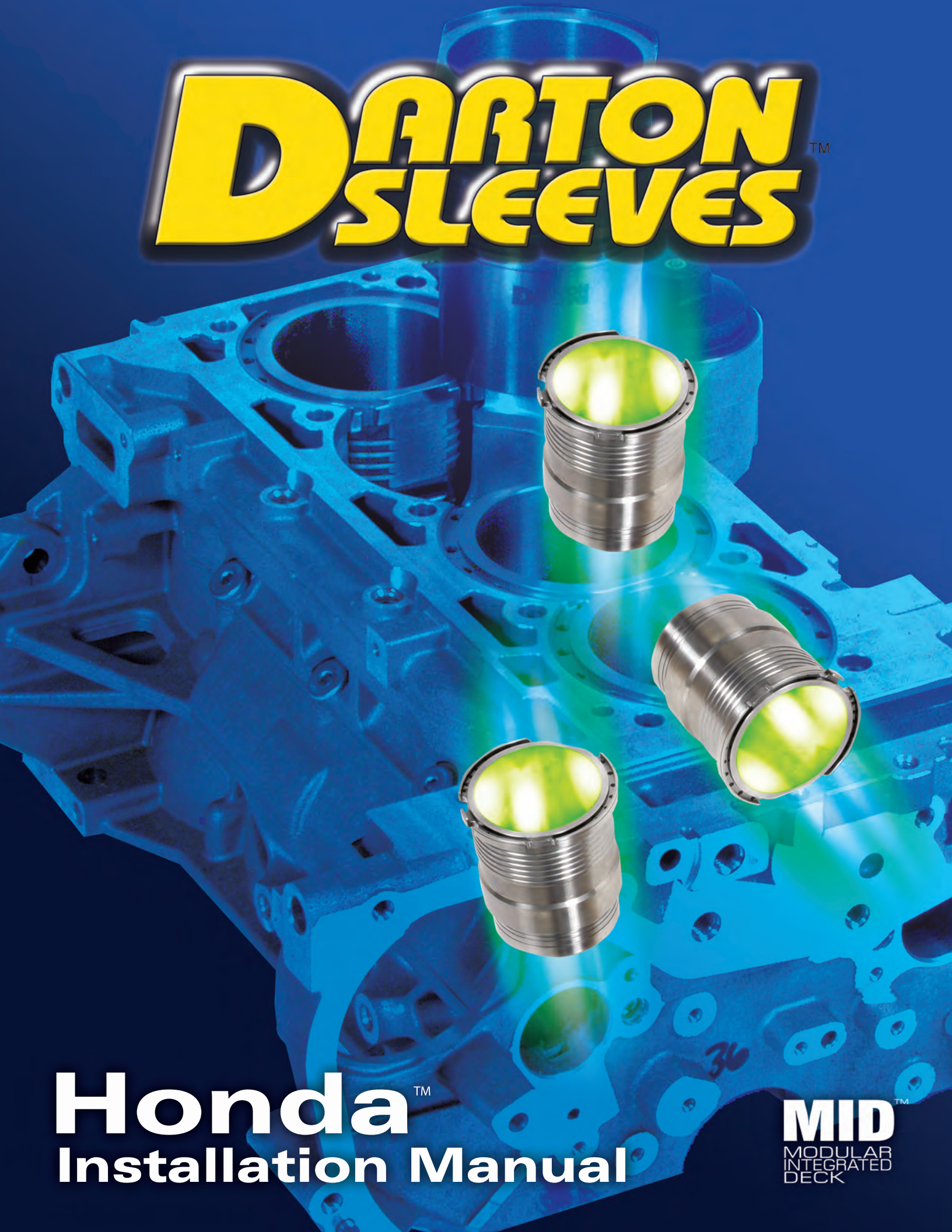
DARTON SLEEVES™



Honda™
Installation Manual

MID™
MODULAR INTEGRATED DECK

INSTALLATION PROCEDURES

ALL HONDA 4 CYLINDERS

1. All machine work may be accomplished on a CNC vertical mill capable of 3-4 axis interpolation with sufficient height to accommodate block height. The bore center distances must be maintained within ±.0005 for sleeve installation to seal properly. (see block specification sheets for dimensions)(See #12 for bore center specs.)
2. All machining must produce a good surface finish and the tolerances must be maintained to assure a quality fit and sleeve seal.
3. Block must be square and perpendicular to machine head. Fixturing should be on main journals
   provided they are not cracked or distorted. Out of Line 1 and 5, main journals will require main line boring prior to block/sleeve machine work.
4. Final sleeve installation should be accomplished with a brass or aluminum mandrel in cylinders 1 through 4, in that order.
5. After sleeve installation, install a deck plate or head, torque and leave til block is cool.
6. Pressure checking of sleeve seal should be accomplished with a top deck plate and water pump plug as shown in photos on Page 11. The main cap bolts can be used to torque down the top deck plate which should be gasketed with thin rubber sheeting.
7. Finish boring and honing should only be accomplished with a deck plate installed.
8. Field service and singular sleeve replacement is possible and practical by using a slide hammer sleeve puller with the drive mandrel "Flatted" and oriented to provide main web clearance. Sleeves can then be ordered from Darton, by cylinder number.
9. If needed for oversized bores, machine sleeve I.D. out to allow .004-.008 from finished size for cylinder honing.
10. Prior to boring for sleeve installation, bore the existing sleeve to .010 over to finish bore dimension stopping at the main bearing web.
11. Seal wire grooves in the top of the sleeves can only be machined after decking.
12. B-16 / B-18—3.543 [90mm]

    F22 & H22/23 & K20—3.701 [94 mm]

NOTES/CAUTIONS

1. Caution: measure each sleeve prior to boring diameter “C” located on the block prints. After measuring each sleeve, machine block to have a .000 to .002 clearance.
2. Take precaution on final washout of block in order not to damage flange sealant or o-rings.

INSTALLATION PROCEDURES

ALL HONDA 4 CYLINDERS

Clean and strip block of all excess bolts, brackets, etc.

Fixture block on machine surface and square, level and secure.

INSTALLATION PROCEDURES

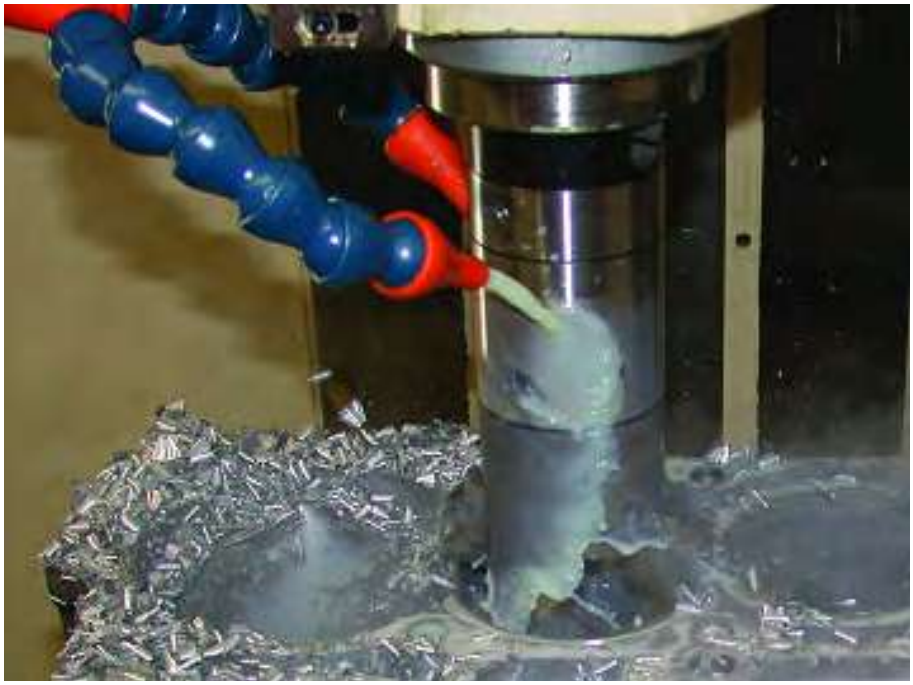
ALL HONDA 4 CYLINDERS

Surface top of block minimum amount to level and flat.

Begin boring operation according to specs and block designation number.*(see prints)*

INSTALLATION PROCEDURES

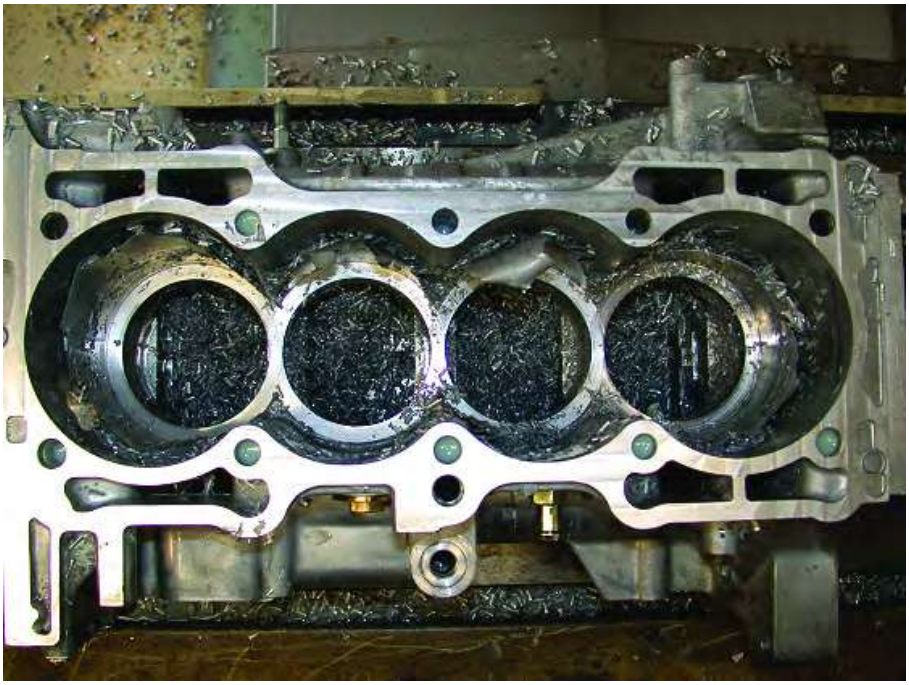
ALL HONDA 4 CYLINDERS



Sequentially bore using bore spacing specifications shown on prints.

