



# SAS HIGH STRENGTH CONCRETE REINFORCEMENT

*Grade 97 thread bar coupling system*



SAS SYSTEMS

# SHEAR WALLS IN HIGH RISE BUILDINGS



United Nations Plaza  
New York City, NY  
Structural Engineer:  
WSP Cantor Seinuk

Over The past several years, the concrete industry has made high strength concrete available for the construction of high-rise buildings. However, the reinforcing steel that is used has stayed at Grade 60 ksi.

The use of high strength steel with high strength concrete simply makes technological sense, enabling engineers to design complex structures safer.

Current shear wall design typically utilizes large concentrations of #11 Grade 60 rebars. Many problems occur in placing the bars, forming the walls and pouring the concrete.

A more practical and elegant solution is to reduce the quantity of rebar by using the Grade 97 ksi steel. One #20 Grade 97 thread bar is equivalent to five #11 Grade 60 bars.

This will lead to significant savings as well as an improved construction time potential.

## BENEFITS:

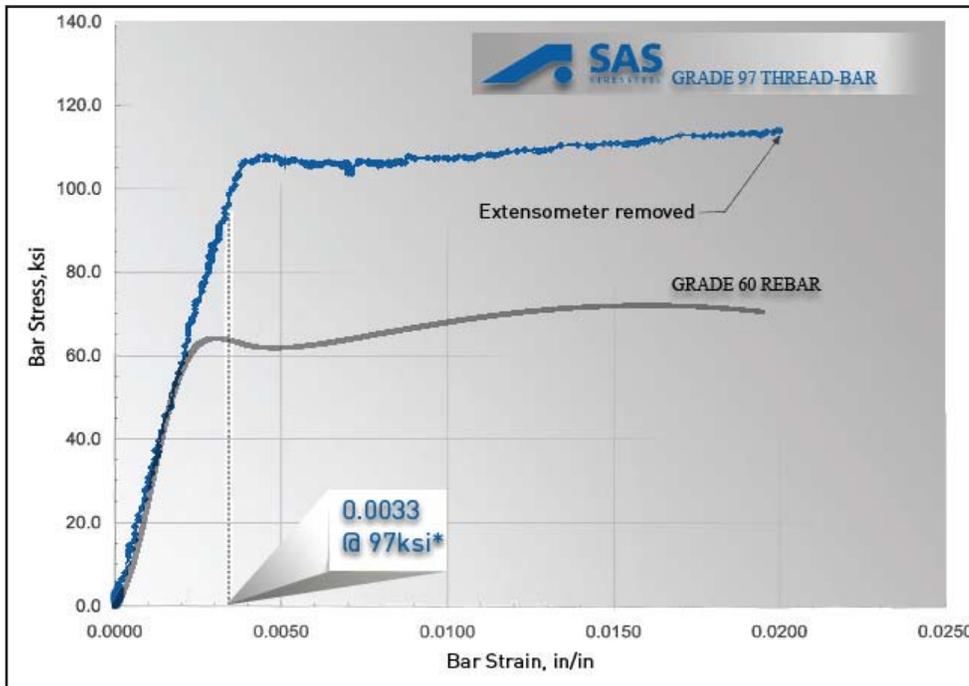
- ♦ The use of Grade 97 ksi with mechanical couplers as compared to Grade 60 ksi with lap splices will result in reinforcing steel weight savings up to 53%.
- ♦ Mechanical couplers with large diameter thread bars result in significant reduction of vertical bars creating additional savings in tie reinforcement.
- ♦ Prefabricated thread bar cages (up to three floors high) can be placed with one pick from the tower crane.
- ♦ Off-site fabrication of cages reduces congestion and staging area at the job site.
- ♦ The stiffness and rigidity of the large diameter thread bars in the cages help maintain vertical alignment of the columns and shear wall forms.
- ♦ Reduction in rebar reduces congestion in heavily reinforced members and permits easier placement of concrete.
- ♦ Designs of columns and shear walls using the high strength thread bars with high strength concrete may result in slender member sections; thereby creating more usable floor area available to sell.



MET II Tower  
Miami, Florida  
Structural Engineer:  
Ysrael A. Seinuk, P.C.

