



U.S. Department  
of Transportation

Federal Highway  
Administration

July 10, 2000

400 Seventh St, SW  
Washington, D.C. 20590

Refer to: HSA- I

David Stoudt  
General Manager  
Sign Up Corporation  
PO Box 14624  
Portland Oregon, 97293

Dear Mr. Stoudt:

Thank you for your letters of March 28 and June 26, 2000, requesting Federal Highway Administration (FHWA) acceptance of your company's X-footprint portable sign stands as crashworthy traffic control devices for use in work zones on the National Highway System (NHS). Accompanying your letter was a report from E-Tech Testing Services, Inc., and videos of the crash tests. You requested that we find the listed devices acceptable for use on the National Highway System under the provisions of National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

FHWA guidance on crash testing of work zone traffic control devices is contained in two memoranda. The first, dated July 25, 1997, titled "Information: Identifying Acceptable Highway Safety Features," established four categories of work zone devices: Category I devices were those lightweight devices which could be self-certified by the vendor, Category II devices were other lightweight devices which needed individual crash testing, Category III devices were barriers and other fixed or massive devices also needing crash testing, and Category IV devices were trailer mounted lighted signs, arrow panels, etc. The second guidance memorandum was issued on August 28, 1998, and is titled "INFORMATION: Crash Tested Work Zone Traffic Control Devices." This later memorandum lists devices that are acceptable under Categories I, II, and III.

A brief description of the devices for which you are requesting acceptance follows:

X-CELL and MS-2000xi are compact portable spring-mounted sign systems. The support legs and uprights are fabricated from 2.1 mm wall 25.4 mm square ERW ASTM A500/A5 13 Grade A steel tubing. One piece support legs are used on the X-CELL, whereas the MS-2000xi is equipped with telescoping support legs. The uprights are attached to the support legs through "spring loaded" mechanisms. The test articles were equipped with 1218 mm vinyl roll-up signs secured by "Fiber-Flex" fiberglass braces. Three 457 mm square vinyl flags were attached to the top of each test article. The flag posts on the X-CELL sign support were wooden dowels inserted into sockets. The fiberglass "Flag-Up" flag attachment was used on the MS-2000xi sign support. Drawings of the two test articles are enclosed. On June 26 you requested a change to the MS-2000Xi stand that would allow one-piece legs as an alternate base.

Full-scale automobile testing was conducted on your company's sign stands. Two stand-alone examples of the device were tested in tandem, one head-on and the next placed six meters downstream turned at 90 degrees, as called for in our guidance memoranda.

The crash tests are summarized in the table below:

Test Number .	18-5077-001	18-5077-002
Test Article	X-CELL	MS-2000xi
Height to Top of Mast	2185 mm (86")	735 mm (29")
Height to Bottom of Sign	460mm (18")	635 mm (25")
Height to Top of Sign	2185 mm (86")	2360 mm (93")
Flags or lights	Flags with wood dowels	Flags with fiberglass stand
Test Article Mass (each)	18.6 kg	18.6
Vehicle Inertial Mass	823 kg	821 kg
Impact Speed, Head-on	103.9 km/h	102.5 km/hr
Impact Speed, 90 Deg.	101.8 km/h	99.1 km/ ho
Velocity Change, Head-on	2.1 km/hr (0.58 m/s)	3.4 km/hr (0.94 m/s)
Velocity Change, 90 Deg.	2.1 km/hr (0.58 m/s)	2.8 km/hr (0.77 m/s)
Vehicle crush	Superficial to grill and hood	Superficial to grill and hood
Occupant Compart. Intrusion	None	None
Windshield Damage Head-on	Minor cracking	Moderate cracking
Windshield Damage 90 Deg.	No contact	Additional Cracking

Damage to the vehicle was limited to cosmetic damage to the grill and hood, and cracking of the windshields of the test vehicles. The most extensive damage was overall cracking of the windshield caused by the MS-2000xi signs, though there was little deformation and no penetration of the glass. The test articles did not show potential for penetrating the occupant compartment.