ALL HONDA 4 CYLINDERS

Continue boring operation to completely remove parent bore material to crankcase.



INSTALLATION PROCEDURES

ALL HONDA 4 CYLINDERS

1. All machine work may be accomplished on a CNC vertical mill capable of 3-4 axis interpolation with sufficient height to accommodate block height. The bore center distances must be maintained within ±.0005 for sleeve installation to seal properly. (see block specification sheets for dimensions)

2. All Remaining inner bore material must be removed to solid area as described in blueprint for cylinder 1. Use a mill and interpolate height, diameter and depth to clean residual parent bore.

Interpolate a mill cutter and bore upper register according to print.

machining must produce a good surface finish and the tolerances must be maintained to assure a quality fit and sleeve seal.

3. Block must be square and perpendicular to machine head. Fixturing should be on

NOTE: It is essential that all parent bore material be removed down to crankcase surface. No gap can remain. if any gap exists, it must be ground out by hand and filed/deburred *(see prints)*.

ALL HONDA 4 CYLINDERS

Finished block, top view

Finished block, side view

INSTALLATION PROCEDURES

ALL HONDA 4 CYLINDERS

Clean sleeves totally, coat o'ring grooves with supplied lubricant and install o'rings using standard o'ring practice. **Caution, do not over stretch or nick o'rings, water leaks will result.**

Arrange all sleeves prior to install according to bore number.

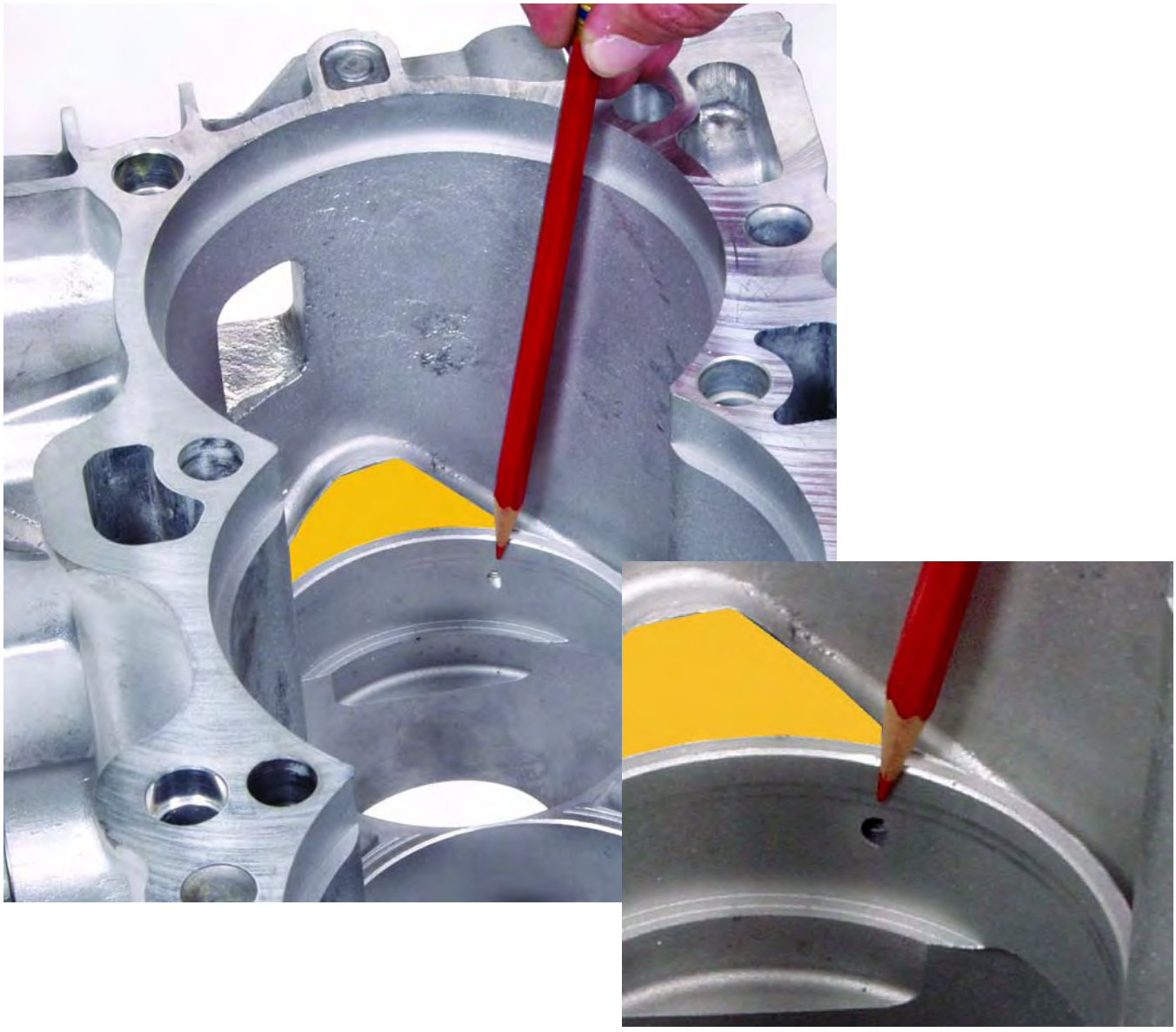
INSTALLATION PROCEDURES

ALL HONDA 4 CYLINDERS

Pre-heat block, cool sleeves and install in bore sequence. be sure to square/align flats 90° to assure fit.

Finished block. use an appropriate solid deck plate to seal off deck and test installation to 30-40 psi to assure no water leaks.

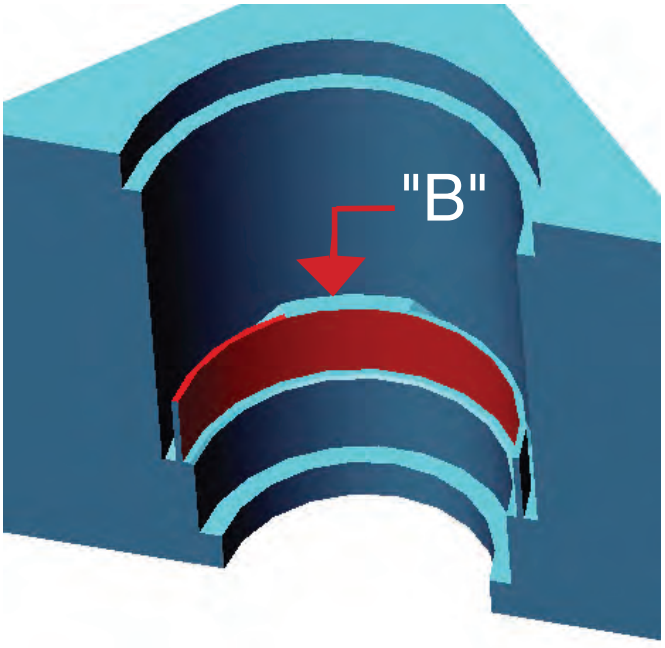
ALL HONDA 4 CYLINDERS



* CAUTION *

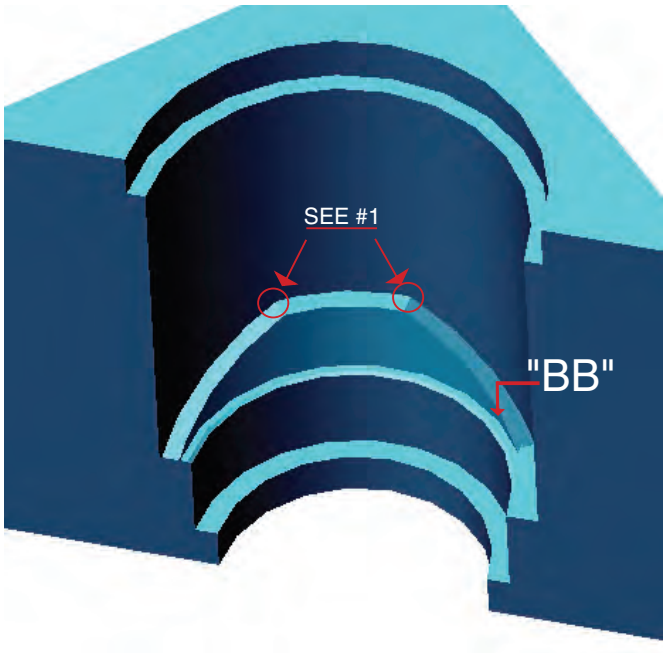
On some Honda blocks when machining the lower register of the number one cylinder you may reveal casting imperfections, which open to the front cover area. The hole that appears is from one of the bolt seats that hold on the timing cover. (noted by the red pencil) To seal this, apply some silicone to the end of the bolt when replacing the timing cover. Take caution and check for this and other holes because it does not occur on all blocks after machining is completed. Also prior to installation apply flange sealent to highlighted area.(see highlight)

ALL HONDA 4 CYLINDERS



This view shows the free standing wall that is remaining after machining to "B" depth.

***note**—free standing wall in sand cast water jacket area will vary in size.



This view shows the finished machine block.
1. Casting ridge begins at a 30° cut to eliminate remaining free standing wall down to surface"BB".
2. Refer to page 11 for example picture of cut in cylinder #1.

***note**— cylinder #1 shown and is typical for cylinder#4.

COMETIC GASKET
www.cometic.com

**Not actual gasket shown.*

FOR BEST RESULTS:

Darton recommends the use of a Cometic MLS head gasket (non HP) when running any of our MID kits.

NOTES/CAUTIONS:

1. Make sure that block and head surfaces are machined within proper RMS specification.
2. Depending on the typeof head bolts used, re-torque head bolts to proper specifications may be required.