## IS SAS GRADE 97 STEEL ACCEPTABLE TO ACI-318 BUILDING CODES?

In Accordance with American Concrete Institute Building Code 318, section 3.5.3.2 which states the following:



“DEFORMED REINFORCING BARS WITH SPECIFIED YIELD STRENGTH  $f_y$  EXCEEDING 60,000 psi SHALL BE PERMITTED, PROVIDED  $f_y$  SHALL BE THE STRESS CORRESPONDING TO A STRAIN NOT GREATER THAN 0.35%. THE BARS OTHERWISE CONFORM TO ONE OF THE ASTM SPECIFICATIONS LISTED IN 3.5.3.1”

**\*SAS Thread bar steel has a stress strain ratio of 0.33% (<0.35%) at the working grade of 97,000 psi**



The image to the left shows the SAS #11 thread bars for rebar matting in the foundation of the Epic Tower project, Miami, FL. The #11 thread bars were bent to 90° using a conventional bending machine.

SAS high strength reinforcing thread bars Grade 97 can be bent and lap-spliced in the same way as regular grade 60 reinforcement. The ACI 318, Chapter 12 formulas apply for the lap-splice calculation.

Epic Tower  
Miami, Florida  
Structural Engineer:  
Desimone Engineers



# THE SAS GRADE 97 REINFORCING THREAD BAR COUPLING SYSTEM

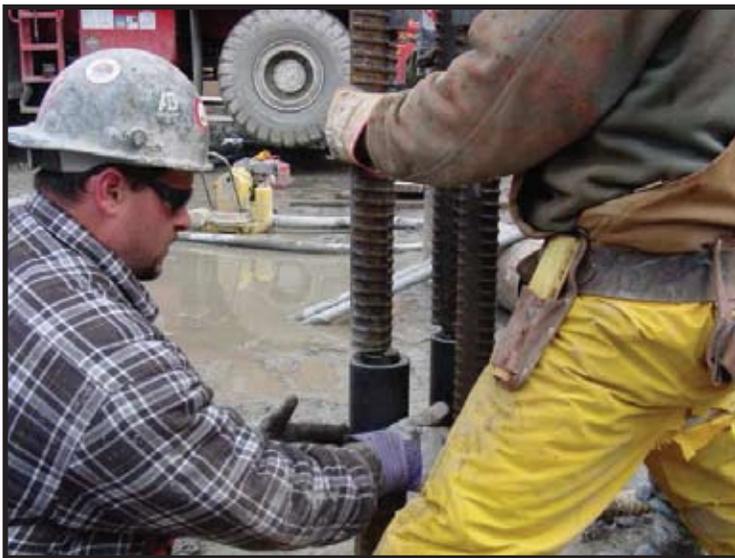


Color coding the thread bars and couplers on the prefabricated cages makes installation easier for the workers at the job site.

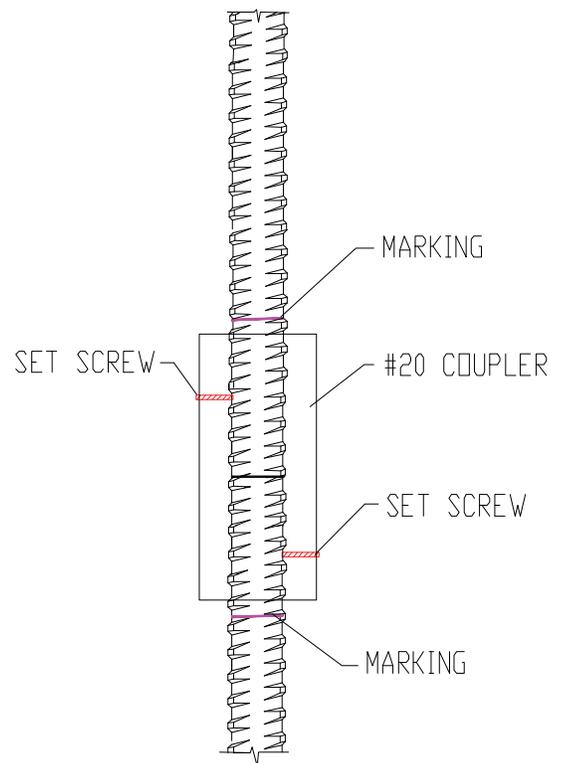


10 Museum Park  
Miami, Florida  
Structural Engineer:  
WSP Cantor Seinuk

SAS provides coupler markings on lower and upper bars, as well as set screws on the couplers.

