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TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER

Tests Conducted by:

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TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER

PURPOSE: The purpose of this series of tests was to evaluate the performance at high velocity and pressure of IBD23A curtain-type horizontal mount fire dampers when installed in special horizontal ductwork systems.

SCOPE: This report covers in particular the following tests and damper criteria: (1) single standard (production) damper, (2) two dampers with over-size springs and new blade latches, mounted in series and (3) single damper with over-size springs and new blade latches.

SET-UP: The 60HP Low Pressure Test Chamber was used as the air supply systems in these tests. Flow nozzles constructed per AMCA Std. 500-83, fig. 9 were used for flow control and a Dwyer 160-24 pitot tube was used for pressure measurement in the duct. As noted above, special horizontal ductwork systems were constructed for testing of each size of damper, and the air supply system in all tests was per fig. 6.5 of AMCA Standard 500-83.

PROCEDURE: (GENERAL) The test unit was secured in the appropriate sized ductwork and sealed against leakage. The damper was then manually cycled three (3) times prior to proceeding with the closure attempts, to insure that the unit was functioning normally and as intended. The blade pkg. was then raised to the full open position and held in place while the test fan was started and set for a specific volume. Pressure readings taken during the test were (a) nozzle pressure drop, (b) nozzle upstream pressure, (c) test unit pressure drop in the open position and (d) test unit static pressure in the closed position.
The test unit was then subjected to a series of closure attempts at various flow and pressure settings. Visual examinations were made of the results of each attempt, with any pertinent data concerning the closure, amount of see-thru, reason for blade jamming, etc., recorded. Data collected was recorded on Data Input Sheet F-015, Rev. 2 or an apropriate test data sheet, and from this, corrections to standard conditions were made.

TEST REPORT
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IBD23 STYLE A FIRE DAMPER (cont.)

The units were degreased to remove oil from the roll-forming process and each damper was dusted with 1/4 cup of grain dust while the damper was in the closed position.

PROCEDURE: TWO STD. UNITS IN SERIES

The two standard units in series were tested as outlined in the GENERAL section of this procedure with the following additional steps:
Two units were mounted in one above the other in the horizontal duct set-up. Both units were fixed in the open position and the test chamber fan started. When the test flow was attained, a closure attempt was made using the upstream damper. The flow rate was purposely set sufficiently high to insure that the damper would not fully close. After observing and noting the amount of remaining opening between the damper blade package and the bottom of the frame, a closure attempt was made using the downstream damper. The same observations were made concerning remaining opening, if any, and the test repeated until the downstream damper closed successfully.
This procedure was followed for all sizes of the two-unit assemblies.

TEST UNITS: INCLUSIVE SIZES

The following sizes of units were subjected to all tests as outlined in the PROCEDURE sections:

6"x 6"
12"x12"
18"x18"
24"x24"
30"x30"
36"x36"
30"x45 1/2"
24"x30"
30"x24"

TEST REQUIRE-MENTS:

Test units were required to close and latch fully with no see-thru observed and no permanent damage to the damper.
Velocities and pressures at which the dampers are able to meet these requirements were to be established during the tests.

TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER (cont.)

TEST RESULTS: The following table is a listing of test results for the various sizes of dampers. The listed information gives the maximum velocities and pressures at which the dampers operated successfully.

DAMPERS WITH STANDARD SPRINGS AND ORIGINAL BLADE LATCHES (SINGLE UNITS)

DAMPER SIZE	AIRFLOW DIRECTION	SPRING SIZE	DUCT VELOCITY	"W.G. CLOSED	TEST TYPE
12"x12"	Up	5/8" std.	1750	5.60	Single Unit
12"x12"	Down	5/8" std.	3550	6.80	Single Unit
18"x18"	Up	3/4" std.	889	4.50	Single Unit
18"x18"	Down	3/4" std.	3222	7.00	Single Unit
24"x24"	Up	3/4" std.	275	1.70	Single Unit
24"x24"	Down	3/4" std.	1295	6.80	Single Unit
30"x30"	Up	3/4" std.	384	2.60	Single Unit
30"x30"	Down	3/4" std.	884	3.35	Single Unit
36"x36"	Up	3/4" std.	122	.40	Two Section
36"x36"	Down	3/4" std.	361	1.45	Two Section
30"x45.5"	Up	1" std.	245	1.25	Single Unit
30"x45.5	Down	1" std.	839	3.70	Single Unit

TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER (cont.)

TEST RESULTS: DAMPERS WITH STANDARD SPRINGS AND ORIGINAL BLADE LATCHES (SINGLE UNITS)

DAMPER SIZE	AIRFLOW DIRECTION	SPRING SIZE	DUCT VELOCITY	"W.G. CLOSED	TEST TYPE
24"x30"	Up	3/4" std.	240	.70	Single Unit
24"x30"	Down	3/4" std.	480	.75	Single Unit
30"x24"	Up	3/4" std.	240	.65	Single Unit
30"x24"	Down	3/4" std.	480	.80	Single Unit

TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER (cont.)