EVANS PRODUCTS

Darton recommends the use of Evans coolant with all MID kits!


Finally, a High Performance Coolant specifically formulated to handle the extreme conditions of racing and high performance automotive, marine and motorcycle applications.

Evans Cooling Systems, Inc. introduces NPG-R, its newest addition to their innovative line of waterless Engine Coolants. NPG-R is specifically formulated to handle the extreme conditions of racing and high performance automotive, marine and motorcycle applications. Engines previously unable to be effectively cooled with water or conventional water-based antifreezes now have the option of the improved heat transfer formula of NPG-R.

NPG-R exhibits superior coolant flow, as it is less viscous than the popular NPG+. Its improvement in thermal-conductivity increases the ability of NPG-R to transfer extreme heat away from the engine coolant jacket. This provides superior engine metal temperature control. High coolant temperature related detonation is also eliminated with NPG-R as it stays in a more liquid state instead of converting to vapor and creating hot spots within the engine coolant jacket. Remaining in a more liquid state allows NPG-R to remove additional heat from the cylinder heads when compared to other coolants. The heat is then transferred away from the engine providing continuous control of cylinder head metal temperatures.

The reduced viscosity of NPG-R makes it more compatible with small tube copper-brass radiators while providing the superior cooling of Evans Waterless Coolants. (NPG+ and NPG are only recommended for large tube aluminum radiators.) All metals, including Magnesium, are safe to use with NPG-R. Although NPG-R is safe for all metals and contains no water, an annual coolant change is suggested for racing vehicles. For maximum corrosion protection, high performance street driven vehicles running NPG-R should change coolant every other year.

NPG-R does not freeze or boil-over. In cold temperatures (down to -10F) NPG-R will not freeze and expand like conventional water-based antifreezes potentially cracking the engine block. In contrast NPG-R contracts into thick slurry - never becoming a solid. With a boiling point of 400°F at 7psi, NPG-R will never boil-over because it immediately condenses back to a liquid within the cylinder head coolant jacket, maintaining a liquid contact on all metal surfaces at all times.

As with NPG+ and NPG, NPG-R is a stand-alone coolant. Therefore, NPG-R requires all the existing antifreeze and water to be removed from the radiator, engine block and heater core. (Evans Prep Fluid is available for smaller capacity systems where the engine block cannot be fully drained) Once system is empty fill 100% with NPG-R. A free Test Strip is included with all purchases as a guide to a successful conversion. Technical assistance is available to assist in determining which Evans Waterless Coolant is right for your application.

EVANS NPG COOLING SYSTEMS™

Coolant • Radiators • Pumps • Accessories

MPG+ for all street applications.
MPGR for full race applications.

All Honda Engines with Darton MID Sleeves
ADDITIONAL INSTRUCTIONS

Break-in, tuning

Fill the engine with a good grade of mineral oil (*not synthetic*) with viscosity for your bearing clearance and intended use. **Prime the oil system** before engine start with ignition off using the engine or dyno starter. We require break-in and tuning using an engine dyno or chassis dyno as follows:

- After initial start up, warm up engine at 2000-2500. Precaution should be exercised to prevent excessively rich or lean conditions, which will gall the cylinders. Monitor oil pressure and temperatures.
- After initial run, adjust valves if using adjustable valve train and retorque heads. Check for leaks.
- Street engines will require multiple run ins with increasing rpm and load up to maximum output.

Use of a dyno allows one to apply a pre-set load to allow the piston rings, and other components to seat properly. It is also much easier to monitor temperatures and pressures than while driving. Most dynos are equipped with O^2 and EGT probes to aid in tuning. The timing and fuel curve needs to be tailored to your particular engine to ensure the engine stays out of detonation, which will lead to engine failure. A racing engine is generally built with sufficient clearance to require no further break-in after dyno tuning and power runs. **However, we recommend head bolt torques be re-checked cold after dyno testing as the head gaskets will take a set.** Remember to replace oil and filter after the dyno session as bearing coatings and metal particles will be trapped in the oil filter. Inspect the oil for foreign material and excessive bearing flakes.

A street engine should be driven moderately for the first thousand miles, as follows:

- full throttle high torque power useage should be limited and never be used until the engine has been running for at least 15 minutes.
- from 0-500 miles, do not exceed 4000 rpm.
- from 500-1000, do not exceed 6000 rpm.
- over 1000 miles, no restrictions.

Also, do not run at the same speed for extended periods during break-in. Make certain the engine is operating at proper coolant temperature and oil pressure. Do not allow the engine to overheat. Make necessary changes if required (radiator, fan, tuning) to get the engine to run in the proper temperature range. We also recommend you do not run synthetic oil until at least 5000 miles. Synthetics work so well that the engine will never break in properly if it is used too soon.

PRECISION ENGINE REBUILDING EQUIPMENT

Sunnen CV-616 Setup

The cost-effective Sunnen CV-616 Automatic Cylinder Hone is one of the most versatile machines you can have in your shop. You can count on consistent results as the CV-616 produces the most precise cylinder bores possible, cylinder after cylinder, block after block.

Results with Sunnen Honing Stones on Darton Cylinder Sleeve Material

EHU 412

RA	23.14 µ"
RY	231.14 µ"
RZ	184.4 µ"
RPK	26.34 µ"
RVK	68.14 µ"
RK	80.14 µ"
MR1	7%
MR2	86%

EHU-412
C30 PHT 731 - 45 Seconds

RA	15.4 µ"
RY	162.4 µ"
RZ	127.4 µ"
RPK	10.5 µ"
RVK	40.9 µ"
RK	35.4 µ"
MR1	5%
MR2	88%

EHU 518

RA	25.1 µ"
RY	266.2 µ"
RZ	198.3 µ"
RPK	29.9 µ"
RVK	44.5 µ"
RK	89.7 µ"
MR1	6%
MR2	88%

EHU 518
C30 PHT 731 - 30 Seconds

RA	9.0 µ"
RY	132.0 µ"
RZ	93.5 µ"
RPK	7.8 µ"
RVK	38.4 µ"
RK	23.8 µ"
MR1	5%
MR2	81%

SUNNEN®

Sunnen CV-616 Set-up

JHU 623

RA	10 µ"
RY	99.6 µ"
RZ	85.5 µ"
RPK	17.8 µ"
RVK	18.8 µ"
RK	34.7 µ"
MR1	10%
MR2	89%

JHU 623
C30 PHT 731 - 15 Seconds

RA	6.4 µ"
RY	79.7 µ"
RZ	62.3 µ"
RPK	4.8 µ"
RVK	13.3 µ"
RK	20.9 µ"
MR1	4%
MR2	89%

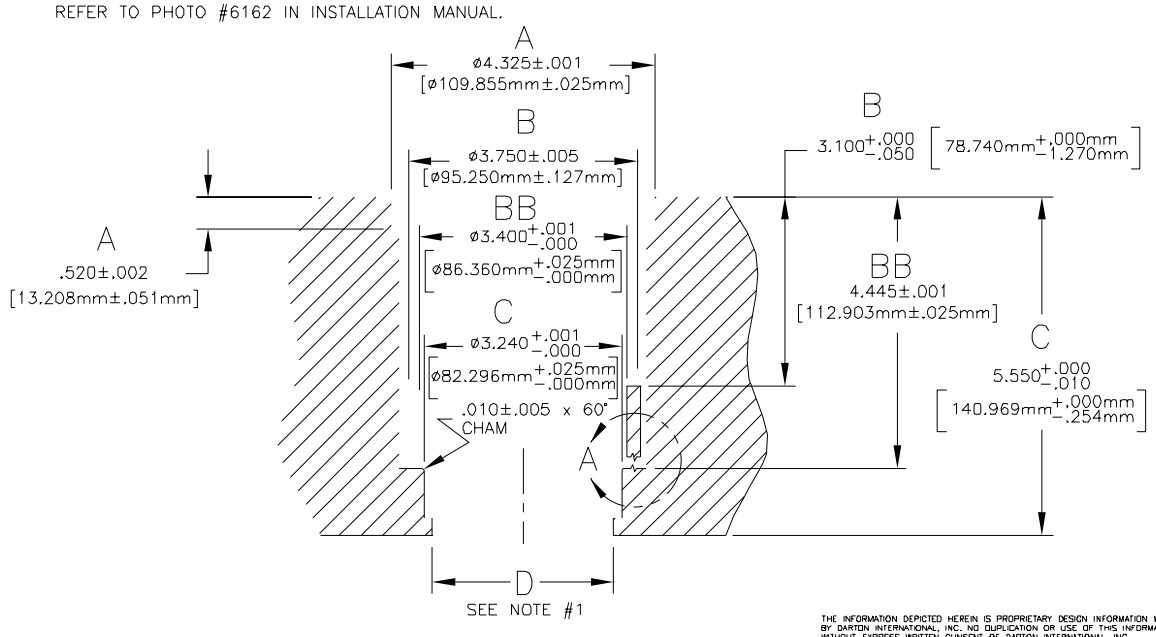
Results obtained with Sunnen MAN 845 honing oils. Results may vary with other oils.

