 0.2 0.7 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	38 310 1: 1.2 50 1 1.1 0.3 0.70 2 1.0 0.3 120 3 120 3 1.0 0.3 120 3 1.0 0.3 0.3 3300 0.7 0.2 0.3 33000 0.7 0.2 0.3 33000 0.7 0.2 0.2 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	40 230 1 1.2 0.1 1.2 0.2 2710 2 1.1 3650 1.0 0.3 3650 0.9 0.2 55900 0.9 0.2 55900 0.9 0.2 8960 0.8 0.2 8960 0.8 0.3	42 080 1.2 0.1 1.2 0.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.2 0.3 1.1 0.3 1.1 0.2 55270 4 1.0 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0	44 4 60 12:1 1.2 1 0.3 0 100 25 0.3 0 000 25 0.0 0 0.3 0 0.4 0.5 0 0.9 0.2 7230 6 0.9 0.3 0.9 0.3 0.9 0.3	46 90 11 1.3 0.0 10 1.3 900 2: 1.2 990 2: 1.2 990 2: 1.2 990 2: 1.2 1.2 990 2: 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2	48 140 11 1.3 690 1 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 1.3 0.2 0.4 1.3 0.2 0.4 1.3 0.2 0.2 0.4 1.3 0.2 0.4 1.3 0.2 0.2 0.4 1.3 0.2 0.2 0.4 1.3 0.2 0.2 0.2 0.4 1.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2

3-48

CI DESIGN HANDBOOK/SEVENTH EDITION

October 12th, 2012

	RY DESIGN	OF PR	ECAS	Γ/PR	ESTR	ESSE	D CO	NCRE	TE ST	RUC	IURE	5						CHA	PIE	13
10 L-Be	eam Loa	d Tal	bles																	
1'-0"	8"														No	orma	lweig	ght C	oncr	ete
		_		Г			and and the			0	Soctio	n Dr	operti	00				-		
				-			T			1	Jecuic		/		, 1	c		c	14	14
-	1-+-		-		Desi	gnatio	on	h	n	1/n2	A	2	in 4)	6	in 3		in ³	lb/	ft
		+	1	-		-		in.		III.			10.400		74	1165		002	21	7
		1 1 1 2	0.01	199	20	LB20		20	1	2/8	304	4	17 569	10	50	1679		1301	40	0
		h			20	LB24		24	16	6/12	432	*	27,883	12	.22	2282		1767	45	0
		"1			20	LB32		32	20	0/12	480	0	41,600	14	.00	2971		2311	50	0
			h	3000	20	LB36	1.5	36	24	4/12	528	8	59,119	15	.82	3737	7 2	2930	55	0
		1		199	20	LB40	100	40	24	4/16	608	8	81,282	17	.47	4653	3 3	3608	63	3
	1.2. J. 183		1.03	1000	20)LB44	1.00	44	28	8/16	656	6 1	108,107	19	.27	5610		4372	70	3
and a	25.0	h2	19		20)LB48		48	32	2/16	704	4	140,133	21	.09	7740		6117	78	3
		1	1		20	JLB52		52	30	0/16	80	0	221.35	24	.80	8926	5	7095	83	3
					20)LB60		60	44	4/16	84	8 2	271,332	2 26	.68	10,17		8143	88	33
1'-1	8"			L	1. 0	Check lo	cal area	for avail	ability of	other si	zes.			1						
-					2. 5	Safe load	ds shown	n include	50% sup	perimpo	sed dea	d load a	and 50%	ive load	Int is rec	nuired				
f' = 50	isq 00				3. 5	BOO psi ti Safe load	op tensio ds can b	on nas bi e signific	antly inci	reased	by use o	f structu	ural comp	osite top	oping.	luncu.				
10 1																				
$T_{pu} = 27$	10,000 ps																	12000		
1/2-in0	liameter.																			
low rol	avation of	rand																		
1000-101	axation of	rana																		
able of sa	fe superir	nposed	d serv	ice lo	ad, Il	o/ft, a	nd ca	ambe	rs, in.	110	-								rolan	0
able of sa Desig-	fe superin Number	nposec y _s	d serv	ice lo	ad, Il	o/ft, a	nd ca	ambe	rs, in.		Spar	n, ft						46	40	50
able of sa Desig- nation	fe superin Number strand	y _s in.	d serv	ice lo 18	20	o/ft, a 22	nd ca 24	amber 26	28	30	Spar 32	n, ft 34	36	38	40	42	44	46	48	50
able of sa Desig- nation	fe superin Number strand	y _s in.	16 6560	18 5130	20 4100	22 3340	nd ca 24 2760	26 2310	28	30 1670	Spar 32 1430	n, ft 34 1240 1 1	36 1070	38	40	42	44	46	48	50
able of sa Desig- nation 20LB20	fe superin Number strand 9	y _s in. 2.44	16 6560 0.3	18 5130 0.4 0.2	20 4100 0.5 0.2	22 3340 0.6	24 2760 0.7 0.2	26 2310 0.8 0.2	28 1960 0.9 0.3	30 1670 1.0 0.3	Spar 32 1430 1.0 0.3	n, ft 34 1240 1.1 0.3	36 1070 1.2 0.2	38	40	42	44	46	48	50
able of sa Desig- nation 20LB20	fe superin Number strand 9	y _s in. 2.44	16 6560 0.3 0.1 9570	18 5130 0.4 0.2 7490	20 4100 0.5 0.2 6000	22 3340 0.6 0.2 4900	nd ca 24 2760 0.7 0.2 4060	26 2310 0.8 0.2 3410	28 1960 0.9 0.3 2890	30 1670 1.0 0.3 2470	Spar 32 1430 1.0 0.3 2130	n, ft 34 1240 1.1 0.3 1850	36 1070 1.2 0.2 1610	38	40	42	44	46	48	50
able of sa Desig- nation 20LB20 20LB24	fe superin Number strand 9	y _s in. 2.44 2.80	16 6560 0.3 0.1 9570 0.3	18 5130 0.4 0.2 7490 0.3	20 4100 0.5 0.2 6000 0.4	22 3340 0.6 0.2 4900 0.5	24 2760 0.7 0.2 4060 0.5	26 2310 0.8 0.2 3410 0.6	28 1960 0.9 0.3 2890 0.7	30 1670 1.0 0.3 2470 0.8	Spar 32 1430 1.0 0.3 2130 0.9	n, ft 34 1240 1.1 0.3 1850 0.9	36 1070 1.2 0.2 1610 1.0	38 1410 1.0	40 1240 1.1	42 1090 1.1	44 969 1.2	46	48	50
able of sa Desig- nation 20LB20 20LB24	fe superin Number strand 9 10	y _s in. 2.44 2.80	16 6560 0.3 0.1 9570 0.3 0.1	ice lo 18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1	24 2760 0.7 0.2 4060 0.5 0.1	2310 0.8 0.2 3410 0.6 0.2	28 1960 0.9 0.3 2890 0.7 0.2	30 1670 1.0 0.3 2470 0.8 0.2	Spar 32 1430 1.0 0.3 2130 0.9 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2	36 1070 1.2 0.2 1610 1.0 0.1	38 1410 1.0 0.1	40 1240 1.1 0.1	42 1090 1.1 0.0	44 969 1.2 0.0	46	48	50
able of sa Desig- nation 20LB20 20LB24	fe superin Number strand 9 10	y _s in. 2.44 2.80	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220	22 3340 0.6 0.2 4900 0.5 0.1 6730	nd ca 24 2760 0.7 0.2 4060 0.5 0.1 5590	26 2310 0.8 0.2 3410 0.6 0.2 4710	28 1960 0.9 0.3 2890 0.7 0.2 4000	30 1670 1.0 0.3 2470 0.8 0.2 3440	Spar 32 1430 1.0 0.3 2130 0.9 0.2 2970	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590	36 1070 1.2 0.2 1610 1.0 0.1 2270	38 1410 1.0 0.1 2000	40 1240 1.1 0.1 1760	42 1090 1.1 0.0 1560	969 1.2 0.0 1390	46	48	50 992
able of sa Desig- nation 20LB20 20LB24 20LB28	fe superin Number strand 9 10 12	y _s in. 2.44 2.80 3.33	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4	nd ca 24 2760 0.7 0.2 4060 0.5 0.1 5590 0.5	26 2310 0.8 0.2 3410 0.6 0.2 4710 0.6	28 1960 0.9 0.3 2890 0.7 0.2 4000 0.6	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7	Spar 32 1430 1.0 0.3 2130 0.9 0.2 2970 0.8	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.9	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9	38 1410 1.0 0.1 2000 1.0	40 1240 1.1 0.1 1760 1.1	42 1090 1.1 0.0 1560 1.1	969 1.2 0.0 1390 1.2	46 1240 1.2	48 1110 1.2	992 1.3