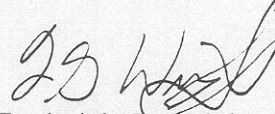
The results of this testing met the FHWA requirements and, therefore, the devices listed in this letter and shown in the enclosed drawings are acceptable for use as Test Level 3 devices on the National Highway System under the range of conditions tested, when proposed by a state. We also concur that the MS-2000 Xi with one-piece legs is an acceptable alternate to the telescoping version.

Please note the following standard provisions which apply to FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices..
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number WZ-43, shall not be reproduced except in full.
- Sign Up Corporation's portable sign stands are patented products and considered "proprietary." The use of proprietary work zone traffic control devices in Federal-aid projects is generally of a temporary nature. They are selected by the contractor for use as needed and removed upon completion of the project. Under such conditions they can be presumed to meet requirement "a" given below for the use of proprietary products on Federal-aid projects. On the other hand, if proprietary devices are specified for use on Federal-aid projects, except exempt, non-NHS projects, they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway

agency must certify that they are essential for synchronization with existing highway facilities or that no equally suitable alternative exists or; (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed.

Sincerely yours,



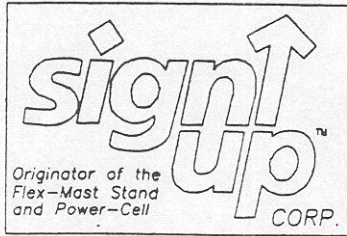
Frederick G. Wright, Jr.  
Program Manager, Safety

3 Enclosures

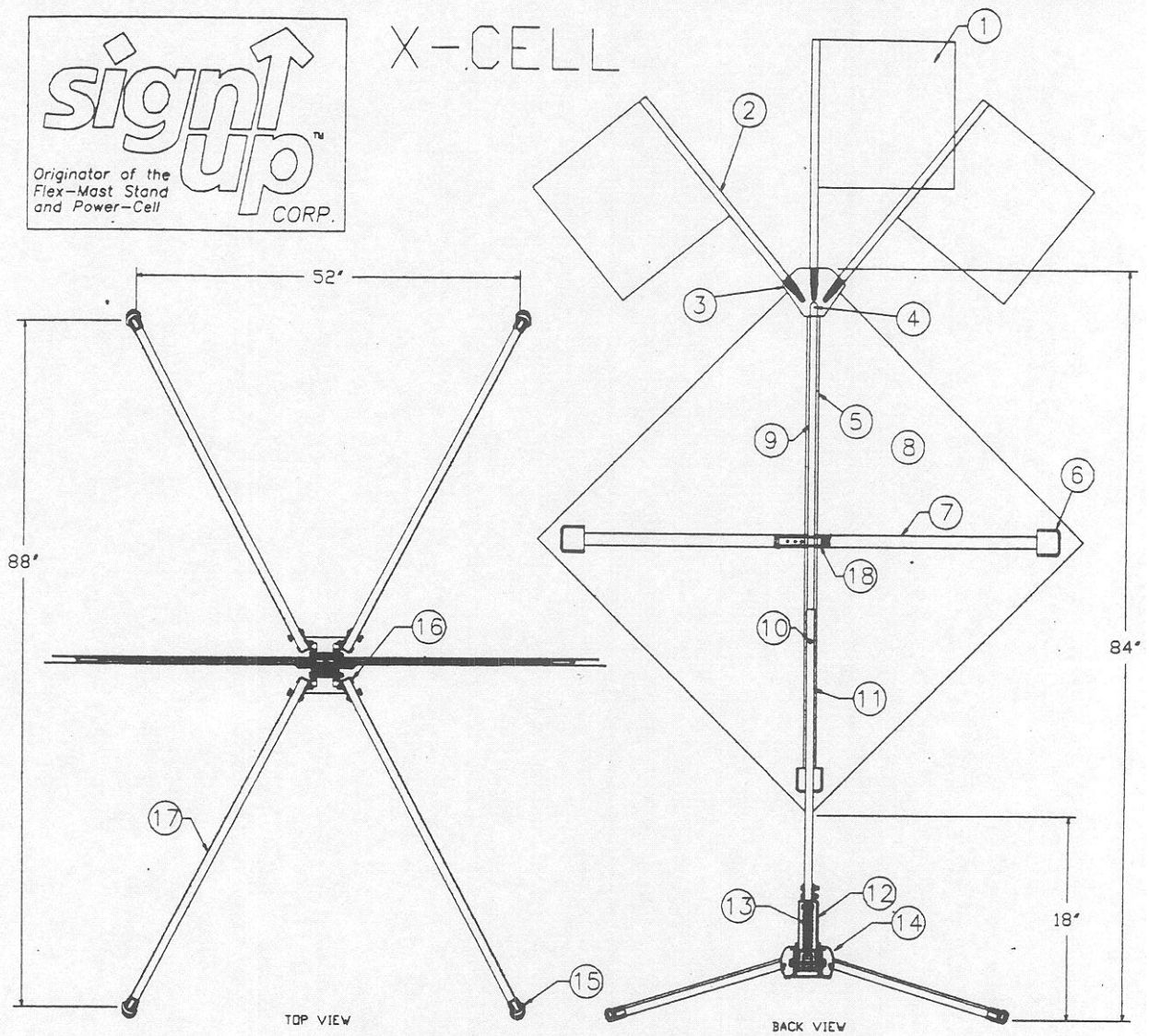
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HSA-1(Artimovich)