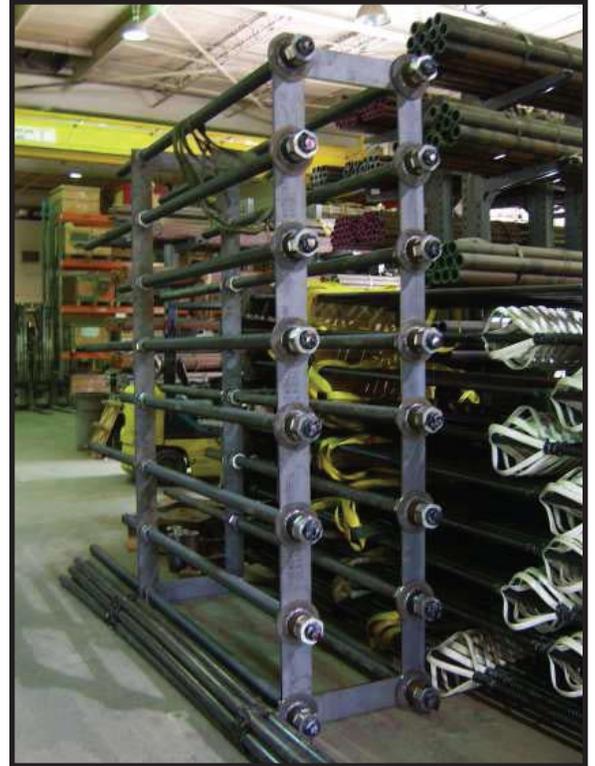


MET II Tower  
Miami, Florida  
Structural Engineer:  
Ysrael A. Seinuk, P.C.



## SAS HIGH STRENGTH REINFORCED STEEL CAGES

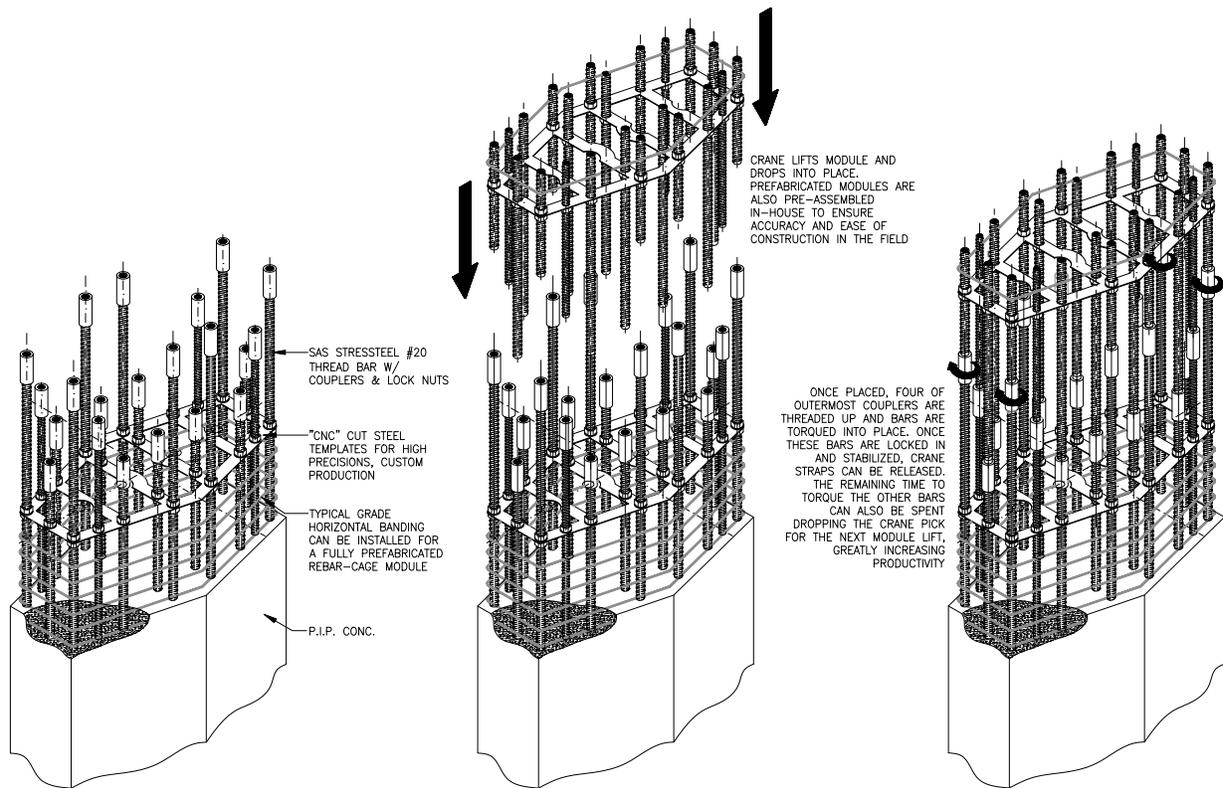
The SAS fabrication team has the capabilities and the experience to pre-assemble thread bar cages ranging from 2 to 30 bars. Our tradition and commitment to deliver every single project on time will continue to be our top priority.