able of sa Desig- nation 20LB20 20LB24 20LB28	fe superin Number strand 9 10 12	y _s in. 2.44 2.80 3.33	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.4	nd ca 24 2760 0.7 0.2 4060 0.5 0.1 5590 0.5 0.5	26 2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2	28 1960 0.9 0.3 2890 0.7 0.2 4000 0.6 0.6 0.6	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2	Spar 32 1430 1.0 0.3 2130 0.9 0.2 2970 0.8 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 0.2	38 1410 1.0 0.1 2000 1.0 0.2 2710	40 1240 1.1 0.1 1760 1.1 0.2 2400	42 1090 1.1 0.0 1560 1.1 0.2 2140	969 1.2 0.0 1390 1.2 0.1	46 1240 1.2 0.1	48 1110 1.2 0.0	992 1.3 0.0
able of sa Desig- nation 20LB20 20LB24 20LB28	fe superin Number strand 9 10 12	y _s in. 2.44 2.80 3.33	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940	nd ca 24 2760 0.7 0.2 4060 0.5 0.1 5590 0.5 0.2 7440	2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280	28 1960 0.9 0.3 2890 0.7 0.2 4000 0.6 0.2 5350	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7	Spar 32 1430 1.0 0.3 2130 0.9 0.2 2970 0.8 0.2 4000 0.7	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 3490 0.2	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 3070 0.9	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0	40 1240 1.1 0.1 1760 1.1 0.2 2400 10	42 1090 1.1 0.0 1560 1.1 0.2 2140 1 1	44 969 1.2 0.0 1390 1.2 0.1 1910 12	46 1240 1.2 0.1 1710 1.2	48 1110 1.2 0.0 1540 1.3	9992 1.3 0.0 1380 1.3
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32	fe superin Number strand 9 10 12 12 14	y _s in. 2.44 2.80 3.33 3.71	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.4 0.4 0.4 0.4	nd ca 24 2760 0.7 0.2 4060 0.5 0.1 5590 0.5 0.2 7440 0.5 0.2	26 2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2	28 1960 0.9 0.3 2890 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7 0.2	Spar 32 1430 1.0 0.3 2130 0.9 0.2 2970 0.8 0.2 4000 0.7 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 3490 0.8 0.2	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 3070 0.9 0.3	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0 0.3	40 1240 1.1 0.1 1760 1.1 0.2 2400 1.0 0.3	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2	44 969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2	46 1240 1.2 0.1 1710 1.2 0.2	48 11110 1.2 0.0 1540 1.3 0.2	992 1.3 0.0 1380 1.3 0.1
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB28	fe superin Number strand 9 10 12 12 14	y _s in. 2.44 2.80 3.33 3.71	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	24 2760 0.7 0.2 4060 0.5 0.1 5590 0.5 0.2 7440 0.5 0.2 7440 0.5 0.2	26 2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 7980	28 1960 0.9 0.3 2890 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7 0.2 5880	Spar 32 1430 1.0 0.3 2130 0.9 0.2 2970 0.8 0.2 4000 0.7 0.2 5110	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 3490 0.8 0.2 3490 0.8 0.2 4470	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 3070 0.9 0.3 3040	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0 0.3 3480	40 1240 1.1 0.1 1760 1.1 0.2 2400 1.0 0.3 3100	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2 2770	44 969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480	46 1240 1.2 0.1 1710 1.2 0.2 2230	48 1110 1.2 0.0 1540 1.3 0.2 2010	9992 1.3 0.0 1380 1.3 0.1 1810
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36	fe superin Number strand 9 10 12 14 14	y _s in. 2.44 2.80 3.33 3.71 4.25	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	24 2760 0.7 0.2 4060 0.5 0.1 5590 0.5 0.2 7440 0.5 0.2 9450 0.4	26 2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 7980 0.5	28 1960 0.9 0.3 2890 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820 0.5	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7 0.2 55880 0.6	Spar 32 1430 0.3 2130 0.9 0.2 2970 0.8 0.2 2970 0.8 0.2 4000 0.7 0.2 5110 0.7	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 3490 0.8 0.2 3490 0.8 0.2 4470 0.8	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 3070 0.9 0.3 3070 0.9 0.3 3940 0.8	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0 0.3 3480 0.9	40 1240 1.1 0.1 1760 1.1 0.2 2400 1.0 0.3 3100 1.0	42 1090 1.1 0.00 1.1 0.2 2140 1.1 0.2 2770 1.1	44 969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480 1.1	46 1240 1.2 0.1 1710 1.2 0.2 2230 1.2	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2	9992 1.3 0.0 1380 1.3 0.1 1810 1.5
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36	fe superin Number strand 9 10 12 12 14 16	y _s in. 2.44 2.80 3.33 3.71 4.25	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.4 0.4 0.4 0.1	nd ca 24 2760 0.7 0.2 4060 0.5 5590 0.5 0.2 7440 0.5 0.2 7440 0.5 0.2 9450 0.4 0.4	26 2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 7980 0.5 0.2	28 1960 0.9 0.3 2890 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820 0.5 0.2	30 1670 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7 0.2 55880 0.6 0.2	Spar 32 1430 0.3 2130 0.9 0.2 2970 0.8 0.2 4000 0.7 0.2 5110 0.7 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 2590 0.9 0.2 3490 0.8 0.2 4470 0.8 0.3	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 3070 0.9 0.3 3940 0.8 0.3	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0 0.3 3480 0.9 0.3	40 1240 1.1 1760 1.1 1.0 22400 1.0 0.3 3100 1.0 0.3	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3	969 1.2 0.0 1.390 1.2 0.1 1910 1.2 0.2 2480 1.1 0.3	46 1240 1.2 0.1 1710 1.2 2230 1.2 0.3	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2 0.3	9992 1.3 0.0 1380 1.3 0.1 1810 1.3 0.2