# X-CELL

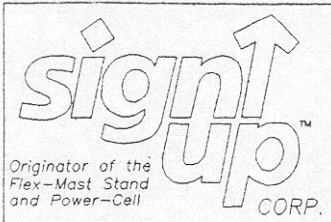


## BILL OF MATERIALS

NO.	DESCRIPTIONS	QUANTITY
1	7 OZ X 18" SQ. VINYL FABRIC.	3
2	.750" DIA. HARDWOOD DOWELL.	3
3	TWO (2) 20 GAGE MILD STEEL PLATES FORMED AND SPOTWELD TOGETHER.	1
4	1/4" DIA. X 1.4" BOLT WITH LOCK NUT.	1
5	3/16" X 1 1/4" X 64" LONG MAT./ROVING FIBERGLASS RECTANGULAR BAR.	1
6	DOUBLED 18 OZ VINYL FABRIC POCKET.	4
7	3/16" X 1 1/4" X 64" LONG MAT./ROVING FIBERGLASS RECTANGULAR BAR.	1
8	VINYL FABRIC ROLL-UP SIGN 48" X 48".	1
9	.063" WALL X .750" SQ. X 34" LONG HRPO MILD STEEL TUBE.	1
10	1050 SPRING STEEL .0002 ZINC PLATED DETENT BUTTON.	1
11	.080" WALL X 1" SQ. X 36" LONG HRPO WITH MILD STEEL TUBE.	1
12	3/16" HRPO MILD STEEL PLATE.	2
13	1 1/2" DIE SPRING 8" LONG	1
14	XCELL ASSEMBLY	1
15	# 19 SBR RUBBER END CAP WITH STEEL/ALUMINIUM BLIND RIVET.	4
16	3/8" DIA. X 2 1/4" BOLTS WITH LOCK NUT.	6
17	.080" WALL X 1" SQ X 47" LONG HRPO MILD STEEL TUBE.	4
18	TRI CLAMP BRACKET "TC-3-A" WITH 3/8-16 X 2.5 STUD FLATTEN ONE END 2.54" LONG.	1

