March 12, 2004

Refer to: HSA-10/B123

Mr. David A. Hubbell
Managing Manager
Composite Structural Design, LLC
P.O. Box 600
Saranac Lake, New York 12983

Dear Mr. Hubbell:

In a July 2003 letter to Mr. Richard Powers of my staff, you requested acceptance of an all-steel barrier for use on the National Highway System (NHS) as a test level 5 (TL-5) or a TL-6 traffic barrier/bridge rail and have recently submitted additional information that he requested relating to the design of this barrier.

The proprietary barrier, called the Sistema, consists of a 1000-mm tall metal safety shape with a pipe rail mounted on top, bringing its total effective height to 1550 mm. The barrier is made from 4-mm thick steel plate in 6-m long segments with closed-section steel diaphragms on the field side. The steel plate is fabricated from A709 Grade 36 steel. The diaphragms are spaced on 1.5-m centers and bolted to the bridge deck with four M20 diameter class 8.8 steel studs. The safety-shape portion of the Sistema barrier falls between the dimensions for the U.S. New Jersey and F-shape concrete barriers with the lower-to-upper slope breakpoint 270 mm above the pavement. There is no vertical reveal on the Sistema barrier and the actual slope angles of 53.5 degrees and 82.2 degrees closely approximate the 55-degree and 84-degree angles on both the N.J. and F-shapes.

The upper rail is made from A572 Grade 50 steel pipe that is 139.7-mm in diameter with a wall thickness of 12.5 mm. It is supported by 139.7-mm diameter pipes with a wall thickness of 8 mm mounted to the top of the metal safety shape on 3-m centers. These support posts have tubular sleeves welded to their tops through which the pipe rail passes, and a steel base plate with gussets for a four-bolt attachment to the top of the barrier. Individual barrier sections are connected through a combination of bolted plates on top of the barrier and steel pins that pass through three steel pipe “loops” welded to the backside of each segment and through mated steel loops in a separate steel hinge plate. Enclosures 1 and 2 show front and back views of the Sistema barrier with the hinge plate attached.

Since the Sistema barrier was developed in Europe and tested there, none of the tests you submitted for Federal Highway Administration (FHWA) review exactly matched the tests recommended in National Cooperative Highway Research Program (NCHRP) Report 350. For the small car test, you sent data from test no. SIS/BSI-01-172, conducted at the L.I.E.R. facility in France. Although the car was heavier than the current Report 350 820C vehicle, the NCHRP Report 350 update, currently underway, will likely increase the weight of the small car to replicate the ever-changing vehicle fleet. Previous tests of safety shape designs with the 820C test vehicle have been satisfactory. Thus, I am willing to accept the heavier weight of the tested Peugeot. In all other aspects, test no. SIS/BSI-01-172 is identical to the NCHRP Report 350 test 3-10. In your test, a Peugeot 205 XT weighing 922 kg was directed into the Sistema barrier at 101.5 km/h and at a 20-degree impact angle. All the NCHRP Report 350 evaluation criteria were satisfied. Occupant impact velocity and ridedown accelerations were 6.5 m/s and 11.8 g's, respectively. The car was redirected upright.

For the tractor-trailer test, you sent data from test no. SIS/BSI-03/176, also conducted at L.I.E.R. In this test, a 29,850-kg articulated truck impacted the Sistema barrier at 68.5 km/h and at an angle of 20 degrees. Although the vehicle weight and impact speed were below the comparable Report 350 test 5-12 guidelines, the increased impact angle resulted in a calculated Impact Severity (IS) of 632.5 kJ, significantly more than the Report 350 value of 596.2 kJ. This test also met Report 350 evaluation criteria as the truck was contained and redirected upright. The barrier deflected 750 mm. In subsequent correspondence with Mr. Powers, you provided additional information on the test vehicle parameters and they were seen to be in substantial compliance with Report 350 specifications for the 36000-kg tractor-trailer. Also included in the material you originally submitted was a test report (test no. X61.01.A10) prepared at the German TUV test laboratory that documented a successful test of a 37,680-kg tractor-trailer impacting the Sistema barrier at 65.7 km/h and a 20-degree impact angle. In this test, the barrier deflected 990 mm. In both tests, the deflection was the result of bolt shear failure in the area of impact and did not result in any significant damage to the simulated bridge deck.