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36	fe superin Number strand 9 10 12 14 14 16	y _s in. 2.44 2.80 3.33 3.71 4.25	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.2 7490 0.3 0.1	20 4100 0.5 0.2 0.4 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 0.2 4060 0.5 5590 0.5 0.2 7440 0.5 7440 0.5 9450 0.2 9450 0.4 0.2	2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 7980 0.5 0.2 9810	28 1960 0.9 0.3 2880 0 2880 0 0.7 0.2 4000 0 0.6 0.2 5350 0.2 6820 0.5 0.2 8380	30 1670 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7 0.2 55880 0.6 0.2 7230	Spar 32 1430 0.3 2130 0.9 0.2 2970 0.8 0.2 2970 0.8 0.2 4000 0.7 0.2 5110 0.7 0.2 6290	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.9 0.9 0.9 0.9 0.2 3490 0.8 0.2 3490 0.8 0.2 3490 0.8 0.2 3500 0.8 0.9 0.2 3500 0.9 0.2 3500 0.9 0.2 3500 0.9 0.2 3500 0.9 0.2 3500 0.9 0.2 3500 0.9 0.2 3500 0.9 0.2 3500 0.9 0.2 3500 0.9 0.2 3500 0.9 0.2 3500 0.8 0.9 0.2 3500 0.8 0.9 0.2 3500 0.8 0.9 0.2 3500 0.8 0.9 0.2 3500 0.8 0.8 0.2 3500 0.8 0.8 0.8 0.8 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.9 0.2 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 3070 0.9 0.3 3940 0.8 0.3 4850	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0 0.3 3480 0.9 0.3 4300	40 1240 1.1 1760 1.0 1.0 0.3 3100 1.0 0.3 3830	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 1.0 2 2770 1.1 0.3 3420	969 1.2 0.0 1.390 1.2 0.1 1910 1.2 0.2 2480 1.1 0.3 3070	46 1240 1.2 0.1 1710 1.2 0.2 2230 1.2 0.3 2760	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2 0.3 2490	9992 1.3 0.0 1380 1.3 0.1 1810 1.3 0.2 2250
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB32 20LB36 20LB36	fe superin Number strand 9 10 12 14 14 16 18	y _s in. 2.44 2.80 3.33 3.71 4.25 4.89	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.2 7490 0.3 0.1	20 4100 0.5 0.2 0.4 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 0.2 4060 0.5 0.2 0.5 0.2 7440 0.5 7440 0.5 9450 0.2 9450 0.4 0.2	2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 7980 0.5 0.2 9810 0.4	28 1960 0.9 0.3 2890 0.7 0.2 2890 0.7 0.2 5350 0.6 0.2 6820 0.5 6820 0.5 8380 0.5	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7 5880 0.6 0.2 7230 0.6	Spar 32 1430 0.3 2130 0.9 0.2 2970 0.8 0.2 2970 0.8 0.2 4000 0.7 0.2 5110 0.7 0.2 5120 0.7 0.2 0.6	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 3490 0.8 0.2 3490 0.8 0.2 3490 0.8 0.2 35510 0.3 5510 0.7	36 1070 1.2 0.2 1610 1.0 0.9 0.2 3070 0.9 0.3 30940 0.8 0.8 0.8 0.8 0.8 0.8 0.8	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0 0.3 3480 0.9 0.3 4300 0.8 4300	40 1240 1.1 0.2 2400 0.3 3100 0.3 3100 0.3 3830 0.9	42 1090 1.1 0.0 1.560 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3 3420 1.0 0 0 0 0 0	969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480 1.1 0.3 3070 1.0 0 2 2 2 8 8 0 2 1 2 1 2 1 2 1 2 1 2 1 2 2 1 2 2 2 1 2 1 2 0.0 1 2 0.0 1.2 1.2 0.0 0.0 1.2 0.0 0.0 1.2 0.0 0.0 1.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	46 1240 1.2 0.1 1710 1.2 0.2 2230 1.2 0.3 2760 1.1	48 11110 1.2 0.0 1.540 1.3 0.2 2010 1.2 0.3 2490 1.1 1.2 0.3	992 1.3 0.0 1380 1.3 0.1 1810 1.3 0.2 22500 1.2
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB32 20LB36	fe superin Number strand 9 10 12 14 14 16 18	y _s in. 2.44 2.80 3.33 3.71 4.25 4.89	16 6560 0.3 0.1 9570 0.3 0.1	ice lo 18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 0.2 4060 0.5 0.5 0.5 0.5 0.5 0.2 7440 0.5 0.2 9450 0.4 0.2	26 2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 7980 0.5 0.2 9810 0.4 0.4 0.4 0.2	28 1960 0.9 0.3 2890 0.7 0.2 2890 0.7 0.2 5350 0.6 0.2 6820 0.5 0.2 8380 0.5 0.2	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 222	Spar 32 1430 0.3 2130 0.9 0.2 2970 0.8 0.2 4000 0.7 0.2 5110 0.7 0.2 6290 0.6 0.6 0.6 0.6 0.2 2222	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 2590 0.9 0.2 34900 0.8 0.2 34900 0.8 0.2 5510 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.	36 1070 1.2 0.2 1610 0.9 0.2 3070 0.9 0.3 3940 0.9 0.3 3940 0.8 0.3 4850 0.8 0.3 2026	38 1410 1.0 0.1 22000 1.0 0.2 2710 1.0 0.3 3480 0.3 3480 0.3 4300 0.8 0.3 0.3 0.3	40 1240 1.1 0.2 2400 0.3 3100 0.3 3100 0.3 3830 0.9 0.9 0.9 0.9	42 1090 1.1 0.0 1.560 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3 3420 1.0 0.3 3420	969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480 1.1 0.3 3070 1.0 3070 0.0 3070	46 1240 1.2 0.1 1710 1.2 2230 1.2 0.3 2760 1.1 0.3 2760 1.1 2760	48 11110 1.2 0.0 1.540 1.3 0.2 2010 1.2 0.3 2490 1.1 1.3 3140	992 1.3 0.0 1380 1.3 0.2 2250 1.2 2250
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB36	fe superin Number strand 9 10 12 14 14 16 18	ys in. 2.44 2.80 3.33 3.71 4.25 4.89	166560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 0.2 4060 0.5 5590 0.5 5590 0.5 0.2 7440 0.5 0.2 9450 0.4 0.2	26 2310 0.8 0.2 3410 0.6 0.2 6280 0.5 0.2 7980 0.5 0.2 9810 0.4 0.2	28 1960 0.9 0.3 22890 7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820 0.5 0.6 8380 0.5 0.2 0.5 0.2 0.2	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 8950 0.6	Spar 32 1430 0.3 2130 0.9 0.2 2970 0.8 0.2 2970 0.8 0.2 5110 0.7 0.2 5110 0.7 0.2 0.6 6290 0.6 0.2 7800	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 2590 0.9 0.2 34900 0.8 0.2 34900 0.8 0.2 5510 0.7 0.2 68400 0.7 0.2 0.2 0.7 0.2 0.8 0.9 0.2 0.8 0.2 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	36 1070 1.2 0.2 1610 0.9 0.2 3070 0.9 0.3 3940 0.8 0.3 3940 0.8 0.3 3940 0.8 0.3 0.8 0.8 0.8 0.8 0.2 6040 0.2	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0 0.3 3480 0.3 3480 0.3 3480 0.3 3480 0.3 35360 0.8 0.3 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	40 1240 1.1 0.1 1.1 0.2 2400 1.0 0.3 3100 1.0 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.0 0.0 0.3 0.0 0.0 0.0 0.0 0.0 0.0	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3 3420 1.0 0.3 4280 0.0	969 1.2 0.0 1.390 1.2 0.2 2480 1.1 0.3 3070 1.0 0.3 3070 0.0 33850 0.0 0.0	46 1240 1.2 0.1 1710 1.2 2230 1.2 0.3 2760 1.1 0.3 34700 1.1	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2 0.3 2490 1.1 0.3 3140 1 1	992 1.3 0.0 1380 1.3 0.1 1810 1.3 0.2 22500 1.2 0.3 22500 1.2