Honda M.I.D. D16-S1
Cylinder #1

NOTE:

1. BORE THRU TO MAIN WEB AT FINISH BORE DIA +.010
2. ON #1 CYL ONLY REMOVE REMAINING 320° ALUM WALL DOWN TO 4.445 BY MILLING OR HAND GRINDING. THIS WILL ELIMINATE ALL ALUM. WALL THAT WOULD FORM A GAP BETWEEN SLEEVE AND WATER JACKET. REFER TO PHOTO #6162 IN INSTALLATION MANUAL.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVAL



DR. BY:	CAD DEPT
DATE:	02/12/04
CHK'D BY:	
MATERIAL:	
HARDNESS:	

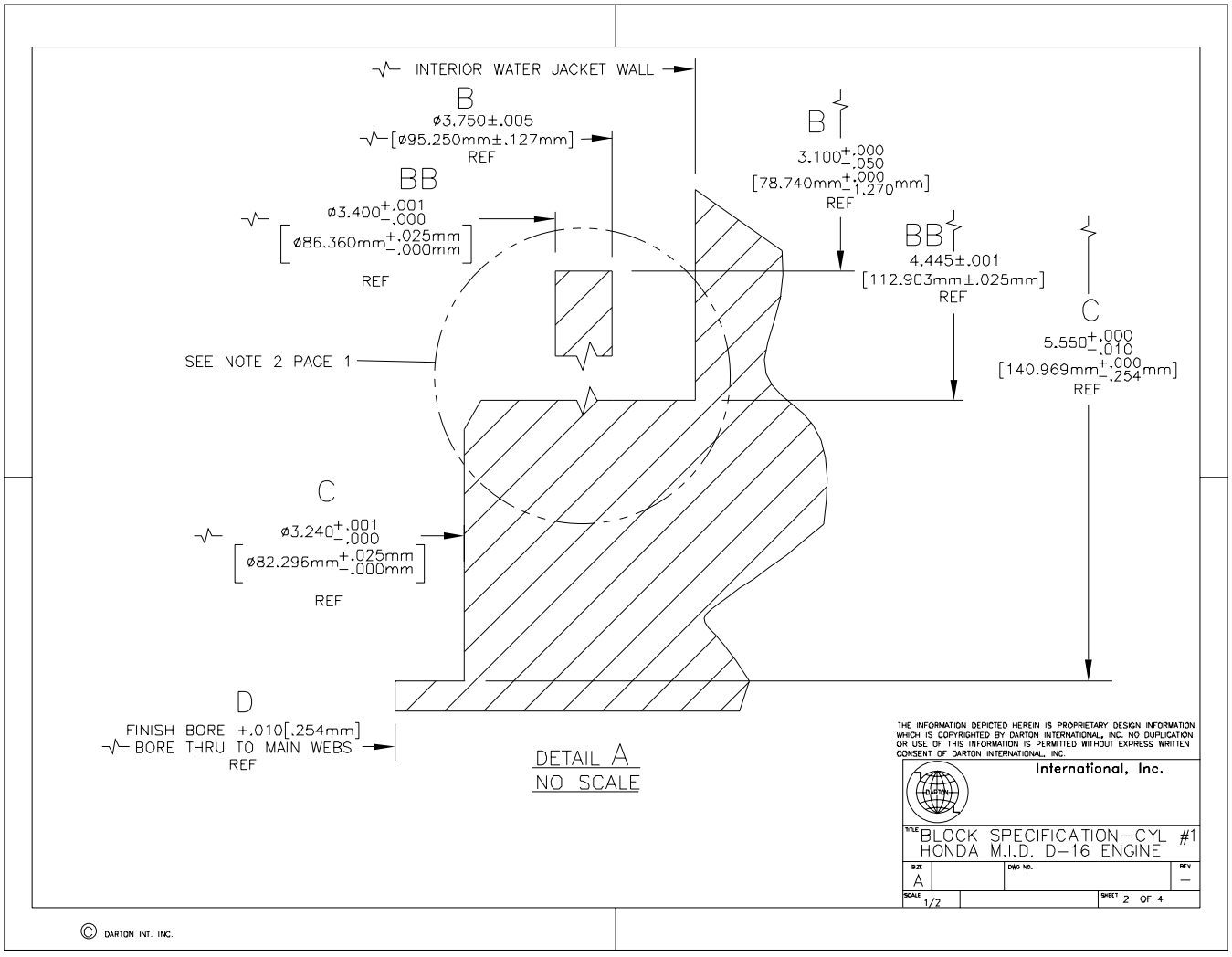
International, Inc.