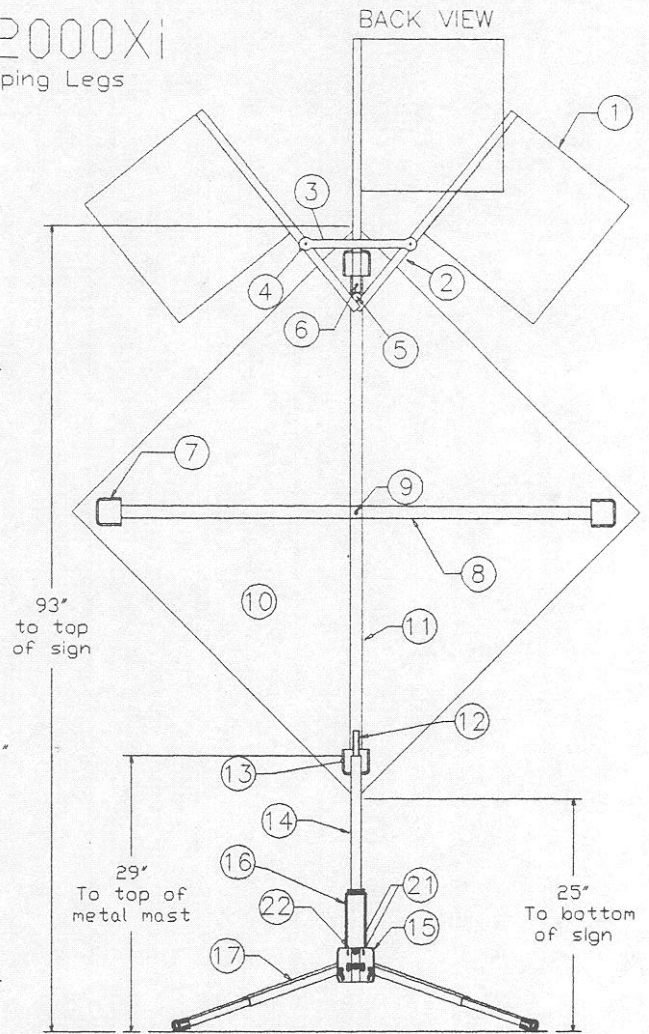
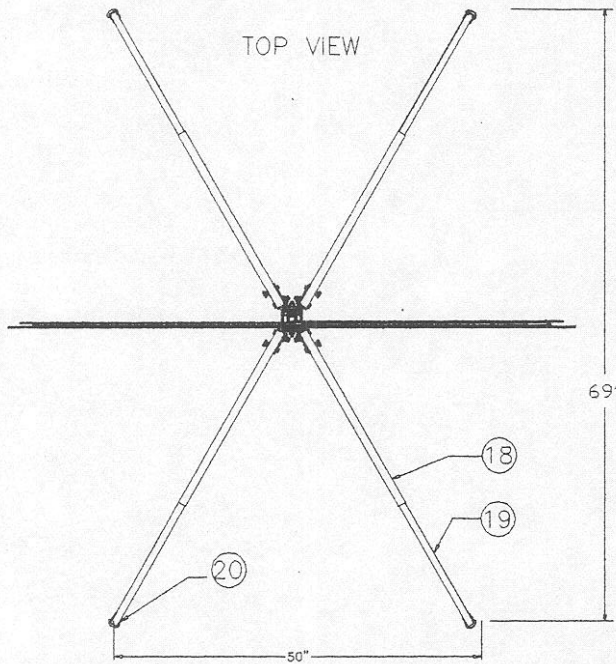
NOTE: ALL NUTS & BOLTS ARE GRADE 5.