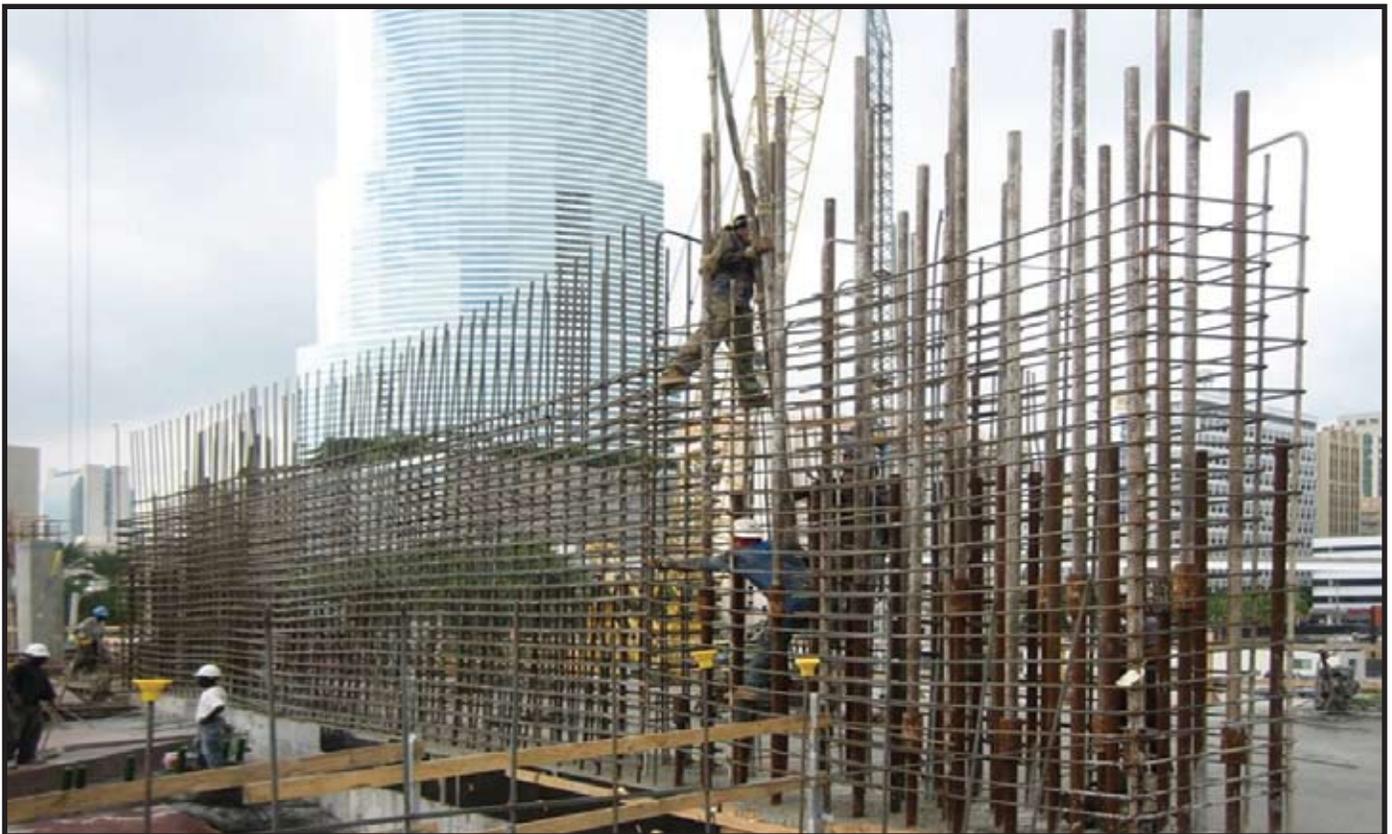
SAS commitment to find innovative solutions in the construction industry has driven us to go beyond the foundations. The Solis Spa & Resort Building in Sunny Isles, FL is expected to be finished ahead of time in 2009.