TEST RESULTS: DAMPERS WITH OVER-SIZE SPRINGS AND NEW-STYLE BLADE LATCHES, TWO UNITS IN SERIES

DAMPER SIZE	AIRFLOW DIRECTION	SPRING SIZE	DUCT VELOCITY	"W.G. CLOSED	TEST NOTES
12"x12"	Up	3/4" spc.	Could not fail first damper		
12"x12"	Down	3/4" spc.	5000	9.30	Upst. unit min. open
18"x18"	Up	1"	spc. 3556	8.00	
18"x18"	Down	1"	spc 4882	10.75	Upst. unit min. open Flow was system max.
24"x24"	Up	3/4" spc.	4206	11.00	Upst. unit 3-6" see-thru. Flow was system max.
24"x24"	Down	3/4" spc.	4206	10.60	Upst. unit 1-3" see-thru. Flow was system max.
30"x30"	Up	1"	spc. 3306	10.60	Upst. unit 3-6" see-thru. Flow was system max.
30"x30"	Down	1"	spc. 3306	9.60	Upst. unit 4-6" see-thru. Flow was system max.

TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER (cont.)

TEST RESULTS: DAMPERS WITH OVER-SIZE SPRINGS AND NEW-STYLE BLADE LATCHES, TWO UNITS IN SERIES (cont.)

DAMPER SIZE	AIRFLOW DIRECTION	SPRING SIZE	DUCT VELOCITY	"W.G. CLOSED	TEST NOTES
36"x36"	Up	1" spc.	2752	10.20	Upst. unit 1" see-thru one section other section latched
36"x36"	Down	1" spc.	2778	9.30	Upst. unit 1-3" see-thru one section, 1" other side.

In these tests, the flow was the maximum attainable by the test chamber fan.

30"x45.5"	Up	1" std.	2574	10.10	Upst. unit 6-8" see-thru.

In this test, the flow was the maximum attainable by the test chamber fan.

30"x45.5"	Down	1" std.	2025	7.70	Upst. unit 10" see-thru.

During one attempt at 2215 FPM and 8.0" w.g., one side of the blade package on the downstream unit was blown out of the frame after the damper latched. This was caused by the ductwork flexing and allowing the damper frame to bow outward. The damage was not sever enough to stop the test, but it may have contributed to the lower flow and pressure at which the damper operated successfully.

TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER (cont.)

TEST RESULTS: DAMPERS WITH OVER-SIZE SPRINGS AND NEW-STYLE BLADE LATCHES, TWO UNITS IN SERIES (cont.)

DAMPER SIZE	AIRFLOW DIRECTION	SPRING SIZE	DUCT VELOCITY	"W.G. CLOSED	TEST NOTES
24"x30"	Up	1" spc.	3460	10.30	Single Unit
24"x30"	Down	1" spc.	3360	8.60	Single Unit
In this test, the flow was the maximum attainable by the test chamber fan.					
30"x24"	Up	1" spc.	3520	10.40	Single Unit
30"x24"	Down	1" spc.	3380	8.60	Single Unit
In this test, the flow was the maximum attainable by the test chamber fan.					

TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER (cont.)

TEST
RESULTS: DAMPERS WITH OVERSIZED SPRINGS AND NEW BLADE LATCHES (SINGLE UNITS)

DAMPER SIZE	AIRFLOW DIRECTION	SPRING SIZE	DUCT VELOCITY	"W.G. CLOSED	TEST TYPE
6"x6"	Up	1" spc.	6000	10.60	Single Unit
6"x6"	Down	1" spc.	6720	9.50	Single Unit
In these tests, the flow was the maximum attainable by the test chamber fan.					
12"x12"	Up	3/4" spc.	5050	8.30	Single Unit Test chamber maximum
12"x12"	Down	3/4" spc.	4500	7.80	Single Unit
12"x12"	Up	1" spc.	4350	9.40	Single Unit
12"x12"	Down	1" spc.	3525	4.90	Single Unit
18"x18"	Up	1" spc.	3377	8.00	Single Unit
18"x18"	Down	1" spc.	4267	7.50	Single Unit
24"x24"	Up	1" spc.	2163	9.70	Single Unit
24"x24"	Down	1" spc.	2525	9.10	Single Unit
30"x30"	Up	1" spc.	1616	8.75	Single Unit
30"x30"	Down	1" spc.	1832	7.90	Single Unit
36"x36"	Up	1" spc.	1917	9.40	Two Section
36"x36"	Down	1" spc.	1717	7.60	Two Section

TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER (cont.)

TEST
RESULTS: DAMPERS WITH OVERSIZED SPRINGS AND NEW BLADE LATCHES (SINGLE UNITS)TEST (cont.)

DAMPER SIZE	AIRFLOW DIRECTION	SPRING SIZE	DUCT VELOCITY	"W.G. CLOSED	TEST TYPE
30"x45.5"	Up	1" std.	1266	7.90	Single Unit
30"x45.5"	Down	1" std.	1097	5.00	Single Unit
24"x30"	Up	1" spc.	2120	8.95	Single Unit
24"x30"	Down	1" spc.	1940	5.60	Single Unit
30"x24"	Up	1" spc.	1740	7.80	Single Unit
30"x24"	Down	1" spc.	2280	6.80	Single Unit