TITLE: BLOCK SPECIFICATION–CYL #1
HONDA M.I.D. D–16 F

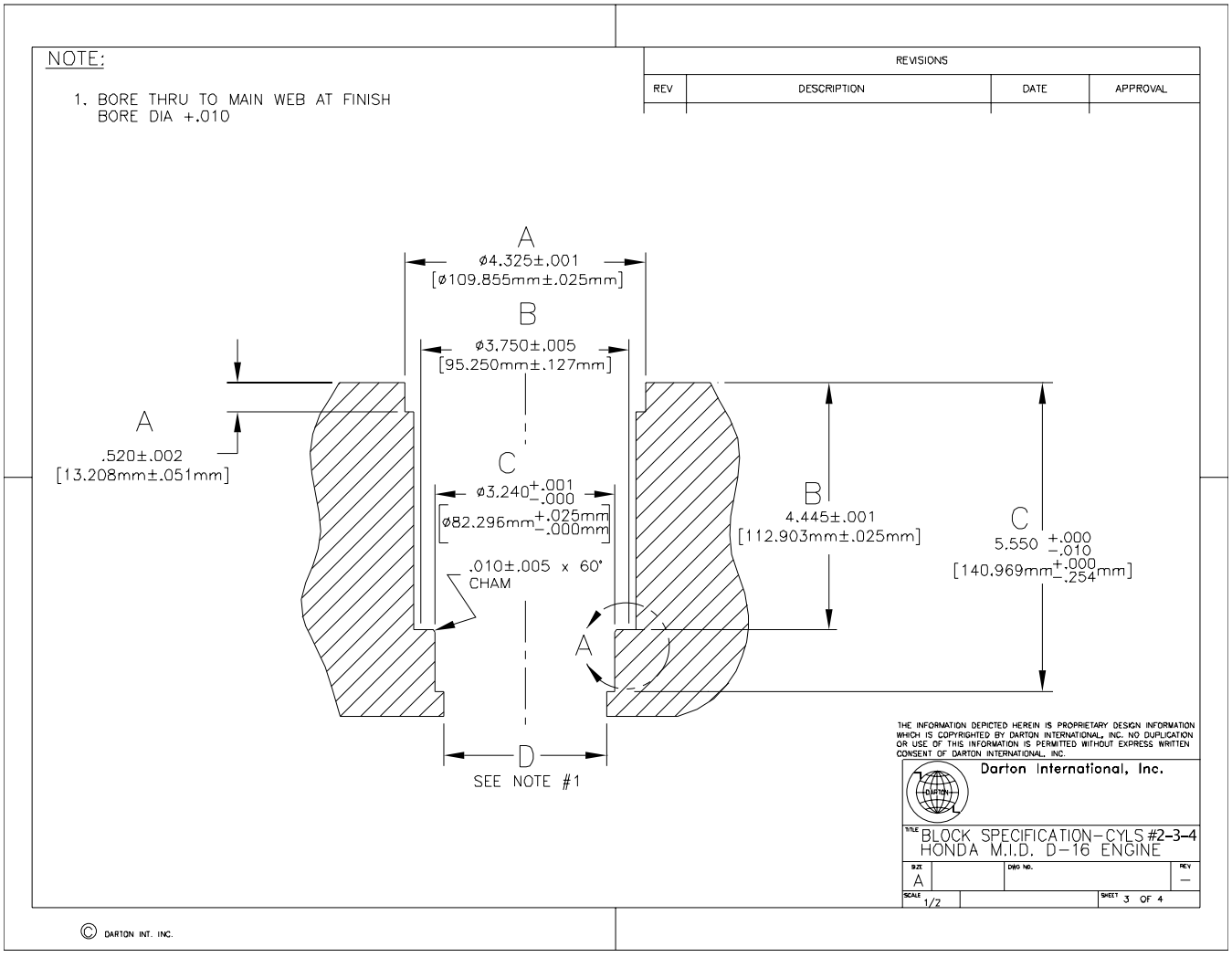
SIZE	DWG NO.	REV
A		–

SCALE 1/2 SHEET 1 OF 4

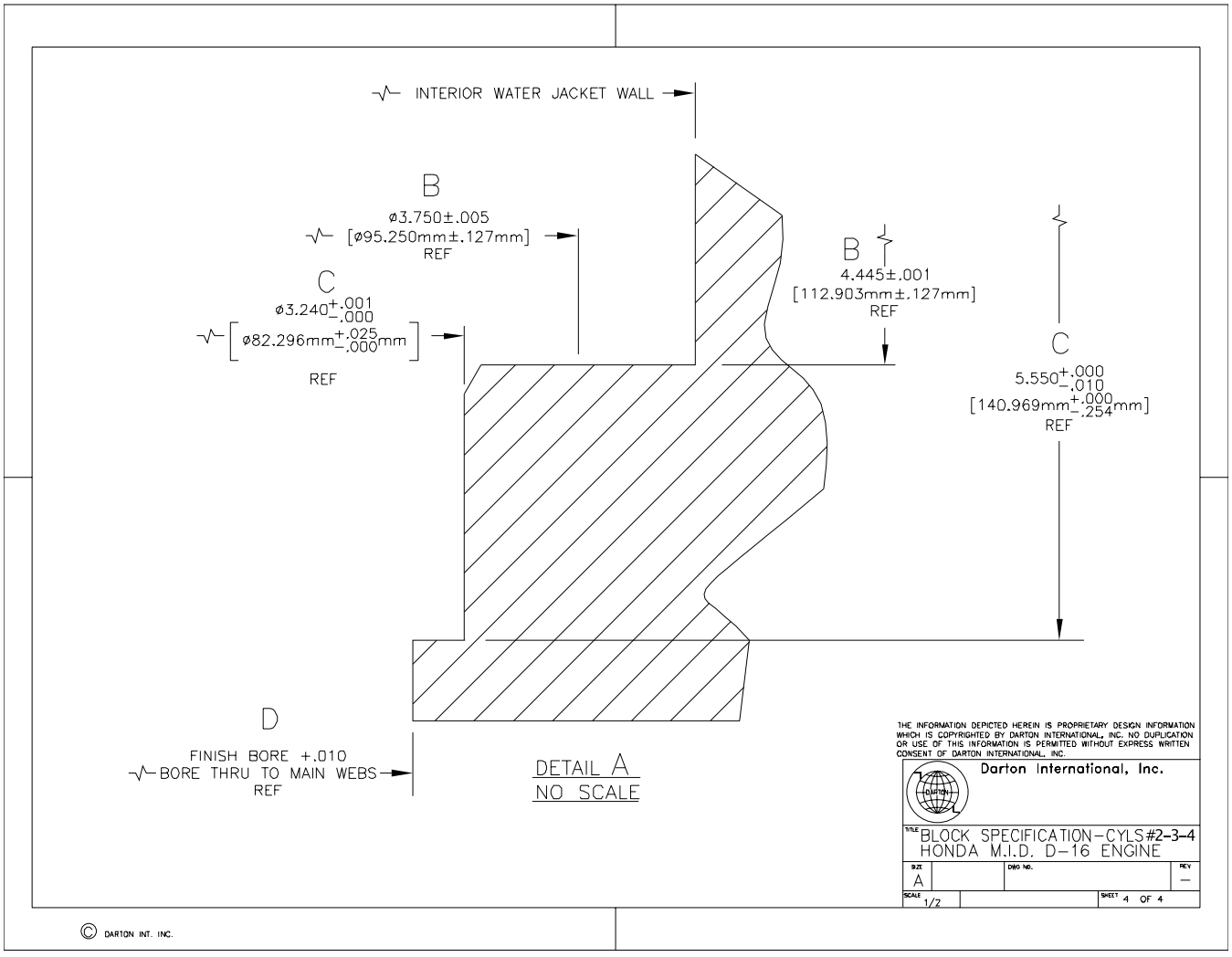
Honda M.I.D. D16-S2
Cylinder #2



Honda M.I.D. D16-S3
Cylinder #2-3-4



Honda M.I.D. D16-S4
Cylinder #2-3-4



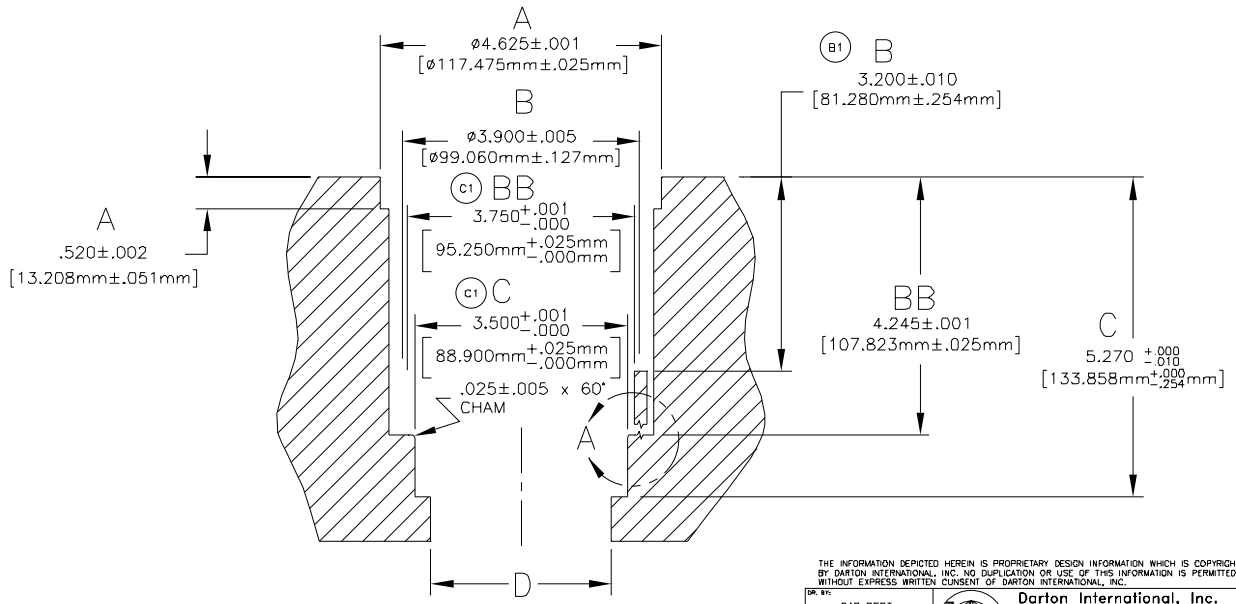
Honda M.I.D. B16-S1
Cylinder #1

NOTE:

1. BORE THRU TO MAIN WEB AT FINISH BORE DIA +.010
2. ON #1 CYL ONLY REMOVE REMAINING 320° ALUM WALL DOWN TO 4.245 BY MILLING OR HAND GRINDING. THIS WILL ELIMINATE ALL ALUM. WALL THAT WOULD FORM A GAP BETWEEN SLEEVE AND WATER JACKET. REFER TO PHOTO #6162 IN INSTALLATION MANUAL.

REVISIONS

REV	DESCRIPTION	DATE	APPROVAL
A	IN NOTE 2 & DIM "BB" 4.245 WAS 4.250	07/08/03	
B	1. ON SHTS 1 & 2 DIM 3.200±.001 WAS 3.25±.001	07/08/03	
C	1. ON SHTS 1–6 ø3.750 TOL+.000/.000 WAS ±.001 AND ø3.500 TOL+.000/.000 WAS ±.001	02/04/04	



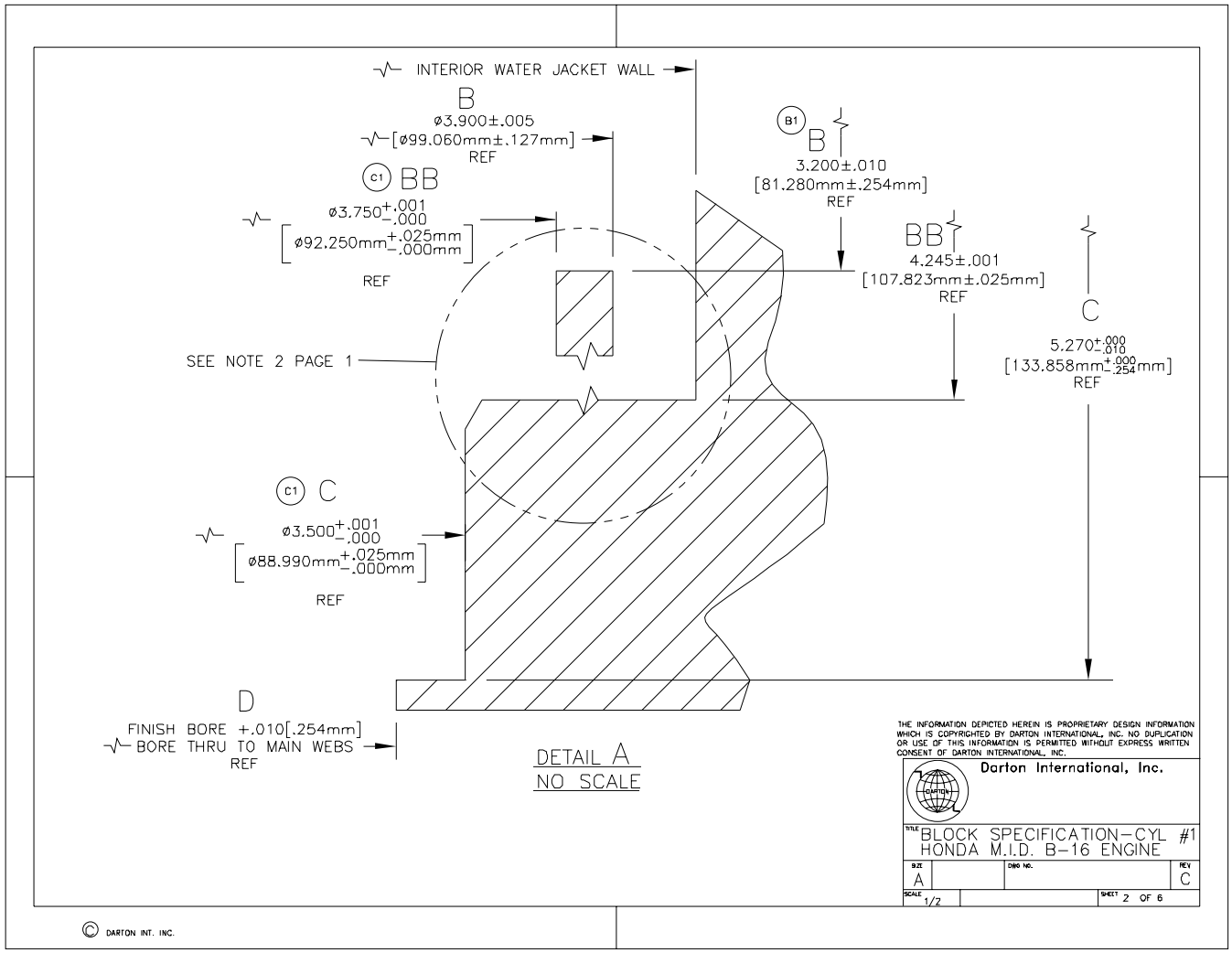
DR. BY: CAD DEPT
DATE: 01/29/03
CHK'D BY:
MATERIAL:
HARDNESS:

Darton International, Inc.