Based on reported results of these tests and on the shape of the barrier, I am willing to consider the Sistema barrier conditionally acceptable for use on the NHS as a TL-5 barrier without a pickup truck test and without a 9000-kg single unit truck test, since the safety shape has been tested successfully with these two vehicles in numerous tests, and the Sistema barrier has demonstrated adequate strength to contain the larger tractor trailer in tests SIS/BSI-03/176 and X61.01.A10. A successful test with a 36,000 kg tractor-tanker truck would be needed to certify the Sistema as a TL-6 barrier.

Because it is a steel product, the Sistema barrier is subject to Section 635.410 (Buy America) of Title 23, U.S. Code, and cannot be permanently incorporated into any federally funded project unless it is made in the U.S. from U.S. steel. However, its use as a temporary barrier during construction is permissible. The Sistema barrier is also proprietary so its use must also be in accordance with the provisions of Title 23, U.S. Code, Section 635.411.

Because it is currently made in Europe and drawings in standard U.S. dimensions and nomenclature are not currently available, you will be expected to certify to any users that the barrier provided for installation is identical to that which was tested, particularly in regard to material specifications and anchorage details. An in-service evaluation should be made for the first U.S. installations to establish cost and performance data, and to verify acceptable crash performance. My staff will review the evaluation report and consider upgrading the Sistema acceptance to fully acceptable at that time.

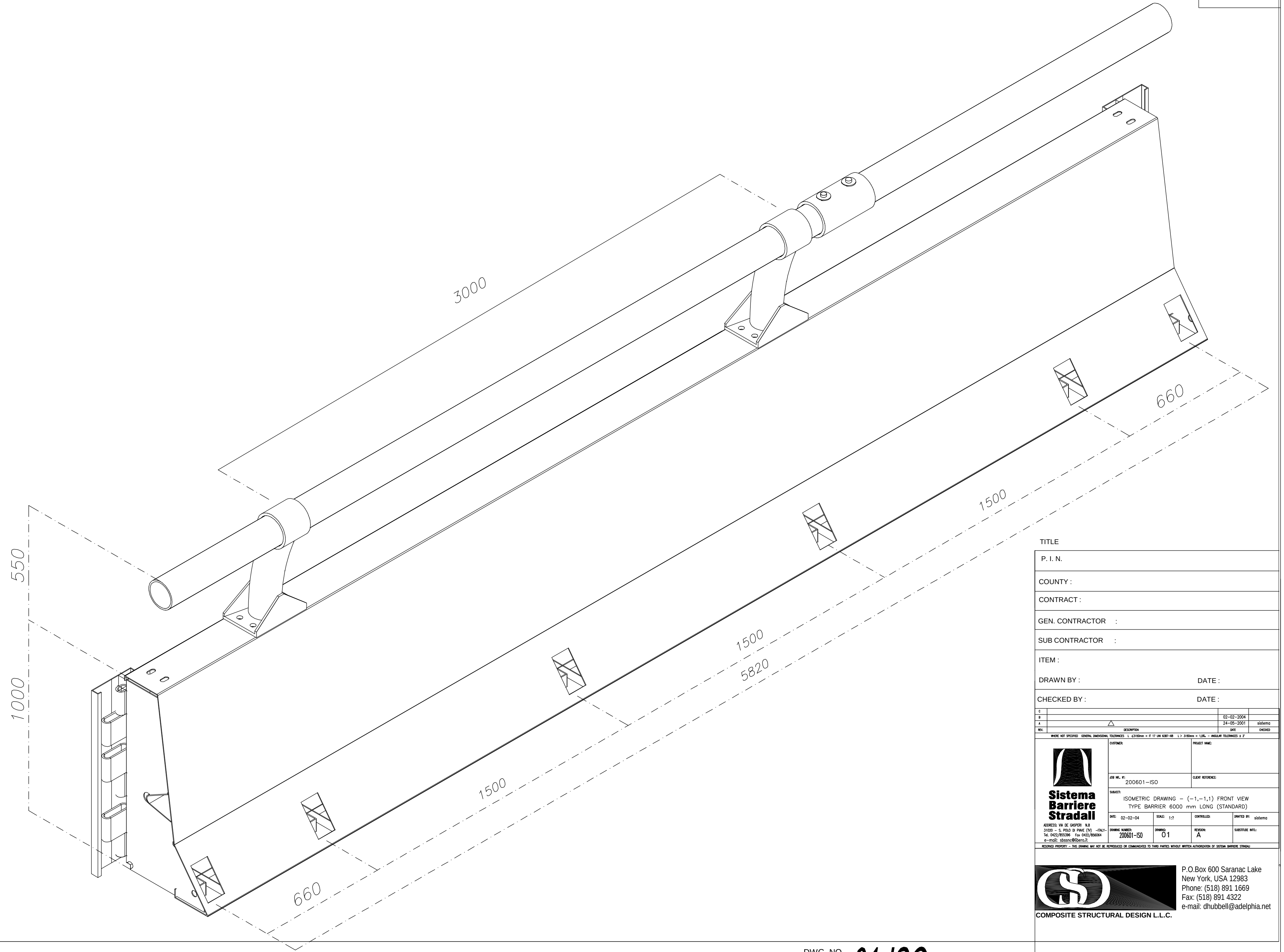
Please be aware also that this acceptance letter shall not be reproduced in part nor construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the requestor does not hold the appropriate patent or patents. Our acceptance is based only on the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