# MS-2000Xi

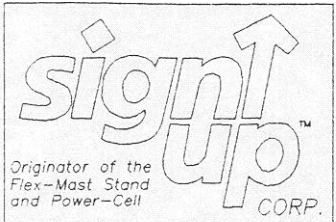
Telescoping Legs



## BILL OF MATERIALS

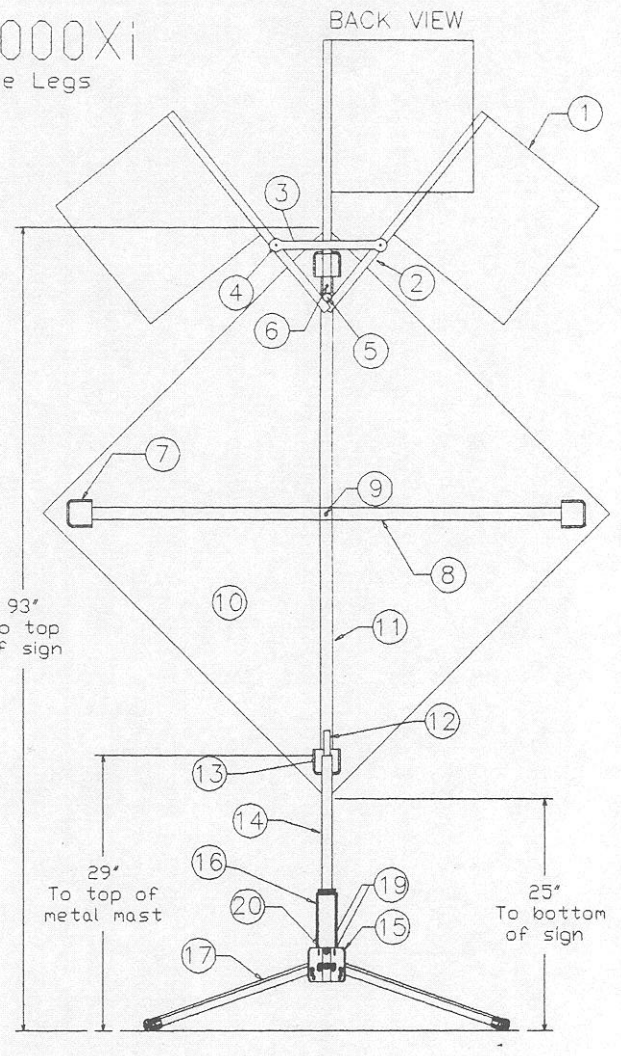
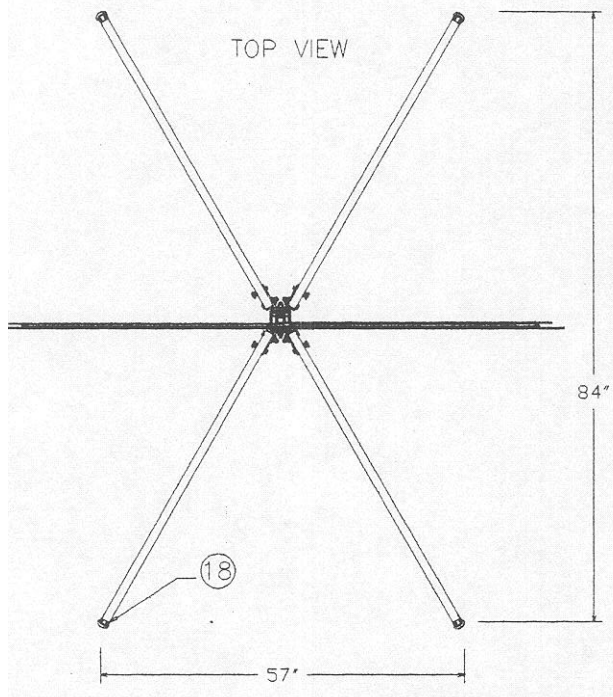
NO.	DESCRIPTIONS	QUANTITY
1	7 OZ X 18" SQ. VINYL FABRIC.	3
2	1/8" X 1" UNIDIRECTIONAL FIBERGLASS ISO POLYESTER RECTANGULAR BAR.	3
3	RUBBER STRETCH BAND.	1
4	5/16" X 3/4" SPRING PIN WITH 10/24" X 1 1/4" SLOT HEAD SCREW & LOCKNUT.	2
5	90 DUROMETER 3/4" X 1" URATHANE BUSHING WITH 1/4" X 1 1/4" SLOT HEAD SCREW & LOCKNUT.	1
6	10/24" X 1 1/4" SLOT HEAD SCREW WITH 10/24" LOCKNUT.	1
7	DOUBLED 18 OZ VINYL FABRIC POCKET.	4
8	3/16" X 1 1/4" UNIDIRECTIONAL FIBERGLASS REINFORCED ISO-POLYESTER RECTANGULAR BAR.	1
9	1/4" X 1" CAP SCREW WITH 1/4 X 1" STEEL FENDER WASHER & 1/4 LOCKNUT.	1
10	REFLEXITE VINYL FABRIC ROLL-UP SIGN 48" X 48".	1
11	5/16" X 1 1/4" X 47 1/2" LONG MAT./ROVING FIBERGLASS RECTANGULAR BAR.	1
12	.063" WALL X .750" SQ. X 12" LONG HRPO MILD STEEL TUBE.	1
13	1050 SPRING STEEL .0002 ZINC PLATED DETENT BUTTON.	1
14	.080" WALL X 1" SQ. X 16" LONG HRPO MILD STEEL TUBE.	1
15	3/16" HRPO MILD STEEL PLATE.	2
16	SPRING AND ROCKER ASSEMBLY	4
17	.080" WALL X 1" SQ. X 24" LONG HRPO MILD STEEL TUBE.	4
18	1050 SPRING STEEL DETENT BUTTON.	4
19	.060" WALL X .750" SQ. X 21" HRPO MILD STEEL TUBE.	4
20	# 19 SBR RUBBER END CAP WITH STEEL/ALUMINIUM BLIND RIVET.	4
21	3/8" DIA. X 2 1/4" BOLTS WITH LOCK NUT.	2
22	3/16" X 1 1/4" X 4" HRPO MILD STEEL SPACERS.	2