The image below shows the easy drop-down cage installation at 10 U.N. Plaza construction site in New York City.





The above typical details show field assembly of the # 20 thread bar cages for the construction of the mega columns on the 610 Lexington Avenue Project in New York City.



The installation of a cage consisting of 16 #20 thread bars, Grade 97, at 30 ft length, which equals 4 tons of steel; can be erected with a crew of 6 workers in less than 15 minutes. This results in a placement rate of 16 tons / hour / crew.

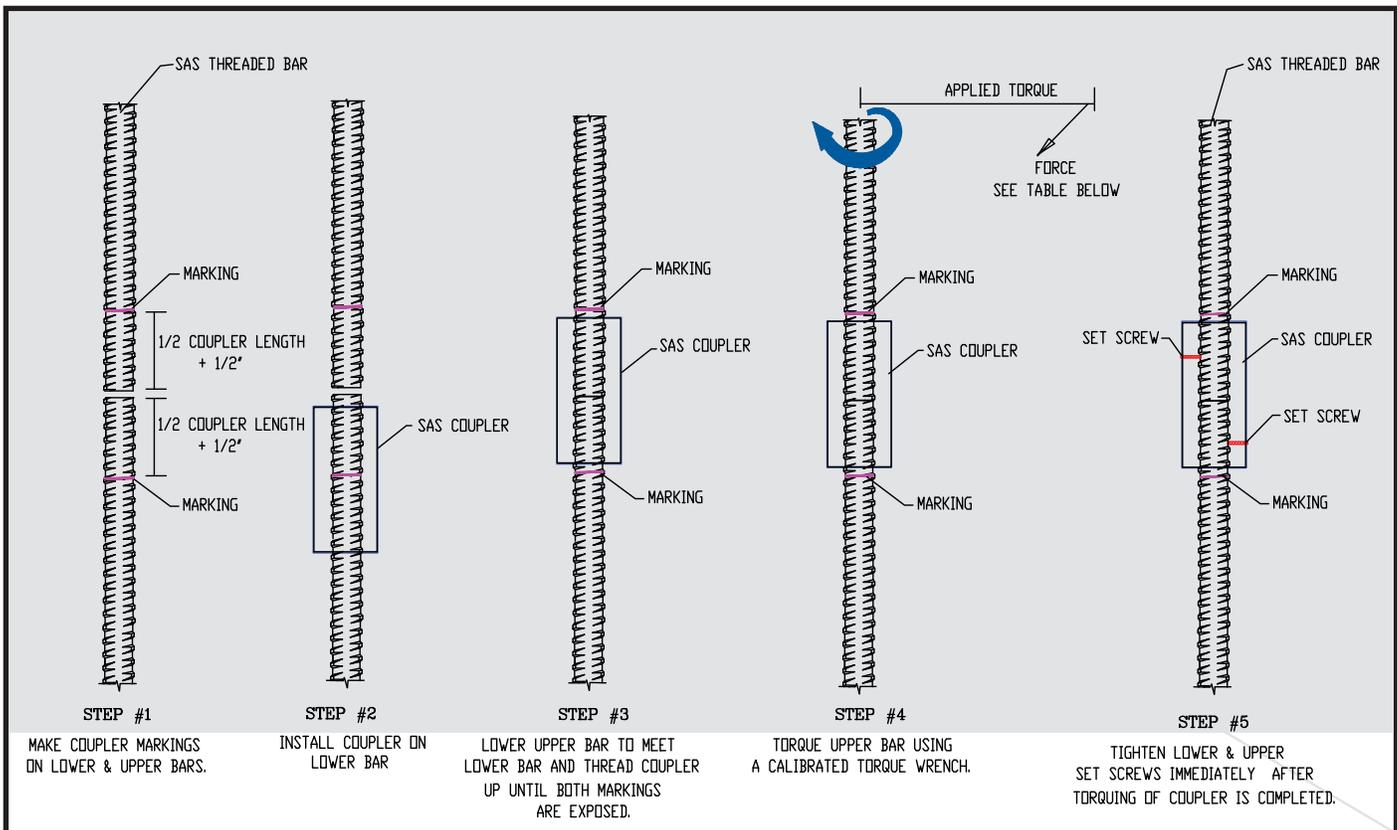
Thread bar couplers are normally staggered 2 and 5 feet above the floor deck, making for ease of installation. Lap-splicing of the bars is avoided, and the amount and time of fixing rebar ties is greatly reduced.