/***Original Signed By***/

John R. Baxter, P.E.
Director, Office of Safety Design
Office of Safety

2 Enclosures



TITLE

P. I. N.

COUNTY :

CONTRACT :

GEN. CONTRACTOR :

SUB CONTRACTOR :

ITEM :

DRAWN BY : DATE :

CHECKED BY : DATE :

REV.	DESCRIPTION	DATE	CHECKED
C			
B		02-02-2004	
A	△	24-05-2001	sistema

WHERE NOT SPECIFIED GENERAL DIMENSIONAL TOLERANCES L ≤3150mm = IT 17 UNI 6387-68 L > 3150mm = 1,5‰ - ANGULAR TOLERANCES ± 2'

Sistema Barriere Stradali

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31020 - S. POLO DI PIAVE (TV) -ITALY-
Tel. 0422/855396 Fax 0422/856064
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CUSTOMER:		PROJECT NAME:	
JOB NR. N°: 200601-ISO		CLIENT REFERENCE:	
SUBJECT: ISOMETRIC DRAWING - (-1,-1,1) FRONT VIEW TYPE BARRIER 6000 mm LONG (STANDARD)			
DATE: 02-02-04	SCALE: 1:?	CONTROLLED:	DRAFTED BY: sistema
DRAWING NUMBER: 200601-ISO	DRAWING: 01	REVISION: A	SUBSTITUDE INFO.:

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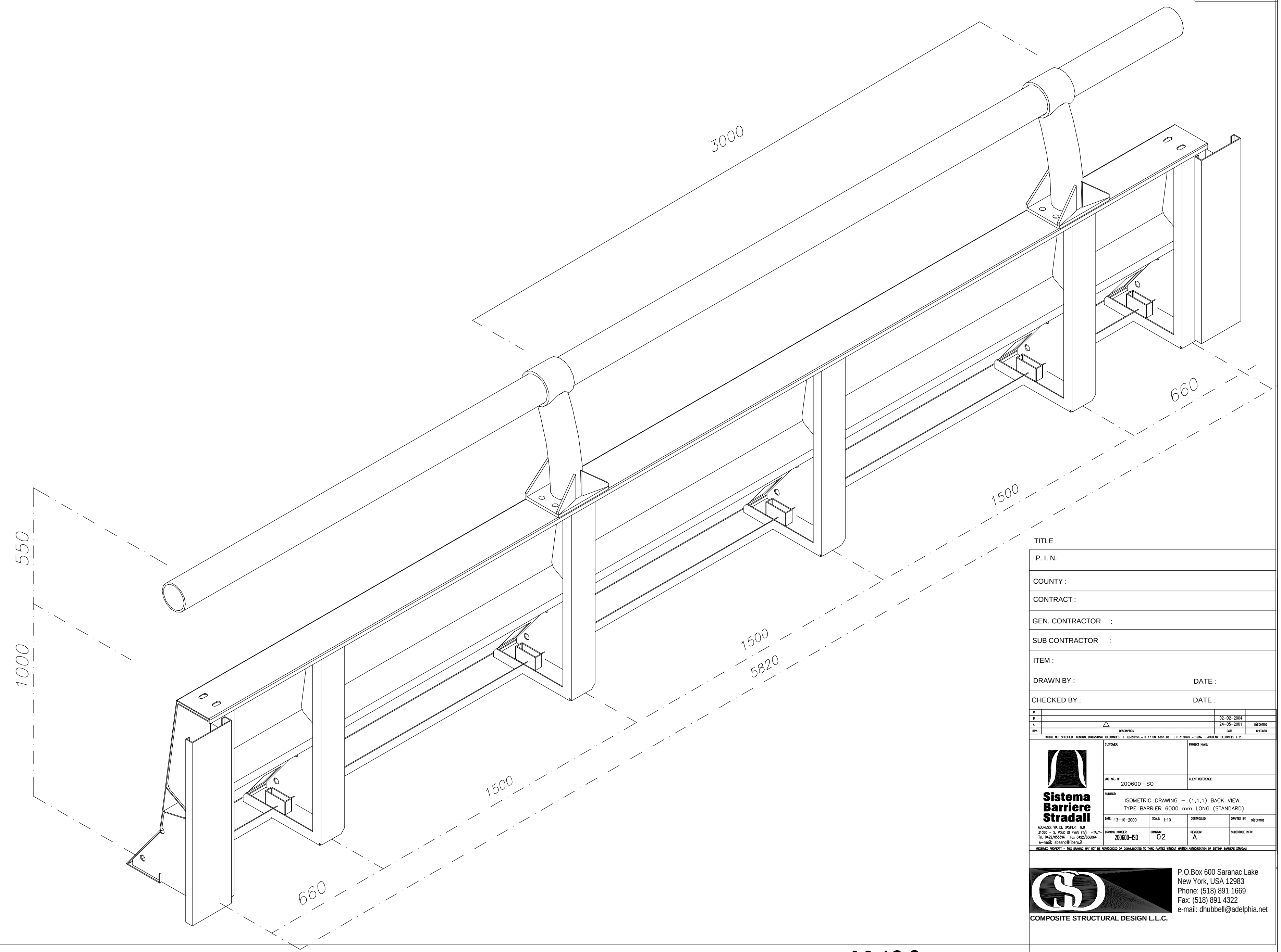
DWG. NO. **01-ISO**

DRAWING : **CSD-01-ISO**



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REV.	DESCRIPTION	DATE	CHECKED
C			
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Sistema Barriere Stradali

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CUSTOMER:

PROJECT NAME:

JOB NR.. N°: 200600-ISO

CLIENT REFERENCE:

SUBJECT: ISOMETRIC DRAWING - (1,1,1) BACK VIEW
TYPE BARRIER 6000 mm LONG (STANDARD)

DATE: 13-10-2000	SCALE: 1:10	CONTROLLED:	DRAFTED BY: sistema
DRAWING NUMBER: 200600-ISO	DRAWING: 02	REVISION: A	SUBSTITUDE INFO.:

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DWG. NO. **02-ISO**

DRAWING : **CSD-02-ISO**