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB40 20LB44	fe superin Number strand 9 10 12 14 14 16 18 18	ys ys 1n. 2.44 2.80 3.33 3.71 4.25 4.89 5.05	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 49000 0.1 6730 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 0.2 4060 0.5 0.2 7440 0.5 0.2 7440 0.5 0.2 9450 0.4 0.2	26 2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 7980 0.5 0.2 9810 0.4 0.2	28 1960 0.9 0.3 2880 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820 0.5 0.2 8380 0.5 0.2 8380 0.5 0.2	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 8950 0.5 2 2	Spar 32 1430 0.3 2130 0.9 0.2 2970 0.8 0.2 2970 0.8 0.2 5110 0.7 0.2 5110 0.7 0.2 5110 0.7 0.2 0.6 6290 0.6 0.2 7800 0.6 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 3490 0.8 0.2 3490 0.8 0.2 3490 0.8 0.2 5510 0.7 0.2 6840 0.6 0.7 0.2 0.8 0.7 0.2 0.9 0.7 0.2 0.9 0.7 0.2 0.9 0.9 0.9 0.7 0.2 0.9 0.2 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	36 1070 1.2 0.2 1610 1.0 0.9 0.9 0.2 3070 0.9 0.3 3040 0.3 3940 0.3 3940 0.3 6040 0.7 6040	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0 0.3 3480 0.9 0.3 4300 0.8 0.3 5360 0.8 0.3 5360 0.8 0.2 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	40 1240 1.1 0.1 1760 1.0 0.3 3100 0.3 3830 0.9 0.3 3830 0.9 0.3 4780 0.8 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.9 0.3 0.0 0.0 0.3 0.0 0.0 0.0 0.0 0.0 0.0	42 1090 1.1 0.2 2140 1.1 0.2 2770 1.1 0.2 2770 1.1 0.2 2770 1.1 0.2 2770 0.1 3420 0.3 4280 0.9 0.2	969 1.2 0.0 1.2 0.1 1390 1.2 0.2 2480 1.1 0.3 3070 1.0 0.3 3050 0.9 0.2	46 1240 1.2 0.1 1710 1.2 2230 1.2 2230 1.2 3 2760 1.1 0.3 3470 1.0 3 3470 0.2	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2 0.3 2490 1.1 0.3 3140 1.1 0.2	992 1.3 0.0 1380 1.3 0.2 2250 1.2 0.3 2850 1.1 0.3
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB36 20LB40	fe superin Number strand 9 10 12 14 14 16 18 18 19	y_s in. 2.44 2.80 3.33 3.71 4.25 4.89 5.05	16 6560 0.3 0.1 95700 0.3 0.1	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 0.2 4060 0.5 0.2 7440 0.5 0.2 7440 0.5 0.2 9450 0.4 0.2	26 2310 0.8 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 9810 0.4 0.2 9810 0.4 0.2	28 1960 0.9 0.3 2880 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820 0.5 0.2 8380 0.5 0.2	30 1670 1.0 0.3 2470 0.8 0.2 3440 0.7 0.2 5880 0.6 0.2 55880 0.6 0.2 8950 0.5 0.2	Spar 32 1430 1.0 0.3 22970 0.2 22970 0.2 22970 0.2 2970 0.7 0.2 5110 0.7 0.2 5110 0.7 0.2 6290 0.6 220 7800 0.2 7800 0.2 2770 0.2 2770 0.2 2970 0.2 2 2970 0.2 2 2970 0.2 2 2970 0.2 2 2970 0.2 2 2970 0.2 2 2970 0.2 2 2970 0.2 2 2000 0.2 2 2000 0.2 20000000000	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 2590 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0	36 1070 1.2 0.2 1610 0.1 2270 0.2 3070 0.9 0.3 3940 0.8 0.3 3940 0.8 0.3 4850 0.2 6040 0.7 0.2 2 6040	38 1410 1.0 0.1 2000 1.0 0.2 2710 1.0 0.3 34800 0.3 4300 0.8 0.3 5360 0.8 0.2 6360	40 1240 1.1 0.2 2400 1.0 0.3 3100 1.0 0.3 3100 1.0 0.3 34780 0.9 0.3 4780 0.9 0.3 5670	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.3 3420 0.3 3420 0.3 34280 0.9 0.2 5090	969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480 1.1 0.3 3070 0.3 3850 0.9 0.2 4580	46 1240 1.2 0.1 1710 1.2 2230 1.2 0.3 2760 1.1 0.3 3470 1.0 3470 1.0 0.2 4140	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2 0.3 0.2 2010 1.2 0.3 0.2 2010 1.3 0.2 2010 1.3 0.2 2010 1.3 3140 1.1 0.2 3750	992 1.3 0.0 1380 1.3 0.2 2250 1.2 0.3 2850 1.2 0.3 3400
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB36 20LB44 20LB48	fe superin Number strand 9 10 12 14 14 16 18 18 19 21	ys ys 10. 2.44 2.80 3.33 3.71 4.25 4.89 5.05 5.81	1 serv	18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 0.2 0.5 0.5 0.5 0.5 0.2 7440 0.5 9450 0.4 0.2	26 2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 9810 0.5 0.2 9810 0.4 0.2	28 1960 0.9 0.3 2890 0.7 0.2 2890 0.7 0.2 0.6 0.6 0.2 5350 0.6 0.2 6820 0.5 0.2 8380 0.5 0.2	30 1670 1.0 0.3 2470 0.2 3440 0.7 0.2 3440 0.7 0.2 5880 0.6 0.2 0.6 0.2 8950 0.5 0.2	Spar 32 1430 1.0 0.3 2130 0.9 0.2 2970 0.8 8 0.2 2970 0.7 0.2 6290 0.6 0.2 7800 0.6 0.2 9220 0.5	a , ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 2590 0.9 0.2 33490 0.8 0.2 33490 0.8 0.2 3490 0.8 0.3 5510 0.7 0.2 6840 0.6 0.2 8100 0.6 0.2 8100 0.6 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	36 1070 1.2 0.2 1610 1.0 0.9 0.2 3070 0.9 0.3 3940 0.9 0.3 3940 0.8 0.3 3940 0.8 0.3 4850 0.8 0.2 2 0.7 150 0.5 0.6 0.4	38 1410 1.0 0.1 2000 1.0 0.2 22710 1.0 0.3 3480 0.9 0.3 3480 0.9 0.3 3480 0.9 0.3 35360 0.8 0.2 6360 0.7 0.7 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	40 1240 1.1 0.2 2400 1.0 0.3 3100 1.0 0.3 3100 1.0 0.3 3100 0.9 0.3 4780 0.9 0.3 4780 0.8 0.2 5670 0.8	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3 3420 0.3 3420 0.3 34280 0.3 5090 0.8	969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480 1.1 0.3 3070 1.0 0.3 3850 0.9 0.2 4580 0.9	46 1240 1.2 0.1 1710 1.2 2230 1.2 0.3 2760 1.1 0.3 3470 1.0 0.2 4140 0.9	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2 0.3 2490 1.1 0.3 3140 1.1 0.2 3750 1.0	992 1.3 0.0 1380 1.3 0.1 1810 1.3 0.2 2250 1.2 2250 1.2 0.3 3400 1.