Solis Spa & Resort Building  
Sunny Isles, Florida  
Structural Engineer:  
Ysrael A. Seinuk, P.C.



## SAS Threaded Bar Torque Requirements

Bar Size	#6	#7	#8	#9	#10	#11	#14	#18	#20
Torque (Ft-LBs)	100	120	140	160	180	200	230	260	300



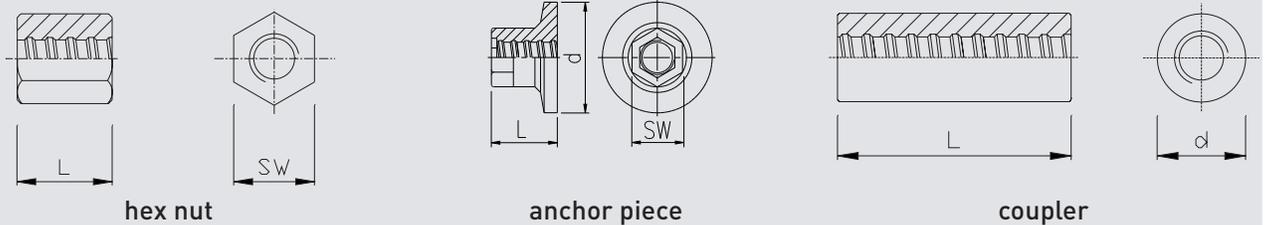


## SAS Grade 97 Thread Bar

bar #	nominal dia [in]	yield load [kip]	ultimate load [kip]	cross area [in <sup>2</sup> ]	weight [ft/mton]	weight [lb/ft]
6	3/4	38	46	0.39	1674.0	1.34
7	7/8	57	68	0.59	1116.0	2.00
8	1	74	88	0.76	852.2	2.59
9	1 1/8	93	111	0.95	679.3	3.25
10	1 1/4	107	127	1.10	580.7	3.73
11	1 3/8	145	173	1.49	434.6	5.07
14	1 3/4	219	261	2.25	285.1	7.66
18	2 1/4	391	467	4.03	161.0	13.7
20	2 1/2	477	570	4.91	132.0	16.7
24	3	665	795	6.85	91.4	23.3



## Standard Accessories for SAS Grade 97 Thread Bar<sup>1)</sup>



Bar #	TR 2002 SW x L [in]	TR 2073 SW x L [in]	TR 3003 <sup>2)</sup> d x L [in]
6	1.42 x 1.77	-	1.42 x 3.94
7	1.61 x 1.97	1.42 x 1.77	1.57 x 4.33
8	1.81 x 2.17	1.62 x 1.97	1.77 x 4.72
9	1.97 x 2.36	1.81 x 2.17	1.97 x 5.51
10	2.17 x 2.56	1.97 x 2.36	2.17 x 5.91
11	2.56 x 2.76	2.36 x 2.76	2.36 x 6.69
14	3.15 x 3.54	2.76 x 3.35	3.15 x 7.87
18	3.55 x 4.02	3.55 x 4.53	4.02 x 9.45
20	3.94 x 4.49	3.94 x 4.93	4.25 x 10.24
24	3.94 x 4.26	-	-

1) SAS accessories are designed and made to meet 125 % yield strength requirement for Type 1 Accessories

2) TR 3003 coupler may be replaced with coupler TR 3020 where set screws are required.