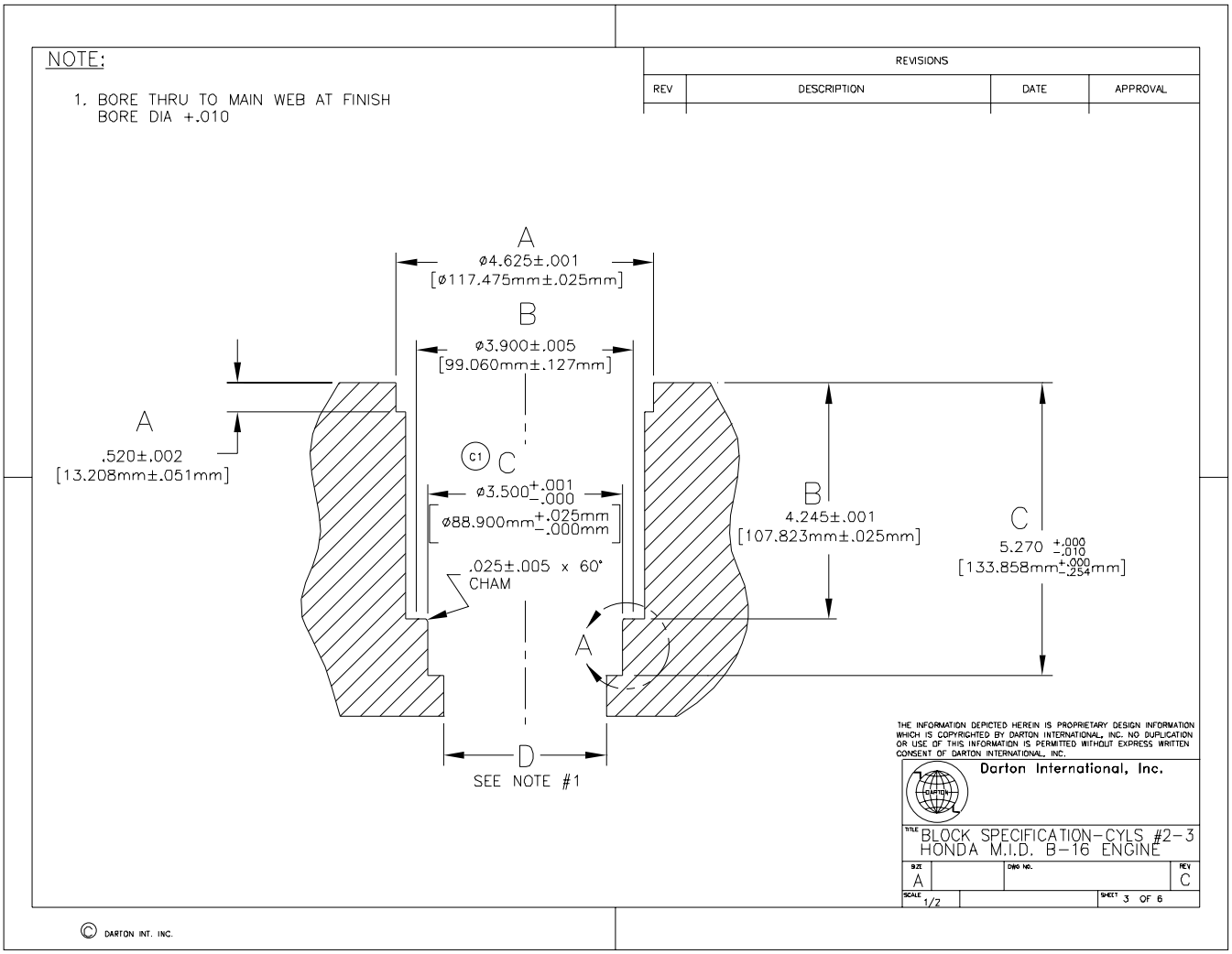
TITLE: BLOCK SPECIFICATION–CYL #1
HONDA M.I.D. B–16 ENGINE