NOTE: ALL NUTS & BOLTS ARE GRADE 5.



# MS-2000Xi

One piece Legs



## BILL OF MATERIALS

NO.	DESCRIPTIONS	QUANTITY
1	7 OZ X 18" SQ. VINYL FABRIC.	3
2	1/8" X 1" UNIDIRECTIONAL FIBERGLASS ISO POLYESTER RECTANGULAR BAR.	3
3	RUBBER STRETCH BAND.	1
4	5/16" X 3/4" SPRING PIN WITH 10/24" X 1 1/4" SLOT HEAD SCREW & LOCKNUT.	2
5	90 DUROMETER 3/4" X 1" URATHANE BUSHING WITH 1/4" X 1 1/4" SLOT HEAD SCREW & LOCKNUT.	1
6	10/24" X 1 1/4" SLOT HEAD SCREW WITH 10/24" LOCKNUT.	1
7	DOUBLED 18 OZ VINYL FABRIC POCKET.	4
8	3/16" X 1 1/4" UNIDIRECTIONAL FIBERGLASS REINFORCED ISO-POLYESTER RECTANGULAR BAR.	1
9	1/4" X 1" CAP SCREW WITH 1/4 X 1" STEEL FENDER WASHER & 1/4 LOCKNUT.	1
10	REFLEXITE VINYL FABRIC ROLL-UP SIGN 48" X 48".	1
11	5/16" X 1 1/4" X 47 1/2" LONG MAT./ROVING FIBERGLASS RECTANGULAR BAR.	1
12	.063" WALL X .750" SQ. X 12" LONG HRPO MILD STEEL TUBE.	1
13	1050 SPRING STEEL .0002 ZINC PLATED DETENT BUTTON.	1
14	.080" WALL X 1" SQ. X 16" LONG HRPO MILD STEEL TUBE.	1
15	3/16" HRPO MILD STEEL PLATE.	2
16	SPRING AND ROCKER ASSEMBLY	4
17	.080" WALL X 1" SQ. X 48" LONG HRPO MILD STEEL TUBE	4
18	# 19 SBR RUBBER FND CAP WITH STEEL/ALUMINIUM BLIND RIVET.	4
19	3/8" DIA X 2 1/4" BOLTS WITH LOCK NUT	2
20	3/16" X 1 1/4" X 4" HRPO MILD STEEL SPACERS.	2

NOTE: ALL NUTS & BOLTS ARE GRADE 5