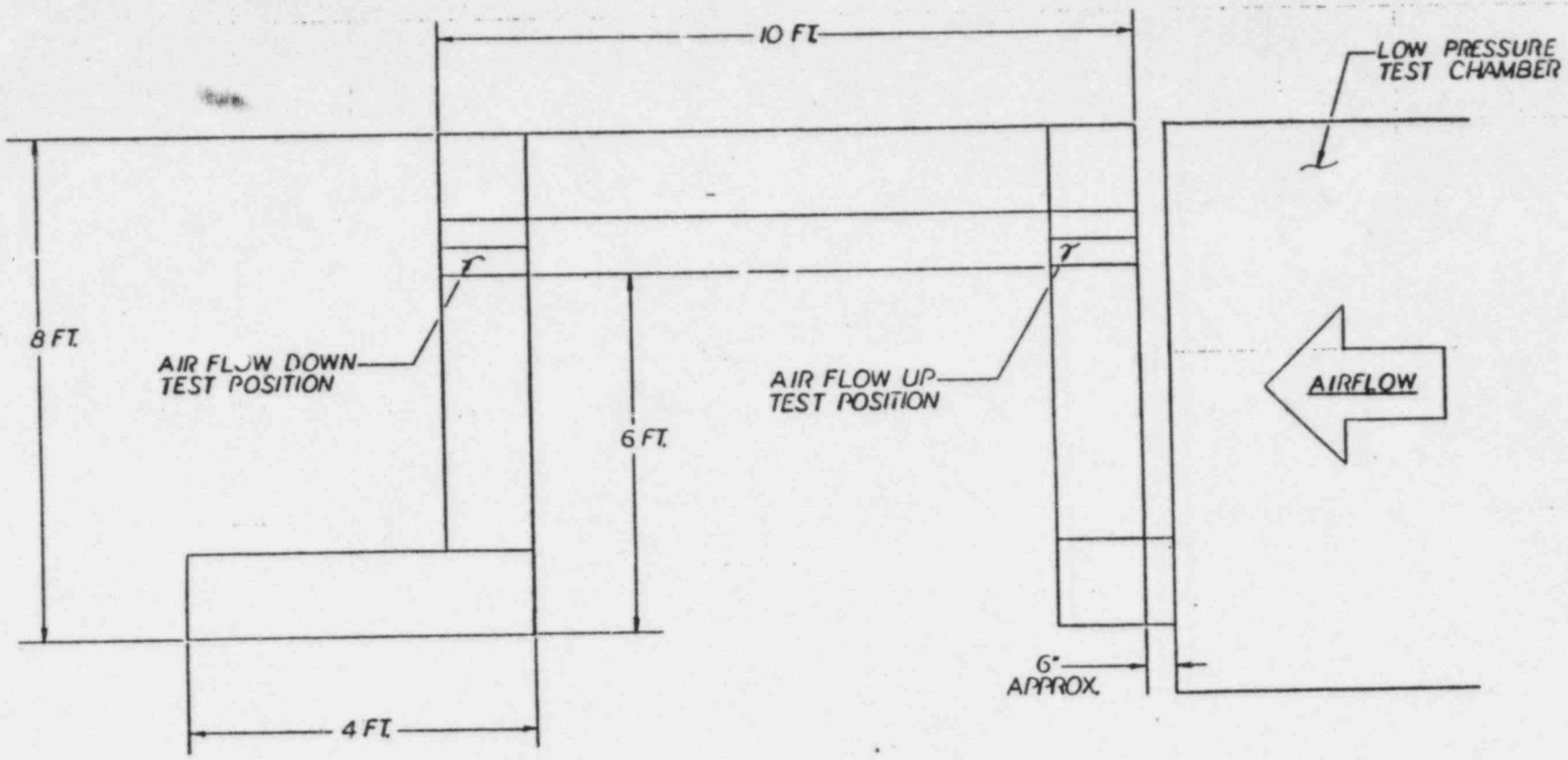
TEST REPORT
CLOSURE AT VELOCITY AND PRESSURE
USING THE HORIZONTAL SPRING CLOSURE SYSTEM
IBD23 STYLE A FIRE DAMPER (cont.)

TEST
RESULTS: SPECIAL TESTS WITH STANDARD LATCH AND SPRINGS
OR WITH NEW LATCH AND OVER-SIZE SPRINGS

DAMPER SIZE	AIRFLOW DIRECTION	SPRING SIZE	DUCT VELOCITY	"W.G. CLOSED	TEST TYPE
36"x36	Down	3/4" std.	361	1.45	Two Section
36"x36"	Up	1" spc.	1572	9.30	Two Section
36"x36"	Down	1" spc.	1156	5.85	Two Section

In all above tests, the unit had one section closed to the passage of air before the test fan was started. Once the fan was running, the other section was subjected to a closure attempt. The above data reflects the successful points of flow (duct velocity) and static pressure in the closed position the unit attained.

The test with standard (3/4") springs and old-style latch was not run due to the low-end limitations of the test chamber.



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DATE: 1-30-85	DATE: 2-11-85	DATE: 2-11-85	02/11/85	