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB36 20LB40 20LB44	fe superin Number strand 9 10 12 14 16 18 19 21	y_s y_s 1n. 2.44 2.80 3.33 3.71 4.25 4.89 5.05 5.81	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 0.2 4060 0.5 0.1 5590 0.5 0.2 0.5 0.2 0.4 0.2 94500 0.4 0.2	2310 0.8 0.2 3410 0.6 0.2 4710 0.6 6280 0.5 0.2 7980 0.5 0.2 9810 0.4 0.2	28 1960 0.9 0.3 2890 3 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820 0.5 5350 0.2 8380 0.5 0.2	30 1670 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7 0.2 5880 0.6 0.6 0.2 7230 0.6 0.2 7230 0.6 0.2 7230 0.6 0.2 7230 0.5 50.2	Spar 32 1430 0.9 0.2 2970 0.8 0.2 4000 0.7 0.2 5110 0.7 0.2 5110 0.7 0.2 5110 0.7 800 0.6 0.2 9220 0.6 0.2 9220 0.5 0.2	a, ft 34 1240 1.1 0.3 18500 0.9 0.2 25900 0.9 0.2 25900 0.9 0.2 34900 0.8 0.3 55100 0.7 0.2 68400 0.6 0.2 81000 0.6 0.2	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 3070 0.9 0.3 3940 0.8 0.3 3940 0.8 0.3 3940 0.8 0.3 6040 0.7 150 0.2 6040 0.7 150 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6040 0.2 6050 0.2 6000000000000000000000000000000000	38 1410 1.0 0.1 22710 1.0 0.3 3480 0.9 0.3 3480 0.9 0.3 3480 0.9 0.3 35360 0.8 0.2 6360 0.7 0.2	40 1240 1.1 0.1 1760 1.0 0.3 3100 0.3 3830 0.3 3830 0.3 4780 0.3 4780 0.8 0.2 5670 0.8 0.2	42 1090 1.1 0.0 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3 3420 1.0 0.3 3420 0.9 0.2 5090 0.8 0.9 0.8 0.2	969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480 1.1 0.3 3070 1.0 0.3 3850 0.9 0.2 4580 0.9 0.2	46 1240 1.2 0.1 1710 1.2 2230 1.2 2230 1.2 2260 1.1 0.3 3470 1.0 0.2 4140 0.9 0.3	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.1 0.3 3140 1.1 0.3 3140 1.1 0.3 3750 0.0 0.3	992 1.3 0.0 1380 1.3 0.2 2250 1.2 2250 1.2 0.3 2850 1.1 0.3 3400 1.1 0.3
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB40 20LB44 20LB48	fe superin Number strand 9 10 12 14 14 16 18 19 21	ys ys 1n. 2.44 2.80 3.33 3.71 4.25 4.89 5.05 5.81	16 6560 0.3 0.1 9570 0.3 0.1	18 5130 0.4 7490 0.3 0.1	20 4100 0.5 6000 0.4 0.4 0.4 0.4 0.4 0.4 0.4	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd c2 24 2760 0.7 0.2 4060 0.5 0.2 7440 0.5 0.2 9450 0.4 0.2 9450	26 2310 0.8 0.2 3410 0.6 0.2 6280 0.5 0.2 7980 0.5 0.2 9810 0.4 0.2	28 1960 0.9 2890 0.3 2890 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820 0.5 5350 0.2 8380 0.5 0.2	30 1670 0.3 2470 0.8 3440 0.7 0.2 4610 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 8950 0.5 0.2	Spar 32 1430 0.3 22130 0.9 0.2 2970 0.8 0.2 4000 0.7 0.2 5110 0.7 0.2 5110 0.7 0.2 5110 0.7 0.2 5120 0.6 0.6 0.2 9220 0.5 0.5 0.2	34 1240 1.1 0.3 1850 0.9 0.2 2590 0.2 2590 0.2 3490 0.8 0.2 3490 0.8 0.2 3490 0.8 0.2 35510 0.7 0.2 6840 0.6 6840 0.6 0.2 81000 0.6 9630	36 1070 1.2 0.2 1610 1.0 0.9 0.2 3070 0.9 0.3 3940 0.8 0.3 3940 0.8 0.3 3940 0.8 0.3 3940 0.9 0.3 3940 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.2 3070 0.9 0.9 0.9 0.9 0.2 3070 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.	38 1410 0.1 2000 1.0 0.2 2710 1.0 0.3 3480 0.9 0.3 3480 0.9 0.3 3480 0.9 0.3 3480 0.9 0.3 3480 0.9 0.3 35360 0.8 0.2 6360 0.7 7570	40 1240 1.1 0.2 2400 1.0 0.3 33100 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 34780 0.8 0.2 5670 0.8 0.2 56770	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3 3420 0.0 3420 0.0 9 0.2 5090 0.8 0.9 6080	969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480 1.1 0.3 3070 1.0 0.3 3850 0.9 0.2 4580 0.9 0.2 5480	46 1240 1.2 0.1 1710 1.2 2230 1.2 2260 1.1 0.3 3470 1.0 0.2 4140 0.9 0.3 4950	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2 0.3 2490 1.1 0.3 3140 1.1 0.2 3750 0.0 0.3 37490	992 1.3 0.0 1380 1.3 0.1 1810 1.2 2250 1.2 0.3 2255 1.2 0.3 2855 1.2 0.3 3400 1.3 0.400
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB36 20LB36 20LB40 20LB44 20LB48 20LB48	fe superin Number strand 9 10 12 14 16 18 19 21 23	ys ys in. 2.44 2.80 3.33 3.71 4.25 4.89 5.05 5.81 6.17	16 6560 0.3 0.1 9570 0.3 0.1	ice lo 18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.4 0.1	nd cz 24 2760 0.7 0.2 4060 0.5 0.7 4060 0.5 0.2 7440 0.5 0.2 9450 0.4 0.2	26 2310 0.8 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 9810 0.4 0.2 9810 0.4 0.2	28 1960 0.9 0.3 2890 3 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820 0.5 0.2 6820 0.5 0.2 8380 5 0.2	30 1670 0.3 2470 0.8 0.2 3440 0.7 0.2 4610 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 8950 0.5 0.2	Spar 32 1430 0.3 22370 0.8 0.2 2970 0.8 0.2 4000 0.7 0.2 5110 0.7 0.2 5110 0.7 0.2 5110 0.7 0.2 5120 0.6 0.2 78000 0.6 0.2 9220 0.5 0.2	34 1240 1.1 0.3 1850 0.9 0.2 2590 0.2 2590 0.2 2590 0.2 3490 0.8 0.2 3490 0.8 0.2 3490 0.8 0.2 35510 0.7 0.2 6840 0.6 8100 0.6 9630 0.6	36 1070 1.2 0.2 1610 0.9 0.9 0.2 3070 0.9 0.3 3940 0.8 0.3 3940 0.8 0.3 3940 0.8 0.2 0.9 0.2 3940 0.3 3940 0.3 3940 0.3 3940 0.2 2 0.2 2 0.2 2 0.2 2 0.2 0.2 10.