SIZE A | DWG NO. | REV C
SCALE 1/2 | SHEET 1 OF 6

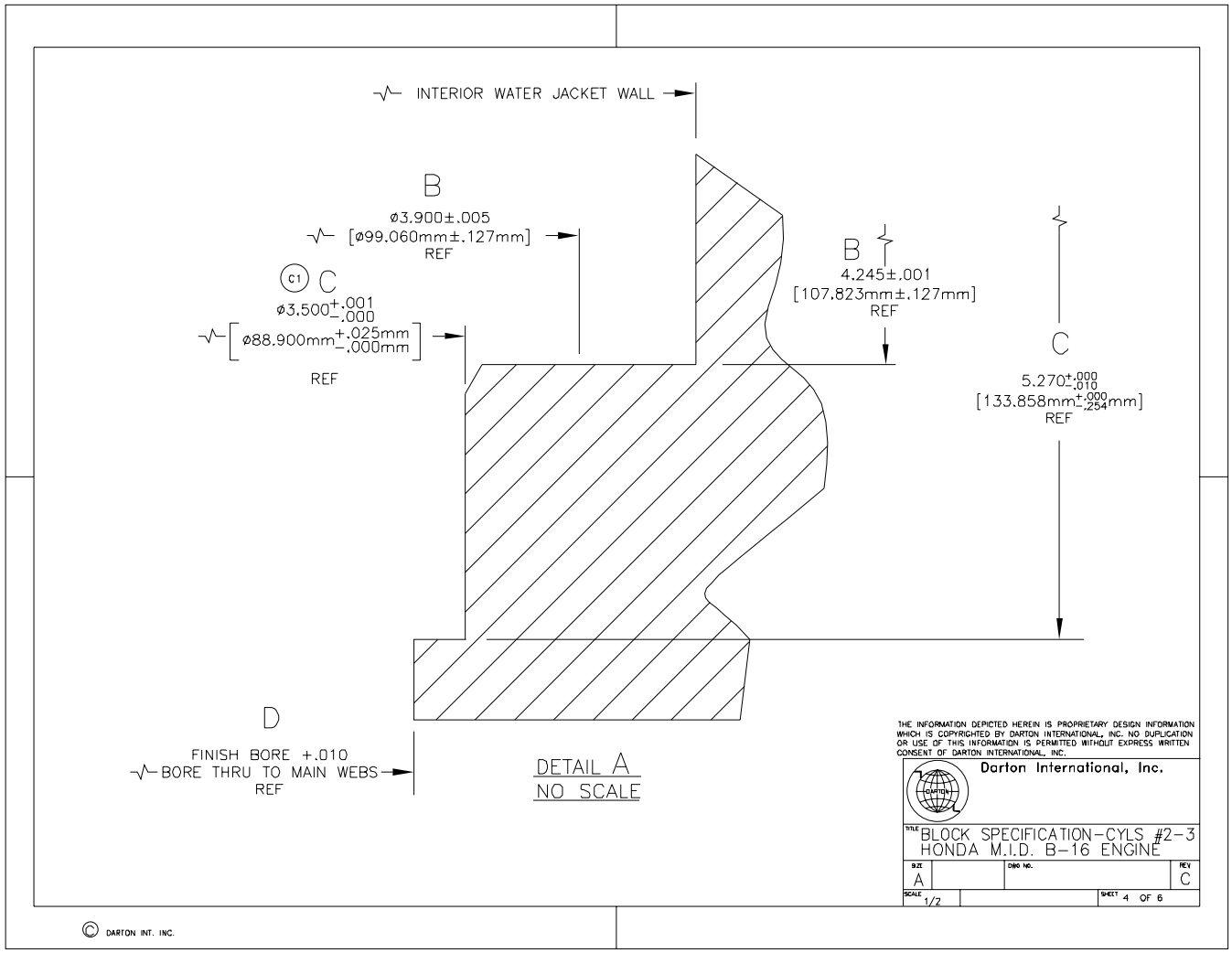
Honda M.I.D. B16-S2
Cylinder #1



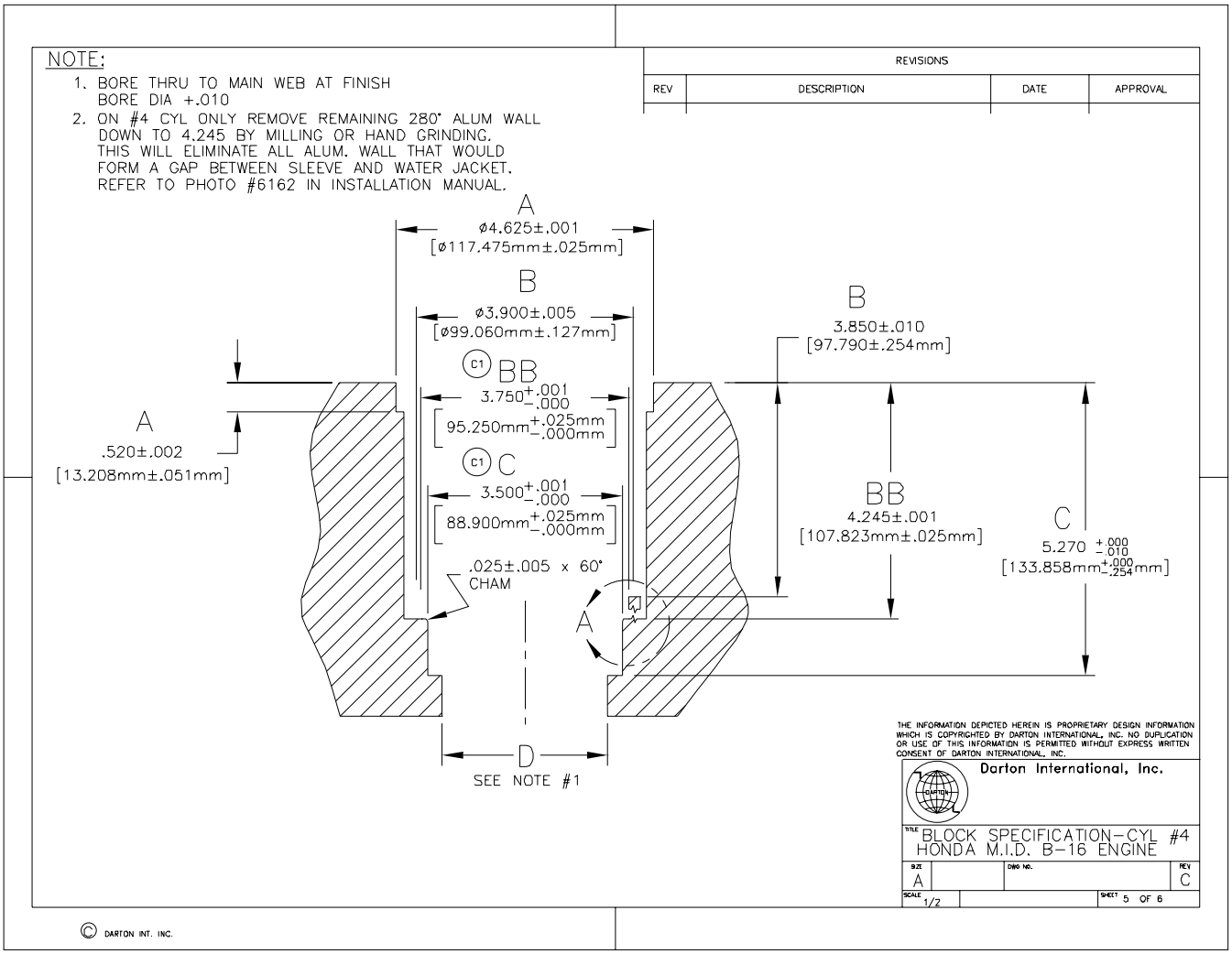
Honda M.I.D. B16-S3
Cylinder #2—3



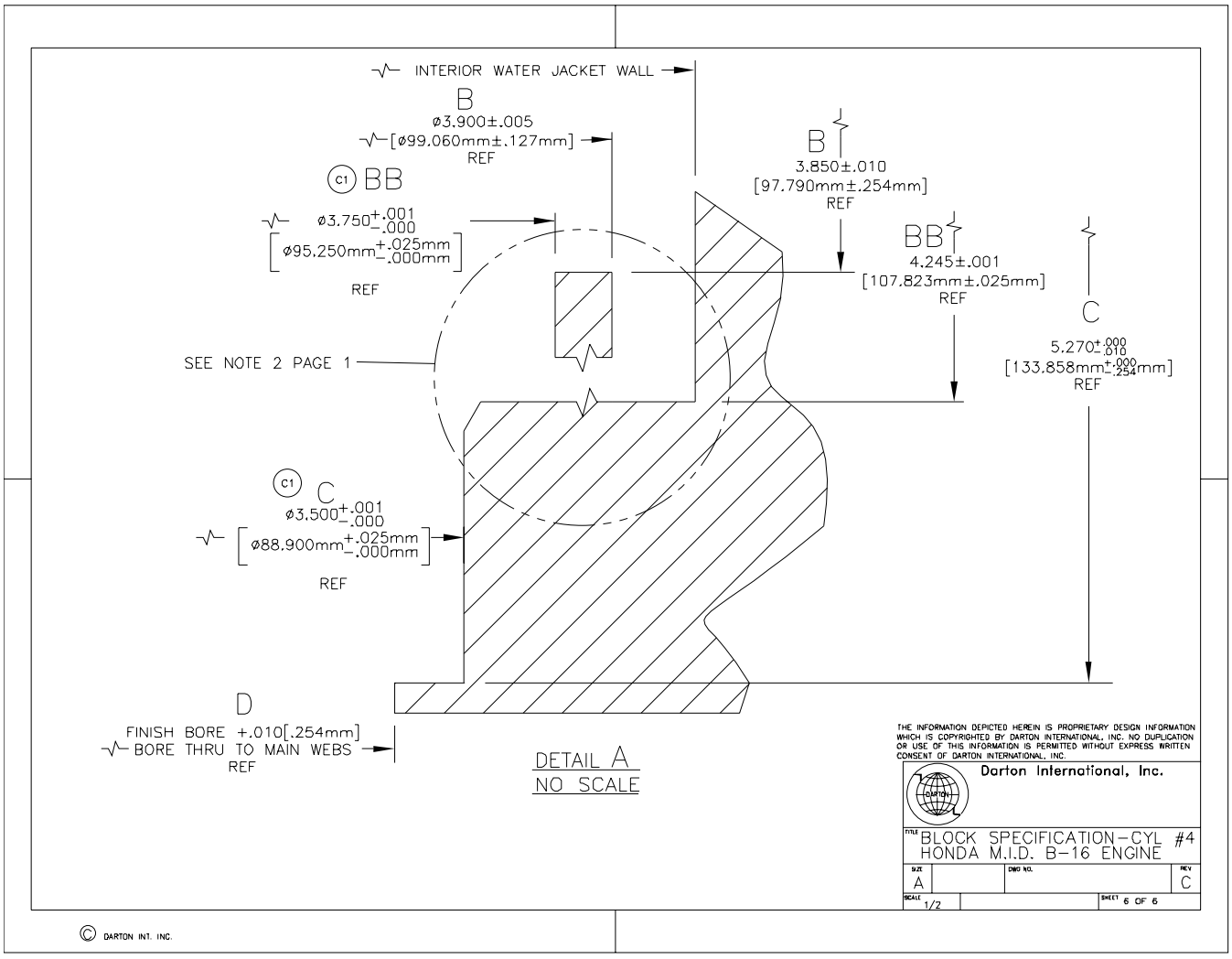
Honda M.I.D. B16-S4
Cylinder #2—3