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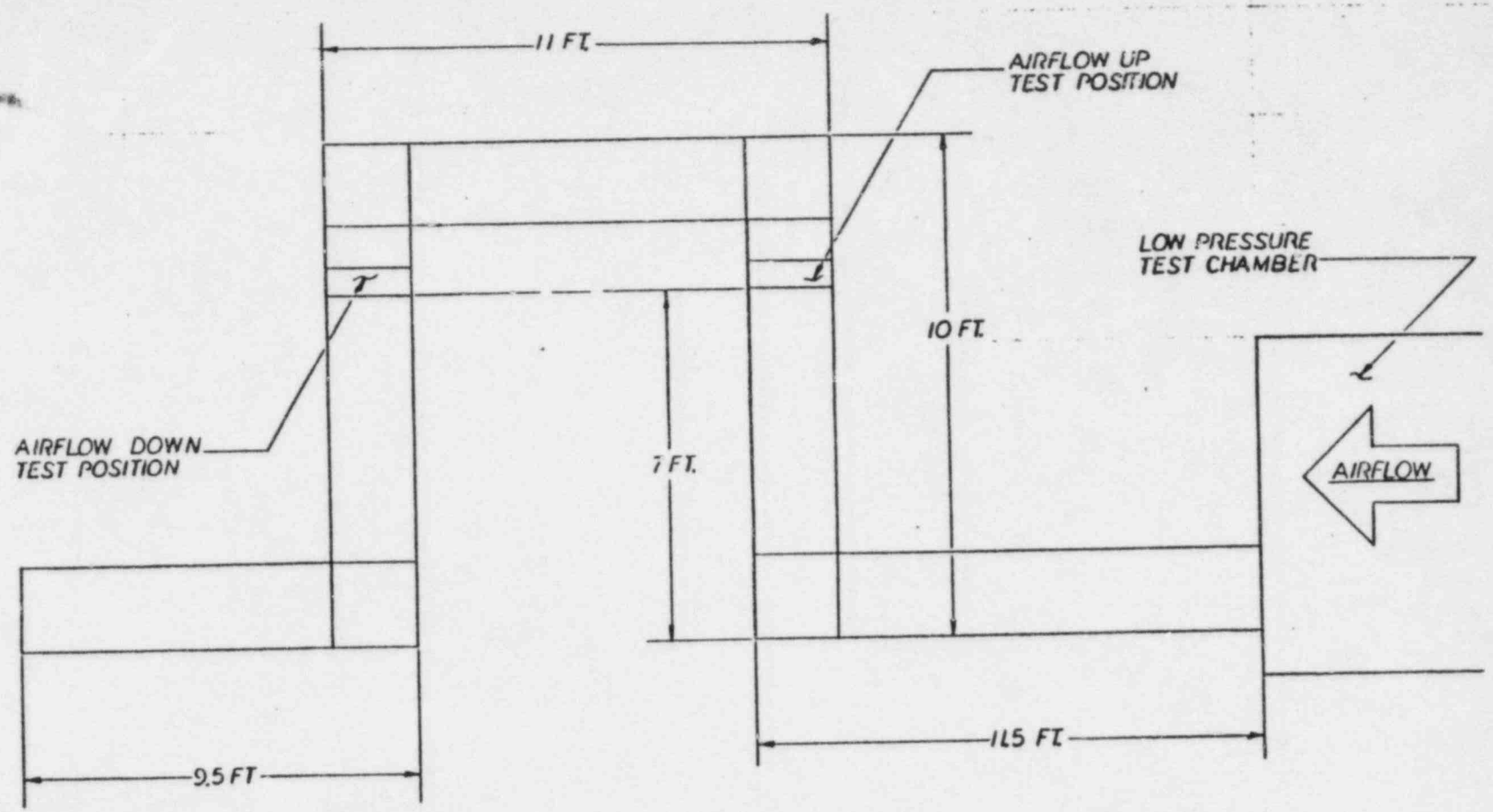
SCALE: ~ | ISSUE:

TITLE: 12" x 12" HORIZONTAL TEST FIXTURE, IBD23 GENERIC TESTS

DWG. NO: HG-001



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DATE: 1-30-85	DATE: 2-11-85	DATE: 2-11-85	02/11/85	

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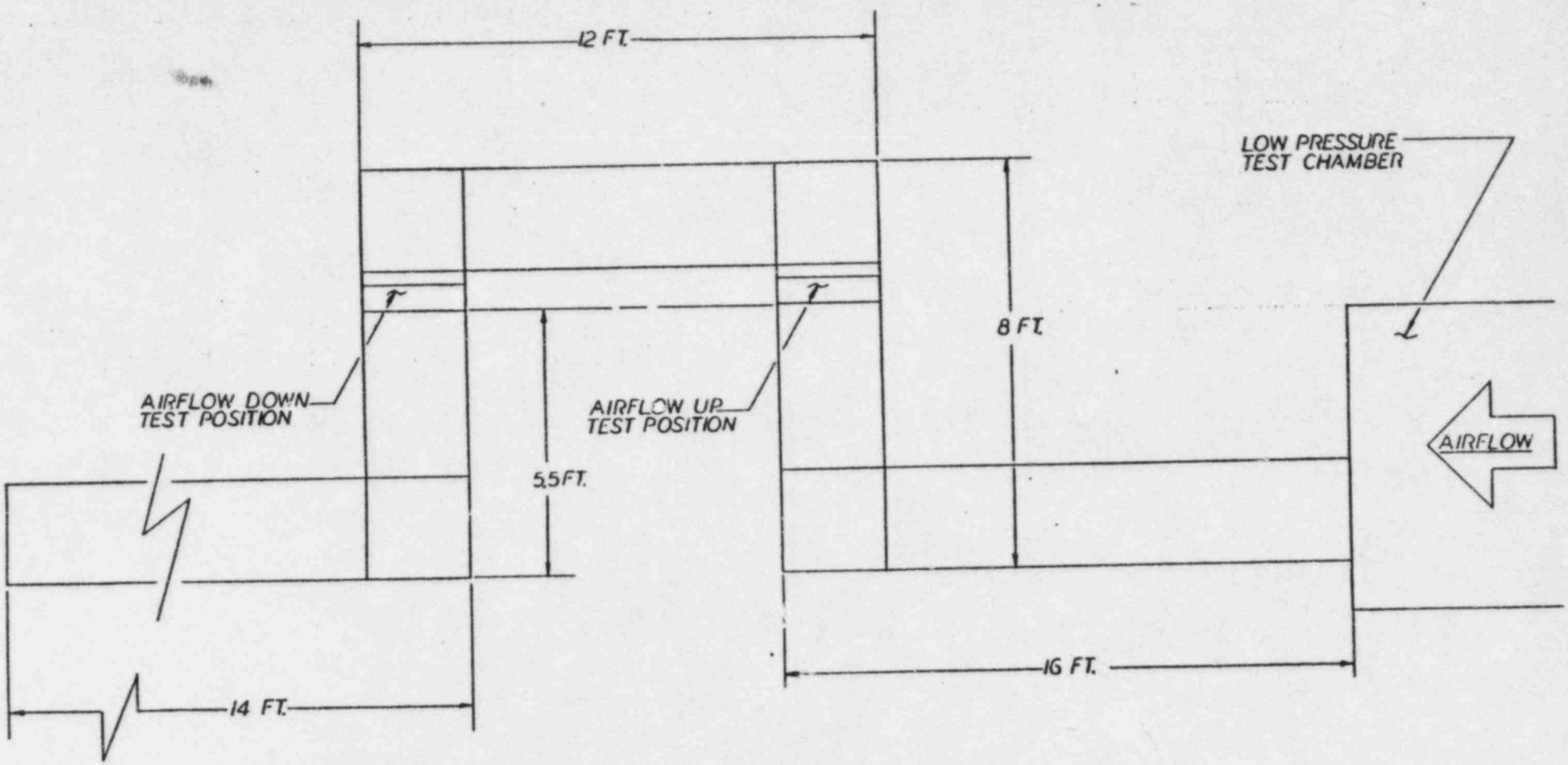
SCALE: ~ ISSUE:

TITLE: 18"x18" HORIZONTAL TEST FIXTURE, IBD23 GENERIC TESTS

DWG. NO: HG-002



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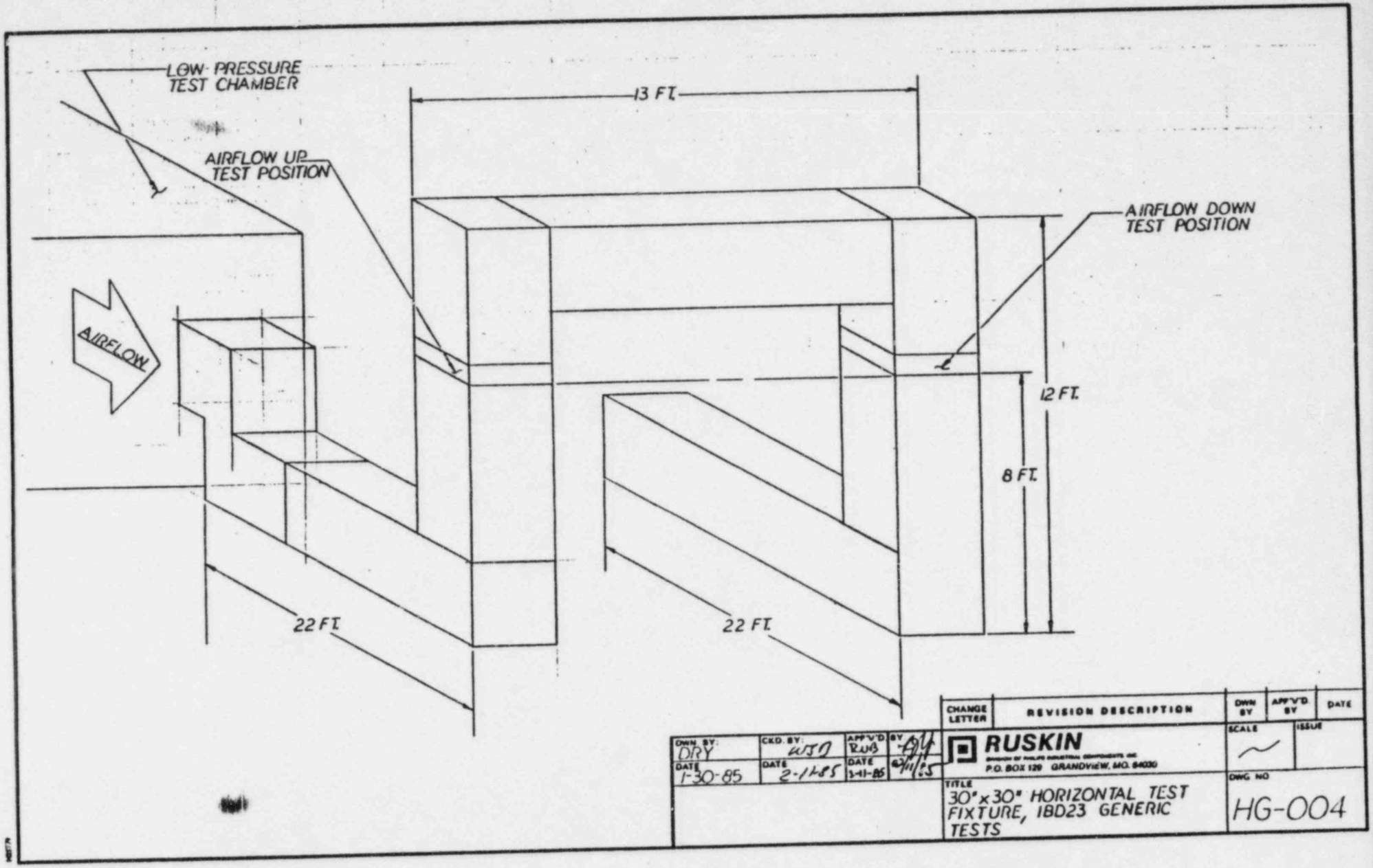
SCALE:

ISSUE:

TITLE: 24" x 24" HORIZONTAL TEST FIXTURE, IBD23 GENERIC TESTS

DWG. NO: HG-003



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DATE 1-30-85	DATE 2-14-85	DATE 3-11-85	DATE 3/11/85	

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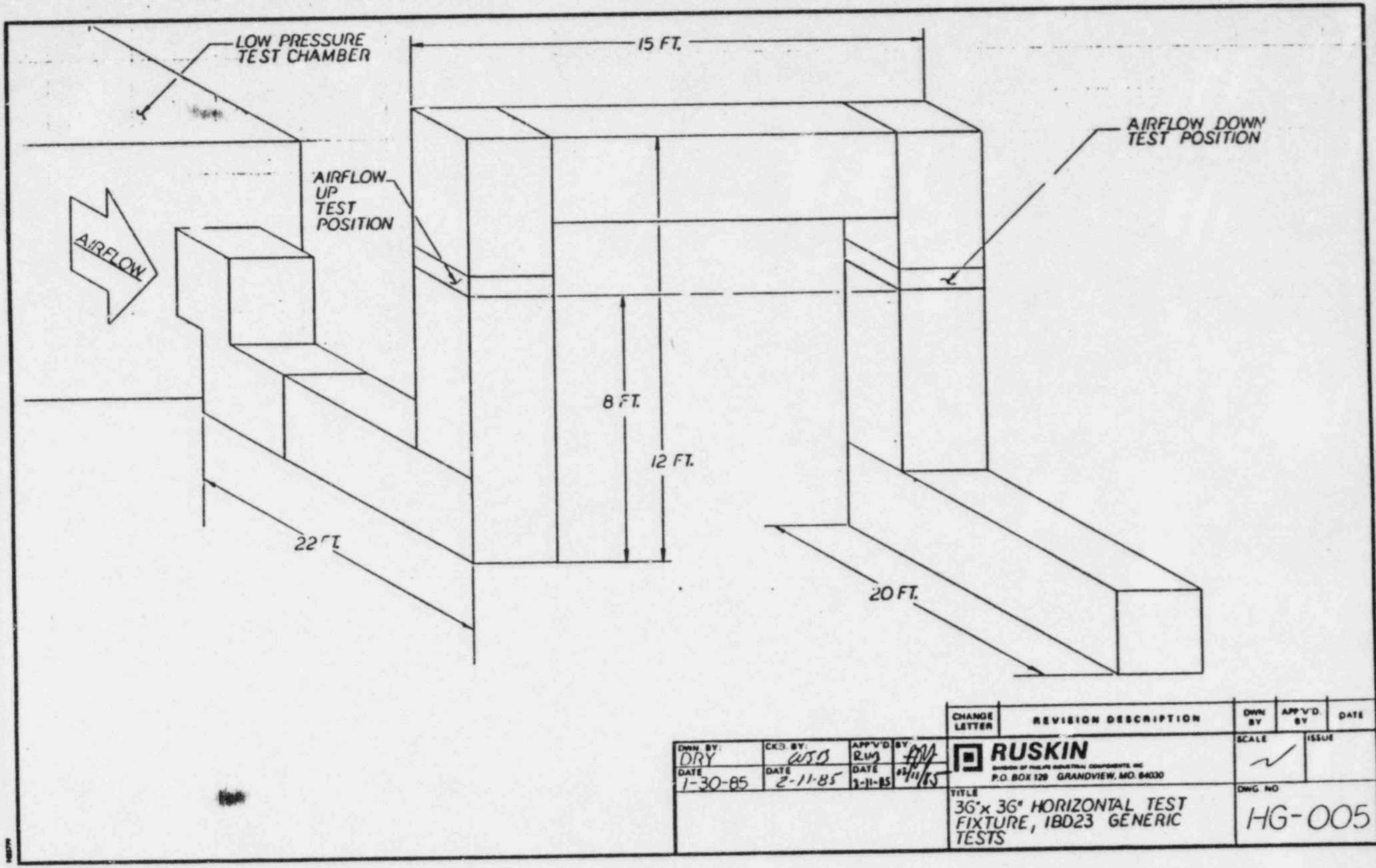
SCALE ~ ISSUE