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	38 1410 1.0 0.1 22010 1.0 0.3 3480 0.3 3480 0.3 3480 0.3 3480 0.3 3480 0.3 6360 0.7 7570 0.7	40 1240 1.1 0.2 2400 1.0 0.3 3100 1.0 0.3 3100 0.3 33100 0.3 33830 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2 2770 1.1 0.2 2770 1.1 0.2 2770 1.1 0.2 2770 0.1 3 3420 0.0 9 0.2 5090 0.8 0.0 2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 8 0.2 5090 0.8 8 0.2 5000 0.8 8 0.2 5000 0.9 1.0 1.0 0.2 2 1.0 0.0 1.1 0.2 2 1.0 0.0 1.1 0.2 2 1.0 0.0 1.1 0.2 2 2 1.0 0 0.1 1.1 0.2 2 1.0 0 1.1 0.2 2 2 1.0 0 0.1 1.1 0.2 2 2 1.0 0 0.1 1.1 0.2 2 2 1.0 0 0.1 1.1 0.2 2 2 1.0 0 0.0 1.1 0.2 2 2 0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0 0.0 0 0.0 0 0 0.0 0 0 0 0.0 0 0 0 0 0.0 0 0 0 0 0.0 0 0 0 0 0 0.0 0 0 0 0 0.0 0 0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480 1.1 0.3 3070 1.0 0.3 3850 0.9 0.2 4580 0.9 0.3 5480 0.9	46 1240 1.2 0.1 1710 1.2 2230 1.2 0.3 2760 1.1 0.3 3470 1.0 0.2 4140 0.9 0.3 4950 0.9	48 11110 1.2 0.0 1540 1.3 2010 1.2 2010 1.2 2010 1.2 2490 1.1 0.3 3140 1.1 0.2 3750 0.0 3750 0.0 3750 0.0 3750 0.0 1.0 0.0 2490 0.1 1.1 0.2 0.0 0 1.2 0.0 0 1.2 0.0 0 1.2 0.0 0 1.5 0.0 0 1.2 0.0 0 1.5 0.0 0 1.5 0.0 0 1.5 0.0 0 1.5 0.0 0 1.5 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.3 2 0.0 0 1.1 3 3140 0 1.1 2 0.0 0 1.1 3 3140 0 1.0 2 0.0 0 1.1 3 0.2 0 0.0 0 1.1 0 0.2 0 0.0 0 1.1 3 0.2 0 0.0 0 1.1 0 0.2 0 0.0 0 1.1 0 0.2 0.0 0 0 0.0 0 0 0.0 0 0 0.0 0 0.0 0 0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9922 1.3 0.0 13800 1.3 22550 1.1 22550 1.1 0.2 28500 1.1 0.2 34000 1.1 0.2 1.2 0.2 1.2 0.2 1.2 0.2 1.3 1.3 0.2 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.0 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.2 1.3 1.3 0.3 1.3 1.3 0.3 1.3 1.3 0.3 1.3 1.3 1.3 0.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB40 20LB44 20LB48 20LB52	Image: fe supering Number strand 9 10 12 14 16 18 19 21 23	ys ys 1n. 2.44 2.80 3.33 3.71 4.25 4.89 5.05 5.81 6.17	16 6560 0.3 0.1 9570 0.3 0.1	ice lo 18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 0.2 4060 0.5 0.2 7440 0.5 0.2 9450 0.4 0.2	2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.2 6280 0.5 0.2 0.5 0.2 9810 0.4 0.2	rs, in. 28 1960 0.9 0.3 2890 0.7 0.2 4000 0.6 0.2 4000 0.6 0.2 6820 0.5 0.2 8380 0.5 0.2 8380 0.5 0.2	30 1670 1.0 0.3 2470 0.2 3440 0.7 0.2 3440 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 8950 0.5 0.2	Spar 32 1430 0.9 0.2 2970 0.8 0.2 2970 0.8 0.2 2970 0.7 0.2 5110 0.7 0.2 6290 0.6 6290 0.6 0.2 7800 0.6 2 9220 0.5 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 34900 0.8 0.2 34900 0.8 0.2 34900 0.8 0.2 8100 0.6 0.2 8100 0.6 0.2 96300 0.6 0.2 10.	36 1070 1.2 0.2 1610 0.1 2270 0.9 0.2 3070 0.9 0.3 3940 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.	38 1410 1.0 0.1 22710 1.0 0.3 3480 0.3 3480 0.3 3480 0.3 5360 0.8 0.3 5360 0.8 0.2 6360 0.7 0.2 7570 0.7 0.7 570 0.7	40 1240 1.1 0.1 1760 1.0 0.3 3100 1.0 0.3 3830 0.9 0.3 4780 0.8 0.2 5670 0.8 0.2 5670 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2 2770 1.0 3420 0.9 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.8 0.0 0.8 0.0 0.0 0.0 0.0 0.0 0.	969 1.2 0.0 1390 1.2 0.2 0.1 1910 1.2 0.2 2480 1.1 0.3 3070 0.3 3850 0.3 3850 0.3 3850 0.9 0.2 4580 0.9 0.3 35480 0.9 0.9 0.3 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	46 1240 1.2 0.2 0.2 2230 1.1 0.3 3470 1.0 3 3470 1.0 0.2 4140 0.9 0.3 34950 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.	48 11110 1.2 0.0 1.540 1.3 0.2 2010 1.2 0.3 3140 1.1 0.2 3750 1.0 0.3 3140 0.0 33750 1.0 0.3 3140 0.0 33750 1.0 0.0 3750 1.0 0.0 3750 1.0 0.0 1.0 0.0 1.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	992 1.3 0.0 1380 1.3 0.2 2250 1.1 2250 1.2 2250 1.1 0.2 3400 1.0 0.3 4090 1.0 0.3 4090
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB36 20LB40 20LB48 20LB48 20LB52	fe superin Number strand 9 10 12 14 16 18 19 21 23	y_s 1n. 2.44 2.80 3.33 3.71 4.25 4.89 5.05 5.81 6.17	1 serv	ice lo 18 5130 0.4 7490 0.3 0.1	20 4100 0.5 6000 0.4 0.4 0.1 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd ca 24 2760 0.7 0.2 4060 0.5 0.2 7440 0.5 0.2 9450 0.4 0.2	2310 0.8 0.2 3410 0.6 0.2 4710 0.6 280 0.5 0.2 7980 0.5 0.2 9810 0.4 0.2	rs, in. 28 1960 0.9 0.3 2890 0.7 24000 0.6 0.2 53500 0.6 0.2 68200 0.5 0.2 83800 0.5 0.2 83800 0.5 0.2 83800 0.5 0.2 83800 0.5 0.2 83800 0.5 0.2 83800 0.5 0.2 0.2 0.5 0.2 0.5 0.2 0.5 0.2 0.5 0.5 0.2 0.5 0.2 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	30 1670 1.0 0.3 2470 0.7 3440 0.7 0.2 3440 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 7230 0.5 0.2	Spar 32 1430 0.9 2130 0.2 2970 0.8 0.2 2970 0.7 0.2 5110 0.7 0.2 51107 0.2 6290 0.6 0.2 7800 0.6 0.2 9220 0.5 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 3490 0.8 0.2 3490 0.8 0.2 3490 0.8 0.2 3490 0.8 0.2 8100 0.6 0.6 0.2 8100 0.6 0.6 0.2 8100 0.6 0.6 0.2 8100 0.6 0.6 0.6 0.6 0.2 8100 0.6 0.6 0.6 0.2 800 0.6 0.6 0.6 0.6 0.6 0.6 0.6 0	36 1070 1.2 0.2 1610 1.0 0.9 0.2 3070 0.9 0.3 3940 0.9 0.3 3940 0.9 0.3 3940 0.9 0.3 3940 0.9 0.2 7150 6040 0.7 10,0 0.2 7150 6040 0.7 10,0 0.2 7150 60,0 0.2 7150 60,0 0.2 7150 60,0 0.2 7150 60,0 0.2 7150 60,0 0.2 7150 60,0 0.2 7150 7150 7150 7150 7150 7150 7150 7150	38 1410 1.0 0.1 22710 1.0 0.3 3480 0.9 0.3 3480 0.8 0.3 5360 0.8 0.3 5360 0.8 0.2 6360 0.7 7570 0.2 7570 0.7 7570 0.7	40 1240 1.1 1760 1.0 1.2 2400 1.0 0.3 3100 0.3 33100 0.3 3830 0.3 3 3830 0.3 3 3830 0.3 3 3830 0.3 3 3830 0.3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2 2770 1.0 3420 1.0 3420 0.9 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.2 5090 0.8 0.8 0.2 5090 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.	