TITLE
30"x30" HORIZONTAL TEST FIXTURE, IBD23 GENERIC TESTS

DWG. NO.
HG-004



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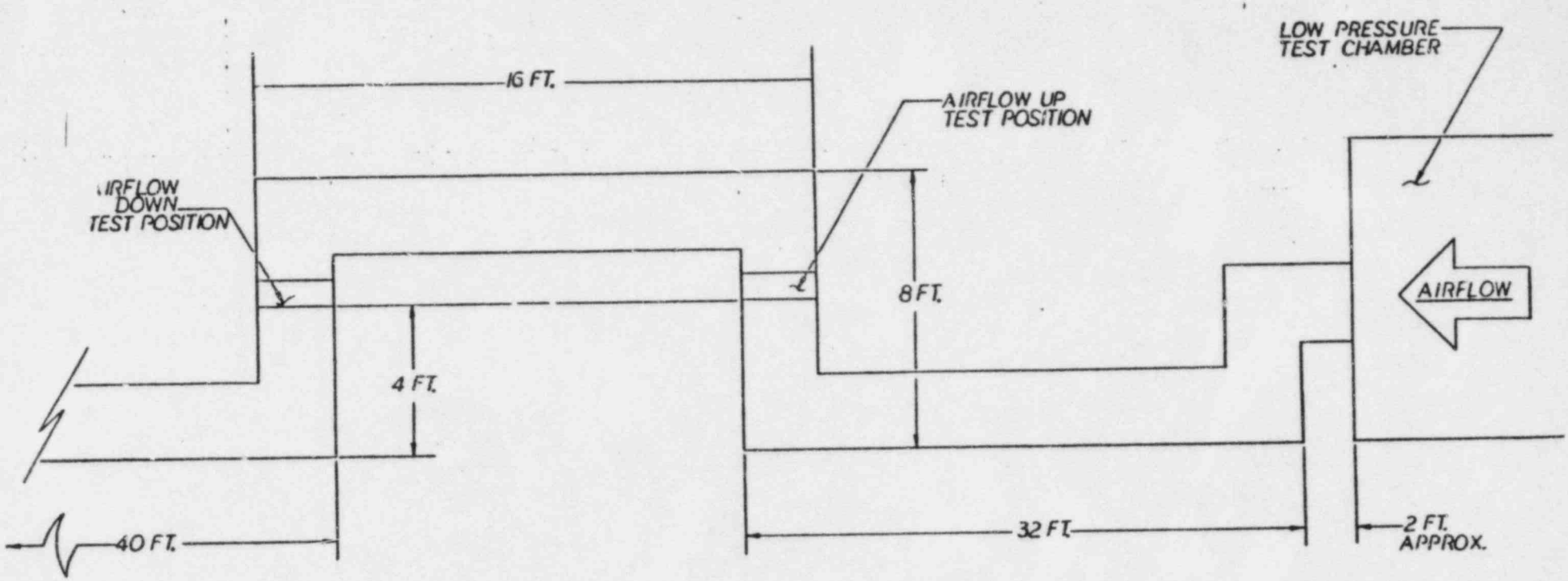
SCALE: ~ ISSUE:

TITLE: 36"x 36" HORIZONTAL TEST FIXTURE, IBD23 GENERIC TESTS

DWG NO: HG-005



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DWN. BY: DRY	CK'D. BY: WTB	APP'V'D BY: RUS	BY: AM	RUSKIN P.O. BOX 129 GRANDVIEW, MO. 64030
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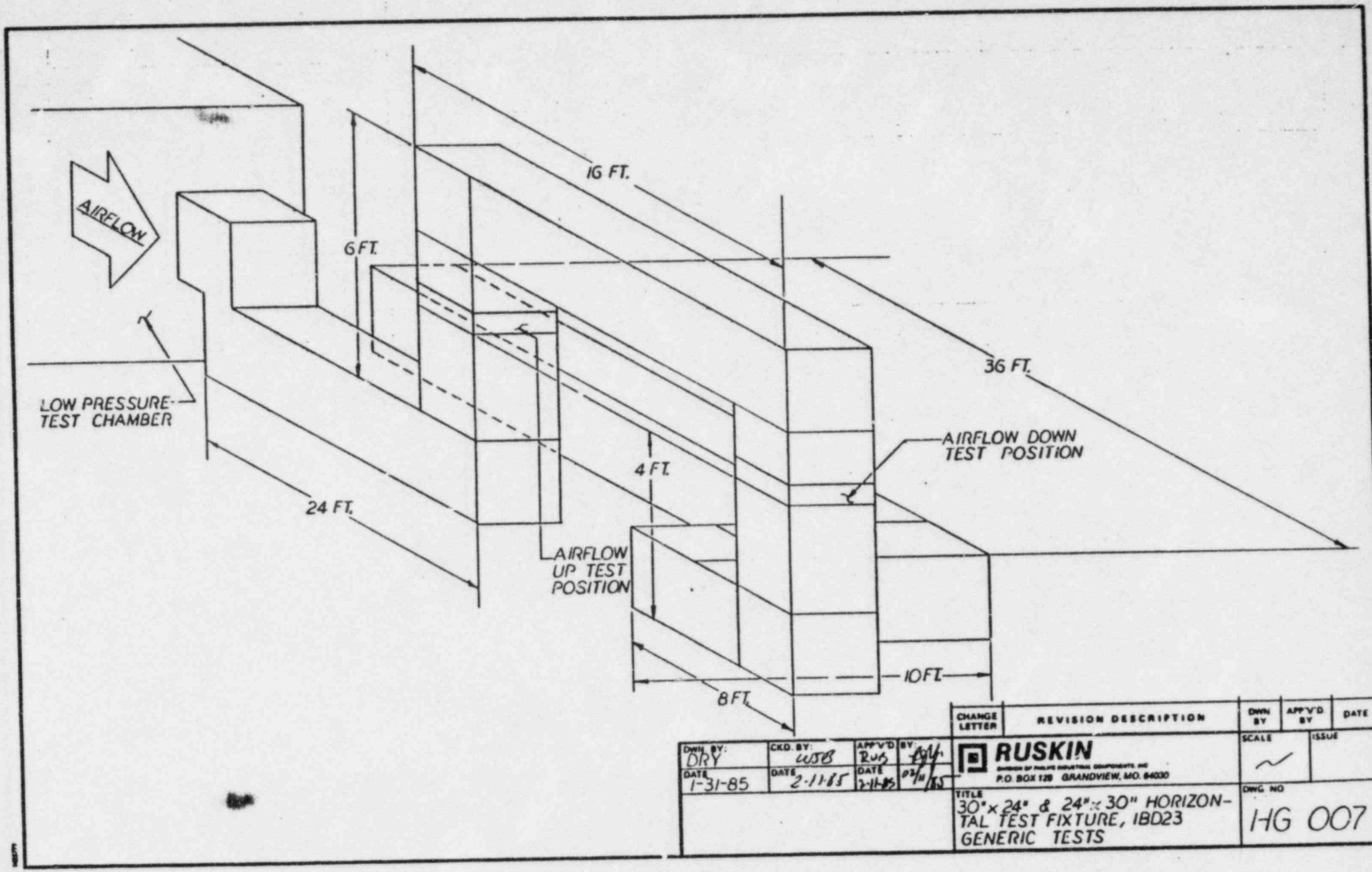
TITLE: 30" x 45½" HORIZONTAL TEST FIXTURE 18D23 GENERIC TESTS