969 1.2 0.0 1390 1.2 0.1 1910 1.2 0.2 2480 0.3 3850 0.9 0.2 4580 0.9 0.2 4580 0.9 0.2 0.3 64200	46 1240 1.2 0.1 1710 1.2 2230 1.2 2230 1.2 0.3 2760 1.1 0.3 3470 1.0 0.2 4140 0.9 0.3 3470 0.9 0.3 58200 0.9	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.1 0.3 3140 1.1 0.3 3140 0.3 3750 0.3 750 0.0 3 750 0.0 0.3 52800 0.3	992 1.3 0.0 1.380 1.3 0.1 1810 1.2 2250 1.2 0.3 2250 1.2 0.3 3400 1.0 .0 .3 3400 1.0 .0 .3 4099 1.0 .0 .1 .1 .0 .2 .2 .0 .0 .1 .3 .0 .1 .2 .2 .0 .0 .1 .2 .2 .0 .0 .1 .2 .3 .0 .0 .1 .3 .0 .1 .2 .2 .0 .0 .1 .3 .0 .0 .1 .3 .0 .0 .1 .3 .0 .0 .1 .3 .0 .0 .0 .1 .3 .0 .0 .0 .1 .3 .0 .0 .1 .2 .2 .3 .0 .0 .1 .2 .2 .3 .0 .0 .1 .3 .0 .0 .1 .3 .0 .0 .1 .3 .0 .0 .1 .3 .0 .0 .1 .2 .3 .3 .0 .0 .1 .2 .3 .3 .0 .0 .1 .1 .0 .2 .3 .3 .0 .0 .1 .1 .0 .2 .3 .3 .0 .1 .1 .0 .2 .3 .3 .0 .1 .1 .0 .2 .3 .3 .0 .1 .1 .1 .1 .1 .1 .1 .1 .1 .1 .1 .1 .1
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB36 20LB36 20LB44 20LB48 20LB48 20LB52 20LB56	Number strand 9 10 12 14 16 18 19 21 23 25	ys ys 2.44 2.80 3.33 3.71 4.25 4.89 5.05 5.81 6.17 6.64	16 6560 0.3 0.1 9570 0.3 0.1	ice lo 18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.7 0.4 0.1 8940 0.4 0.1	nd ca 24 2760 0.7 0.2 4060 0.5 0.5 0.5 0.5 0.2 9450 0.4 0.2	2310 0.8 0.2 3410 0.6 0.2 4710 0.6 0.5 0.2 7980 0.5 0.2 9810 0.4 0.2	rs, in. 28 1960 0.9 0.3 2890 0.7 0.2 5350 0.6 0.2 5350 0.6 0.2 6820 0.5 5.2 8380 0.5 0.2 8380 0.5 0.2 8380	30 1670 0.3 2470 0.8 0.2 4610 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 7230 0.6 0.2 9950 0.5 0.2	Spar 32 1430 0.9 0.2 2970 0.8 0.2 2970 0.8 0.7 0.2 5110 0.7 0.2 5110 0.7 0.2 6290 0.6 0.2 9220 0.6 0.2 9220 0.5 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 3490 0.8 0.2 4470 0.8 0.3 5510 0.7 0.2 8100 0.6 0.2 9630 0.6 0.2 9630 0.6 0.2 9630 0.6 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	36 1070 1.2 0.2 1610 1.0 0.9 0.2 2270 0.9 0.9 0.9 0.9 0.3 3940 0.9 0.3 3940 0.8 0.3 3940 0.8 0.3 3940 0.2 7150 0.5 0.6 0.4 0.2 7150 0.5 0.2 7150 0.5 0.2 7150 0.5 0.2 7150 0.5 0.2 7150 0.5 0.2 7150 0.5 0.2 7150 0.5 0.2 7150 0.5 0.2 7150 0.5 0.2 7150 0.5 0.2 7150 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0	38 1410 1.0 0.1 22710 1.0 0.3 3480 0.7 0.2 3600 0.7 0.2 3600 0.7 0.2 3600 0.7 0.2 3880 0.7 0.2 3880 0.7 0.2 3880 0.7 0.2 3880 0.7 0.2 0.7 0.2 0.7 0.2 0.2 0.7 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	40 1240 1.1 0.2 2400 1.0 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3830 0.3 3700 0.5 3700 0.5 3700 0.5 3700 0.5 3700 0.5 3700 0.5 3700 0.5 3700 0.5 3700 0.5 37000 0.5 37000000000000000000000000000000000000	42 1090 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3 3420 1.0 3420 0.3 4280 0.9 0.2 5090 0.8 0.2 6080 0.8 0.2 6080 0.8 0.2 6080 0.8 0.2 6090 0.8 0.2 6090 0.8 0.2 6090 0.8 0.2 6090 0.8 0.2 6090 0.8 0.2 6090 0.8 0.2 6090 0.8 0.2 6090 0.8 0.2 6090 0.8 0.2 6090 0.8 0.9 0.2 6090 0.8 0.9 0.2 6090 0.8 0.9 0.2 6090 0.8 0.8 0.9 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.9 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.2 6090 0.8 0.8 0.8 0.2 6090 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.	44 969 1.2 0.0 1390 1.2 0.2 2480 1.1 1.2 0.2 2480 1.1 1.3 3070 1.0 33850 0.9 0.2 4580 0.9 0.3 5480 0.9 0.3 10 10 10 10 10 10 10 10 10 10 10 10 10	46 1240 1.2 0.1 1710 1.2 2230 1.2 2230 1.2 0.3 2760 1.2 0.3 2760 1.2 0.3 3470 1.0 0.9 0.3 3470 0.9 0.3 5820 0.9 0.2	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2 0.3 2490 1.1 0.2 3750 1.0 0.3 3140 1.1 0.2 3750 1.0 0.3 3140 1.0 0.3 5280 0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	992 1.3 0.0 1380 1.3 0.1 1810 1.3 2250 1.2 2250 1.2 0.3 3400 1.0 .3 4090 1.0 0.3 4491 1.0 0.3
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB40 20LB44 20LB48 20LB52 20LB56	Image: second strand 9 10 12 14 16 18 19 21 23 25	y_s y_s 1 2.44 2.80 3.33 3.71 4.25 4.89 5.05 5.81 6.17 6.64	16 6560 0.3 0.1 9570 0.3 0.1	ice lo 18 5130 0.4 7490 0.3 0.1	20 4100 0.5 0.2 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 0.4 0.4 0.1 8940 0.4 0.1	nd ca 24 2760 0.7 0.2 4060 0.5 0.2 74400 0.5 0.2 9450 0.4 0.2 9450	2310 0.8 0.2 3410 0.6 0.2 3410 0.6 0.2 0.5 0.2 7980 0.5 0.2 9810 0.4 0.2	rs, in. 28 1960 0.9 0.3 2890 0.7 0.2 2890 0.7 0.2 5350 0.6 0.2 6820 0.5 0.2 8380 0.5 0.2 8380 0.5 0.2 8380	30 1670 0.3 2470 0.8 0.2 4610 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 8950 0.5 0.2	Spar 32 1430 0.9 0.2 2970 0.8 0.2 2970 0.8 0.7 0.2 5110 0.7 0.2 5110 0.7 0.2 5110 0.7 800 0.6 0.2 9220 0.6 0.2 9220 0.6 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 34900 0.8 0.3 5510 0.7 0.2 6840 0.6 0.2 81000 0.6 0.2 9630 0.6 0.2 9630 0.6 0.2 9630 0.6 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 3070 0.9 0.3 3940 0.8 0.3 3940 0.8 0.3 3940 0.8 0.3 6040 0.7 1500 0.2 6040 0.7 1500 0.2 2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	38 1410 1.0 0.2 2710 0.3 3480 0.3 3480 0.3 3480 0.3 34300 0.8 0.3 5360 0.8 0.3 5360 0.8 0.2 6360 0.7 7570 0.7 8860 0.7 7.2 2 8860 0.7 0.2	40 1240 1.1 0.1 1760 1.1 0.2 2400 1.0 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3700 0.3 3700 0.3 3700 0.3 3700 0.3 3700 0.3 3700 0.3 3700 0.3 3700 0.3 3700 0.3 3700 0.3 3700 0.3 3770 0.8 0.9 0.3 3770 0.8 0.9 0.7 0.8 0.7 0.7 0.0 0.8 0.7 0.7 0.0 0.8 0.7 0.7 0.0 0.8 0.7 0.7 0.0 0.8 0.7 0.0 0.8 0.7 0.7 0.0 0.7 0.0 0.8 0.9 0.7 0.0 0.8 0.9 0.7 0.0 0.8 0.9 0.7 0.0 0.8 0.9 0.7 0.0 0.8 0.9 0.7 0.0 0.8 0.9 0.7 0.0 0.7 0.9 0.7 0.9 0.7 0.9 0.7 0.9 0.7 0.9 0.7 0.9 0.7 0.9 0.7 0.9 0.7 0.9 0.7 0.9 0.7 0.9 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	42 1090 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3 3420 1.0 0.3 3420 0.9 0.2 5090 0.8 0.2 6080 0.8 0.3 7120 0.8 3.1 0.2 6080 0.8 0.3 7120 0.8 0.3 8 0.2 0.8 0.3 1.1 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.2 0.8 0.8 0.2 0.8 0.8 0.2 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	969 1.2 0.0 1390 1.2 0.2 2480 1.1 1910 2.2 2480 1.1 0.3 3070 1.0 33850 0.9 0.2 4580 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 0.3 0.3 0.0 0.3 0.3 0.0 0.0 0.3 0.0 0.0	46 1240 1.2 0.1 1710 1.2 2230 1.2 0.3 2760 1.1 3 3470 1.0 0.9 0.3 4950 0.9 0.3 5820 0.9 0.3 5820 0.9 0.3 5820	48 11100 1.2 0.0 1540 1.3 0.2 2010 1.2 0.3 2490 1.1 0.2 37500 1.0 0.3 3140 1.1 0.2 37500 1.0 0.3 52800 1.0 0.3 0.3 6080	9922 1.3 0.1 1380 1.3 0.2 22550 1.3 0.2 2850 1.3 0.3 3400 1.0 0.3 3400 1.0 0.3 3400 1.0 0.3 3400 1.0 0.5 544
able of sa Desig- nation 20LB20 20LB24 20LB28 20LB32 20LB36 20LB40 20LB44 20LB48 20LB48 20LB52 20LB56 20LB56	Number strand 9 10 12 14 16 18 19 21 23 25 27	ys ys 1n. 2.44 2.80 3.33 3.71 4.25 4.89 5.05 5.81 6.17 6.64 7.22	16 6560 0.3 0.1 9570 0.3 0.1	ice lo 18 5130 0.4 0.2 7490 0.3 0.1	20 4100 0.5 6000 0.4 0.1 8220 0.4 0.1	22 3340 0.6 0.2 4900 0.5 0.1 6730 0.4 0.1 8940 0.4 0.1	nd cz 24 2760 0.7 4060 0.5 0.2 7440 0.5 0.2 9450 0.4 0.2 9450	2310 0.8 0.2 3410 0.6 0.2 4710 0.6 6280 0.5 0.2 7980 0.5 0.2 9810 0.4 0.2	rs, in. 28 1960 0.9 0.3 2890 0.7 0.2 4000 0.6 0.2 5350 0.6 0.2 6820 0.5 5350 0.2 8380 0.5 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	30 1670 0.3 2470 0.8 0.2 3440 0.7 0.2 5880 0.6 0.2 7230 0.6 0.2 7230 0.6 0.2 0.2	Spar 32 1430 0.9 0.2 2970 0.8 0.2 4000 0.7 0.7 5110 0.7 0.2 5110 0.7 0.2 5290 0.6 0.2 9220 0.5 0.2	n, ft 34 1240 1.1 0.3 1850 0.9 0.2 2590 0.9 0.2 2590 0.9 0.2 3490 0.8 0.2 4470 0.8 0.3 5510 0.7 0.2 68400 0.6 0.2 81000 0.6 0.2 9630 0.6 0.2 9630 0.6 0.2 9630 0.6 0.2 9630 0.6 0.2 0.2 0.5 0.7 0.2 0.7 0.7 0.2 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	36 1070 1.2 0.2 1610 1.0 0.1 2270 0.9 0.2 3070 0.9 0.3 3940 0.8 0.3 3940 0.8 0.3 3940 0.8 0.3 4850 0.8 0.2 7150 6040 0.5 0.2 2 9950 0.6 2 9950 0.6 2 9950	38 1410 1.0 0.1 2000 1.0 0.2 2710 0.3 3480 0.9 0.3 3480 0.3 3480 0.3 35360 0.8 0.2 6360 0.7 0.2 7570 0.7 0.2 8860 0.7 0.2 10 0.7 0.2 0.2 10 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.	40 1240 1.1 0.1 1760 1.0 0.3 3100 1.0 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 3830 0.9 0.3 5670 0.8 0.2 5670 0.8 0.2 56770 0.8 0.8 0.2 56770 0.8 0.9 0.8 0.9 0.8 0.9 0.8 0.9 0.8 0.9 0.8 0.9 0.8 0.9 0.8 0.9 0.9 0.8 0.9 0.8 0.9 0.8 0.9 0.8 0.9 0.8 0.9 0.8 0.9 0.9 0.8 0.9 0.9 0.8 0.9 0.9 0.8 0.9 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	42 1090 1.1 0.0 1560 1.1 0.2 2140 1.1 0.2 2770 1.1 0.3 3420 0.9 0.2 5090 0.8 0.9 0.2 5090 0.8 0.9 0.2 6080 0.8 0.2 6080 0.8 0.2 6080 0.8 0.3 8170 0.7	969 1.2 0.0 1.2 0.1 1390 1.2 0.2 2480 1.1 0.3 3070 1.0 0.3 3850 0.9 0.2 4580 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.9 0.3 5480 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 5420 0.0 0.3 550 0.0 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 0.3 550 0.0 5 50 0.0 5 5 50 0.0 5 5 5 50 0.0 5 5 50 0.0 5 5 5 5	46 1240 1.2 0.1 1710 1.2 2230 1.2 2260 1.1 0.3 3470 1.0 0.2 4140 0.9 0.3 34950 0.9 0.3 5820 0.9 0.3 66800 0.9	48 11110 1.2 0.0 1540 1.3 0.2 2010 1.2 2010 1.2 0.3 3140 1.1 0.2 3750 1.0 0.3 3750 1.0 0.3 5280 1.0 0.3 5280 0.0 3 5280 0.0 0.3	9922 1.3 0.0 1380 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.2 2250 1.3 0.4 0.3 0.4 0.2 2250 1.3 0.4 0.3 0.4 0.5 1.3 0.2 2250 1.3 0.4 0.3 0.4 0.5 1.5 0.5 0.4 0.5 1.5 0.5 0.5 1.5 0.5 0.5 1.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0

PCI DESIGN HANDBOOK/SEVENTH EDITION

3-45