DWG NO: HG-006



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DATE 1-31-85	DATE 2-11-85	DATE 2-11-85	DATE

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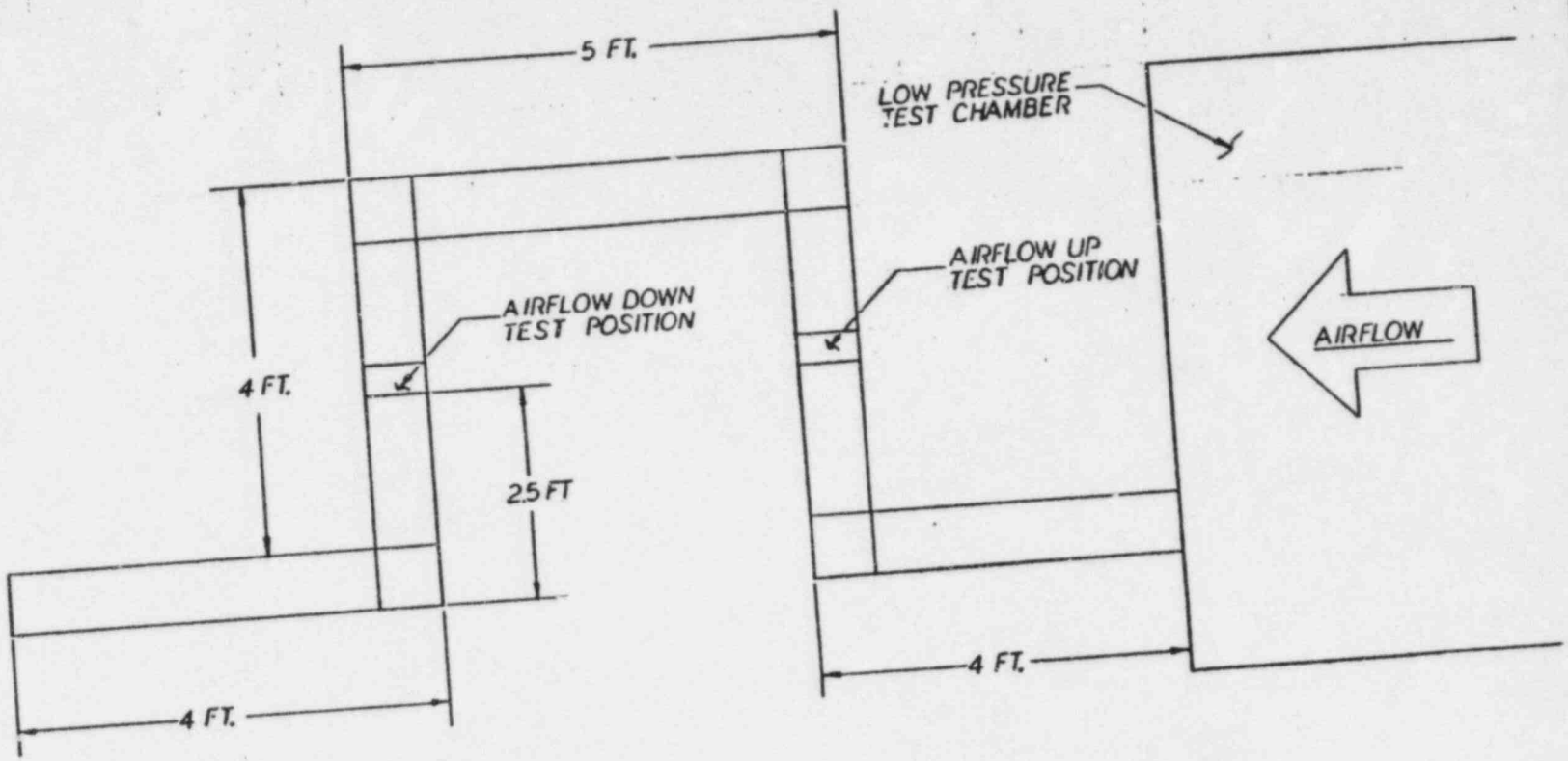
SCALE ~ | ISSUE

TITLE
30"x24" & 24"x30" HORIZONTAL TEST FIXTURE, IBD23 GENERIC TESTS

DWG NO
HG 007



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DATE: 1-31-85
CK'D BY: WJO
DATE: 2-1485
APP'V'D BY: RJG
DATE: 2-11-85
BY: [signature]
DATE: 02/11/85

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SCALE: ~
ISSUE:

TITLE: 6"x6" HORIZONTAL TEST FIXTURE 18D23 GENERIC TESTS

DWG NO: HG 008