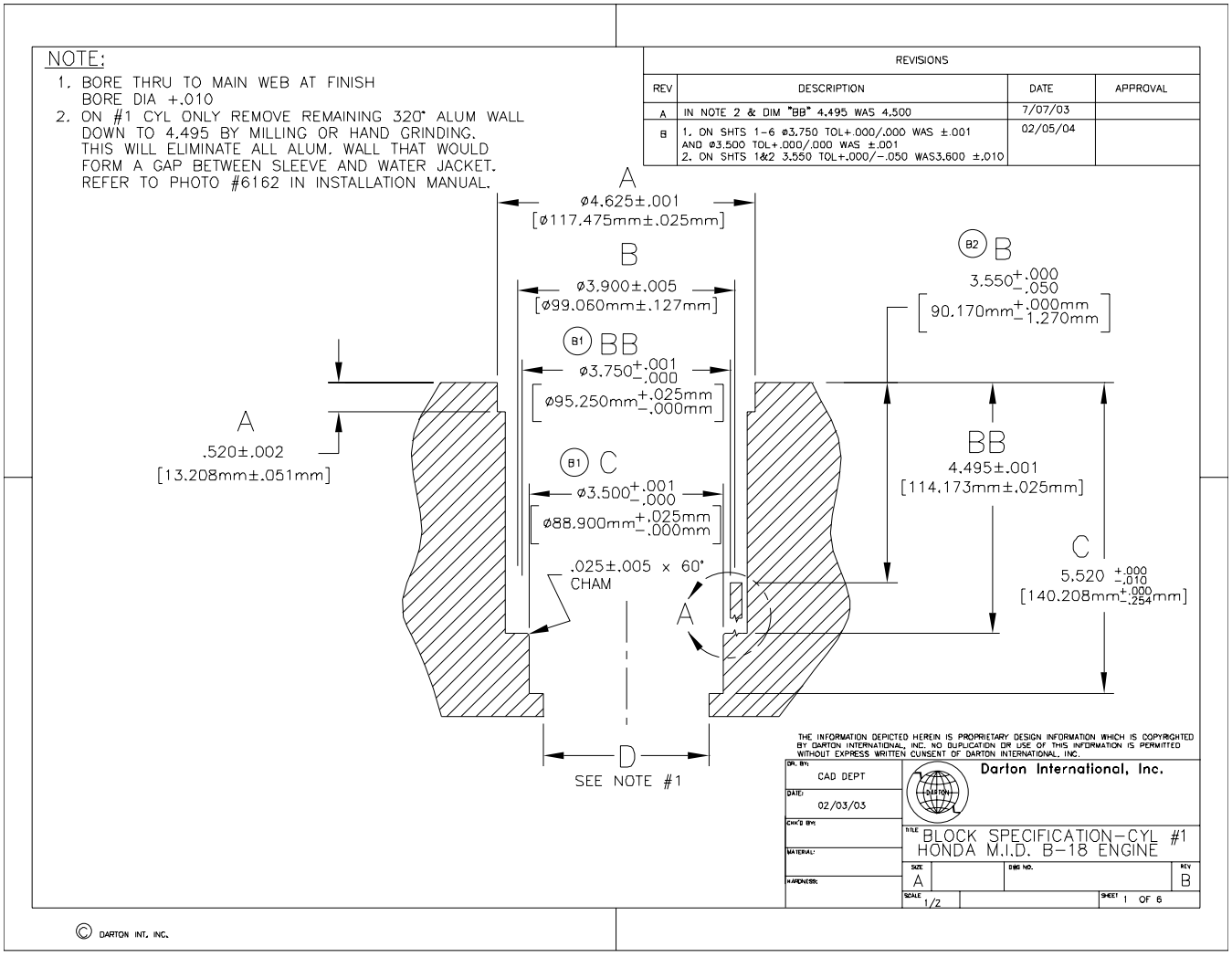
Honda M.I.D. B16-S5
Cylinder #4



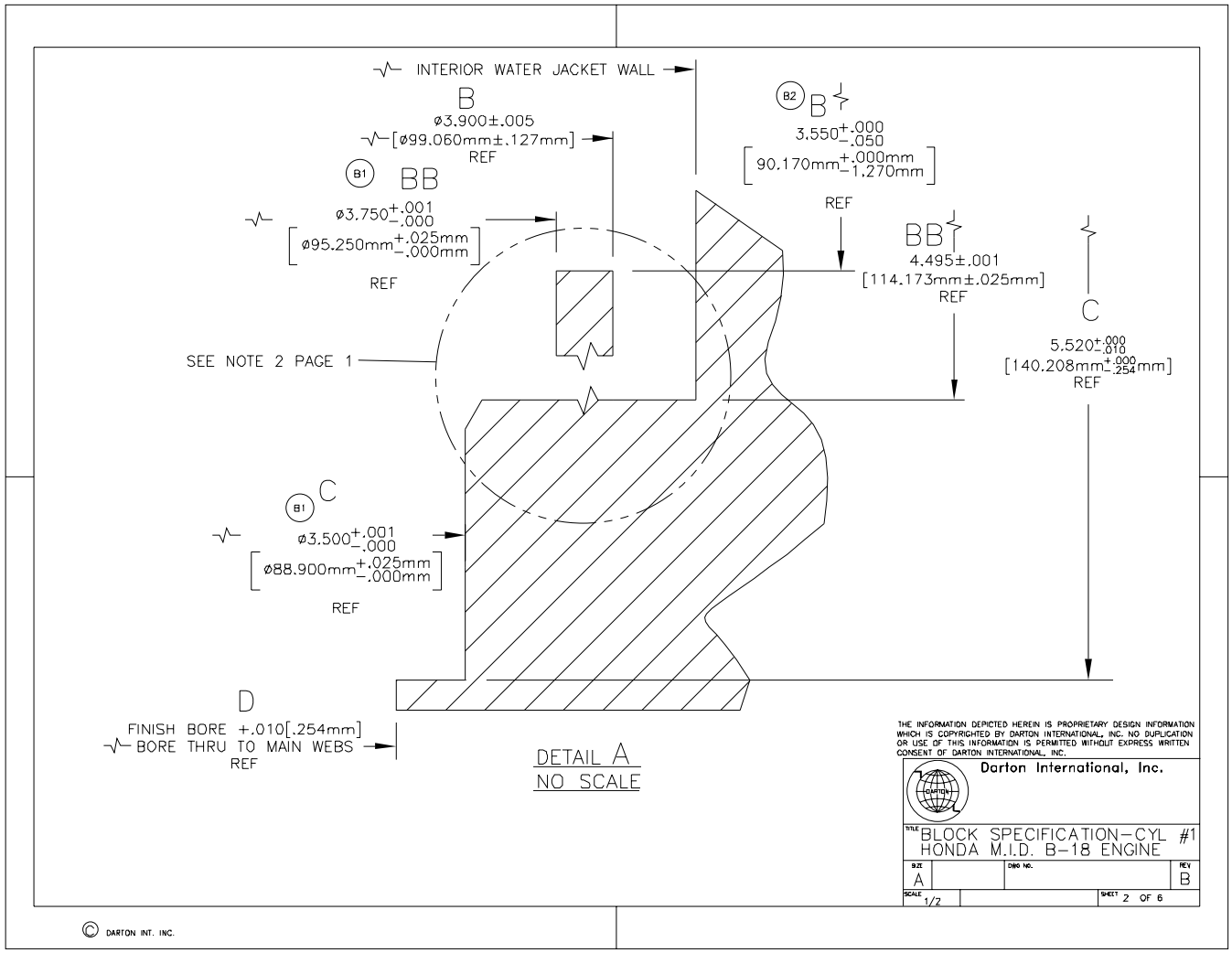
Honda M.I.D. B16-S6
Cylinder #4



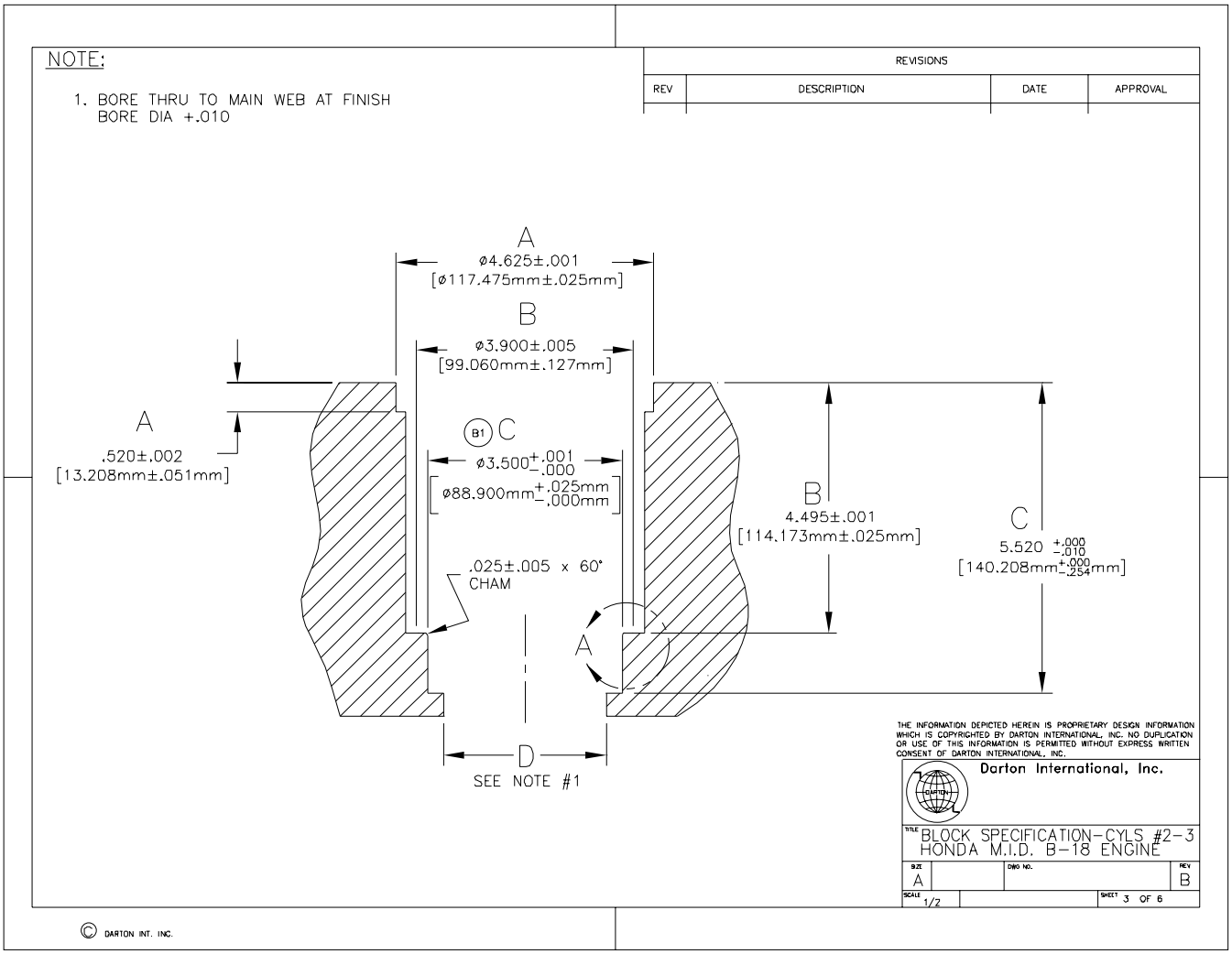
Honda M.I.D. B18-S1
Cylinder #1



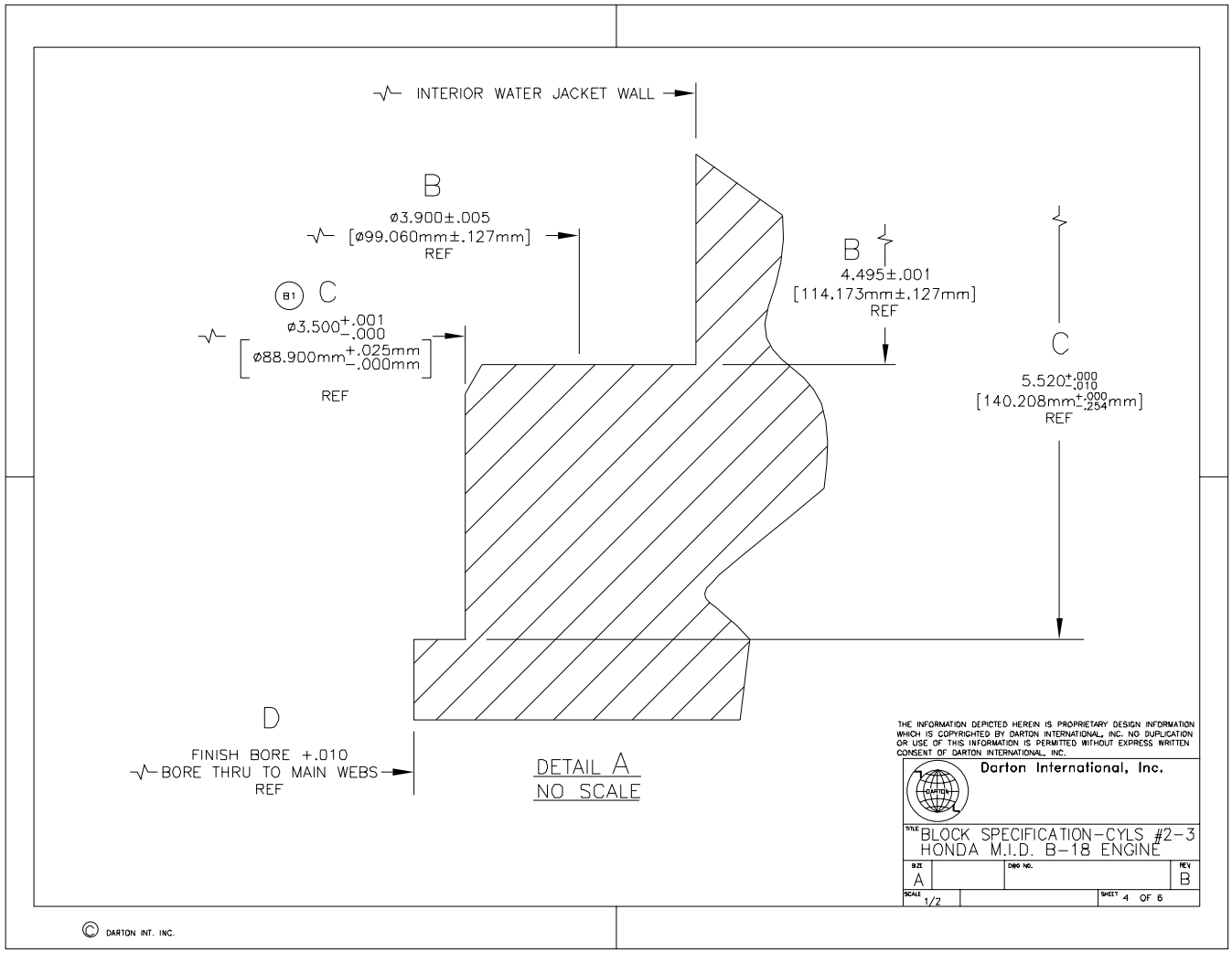
Honda M.I.D. B18-S2
Cylinder #1



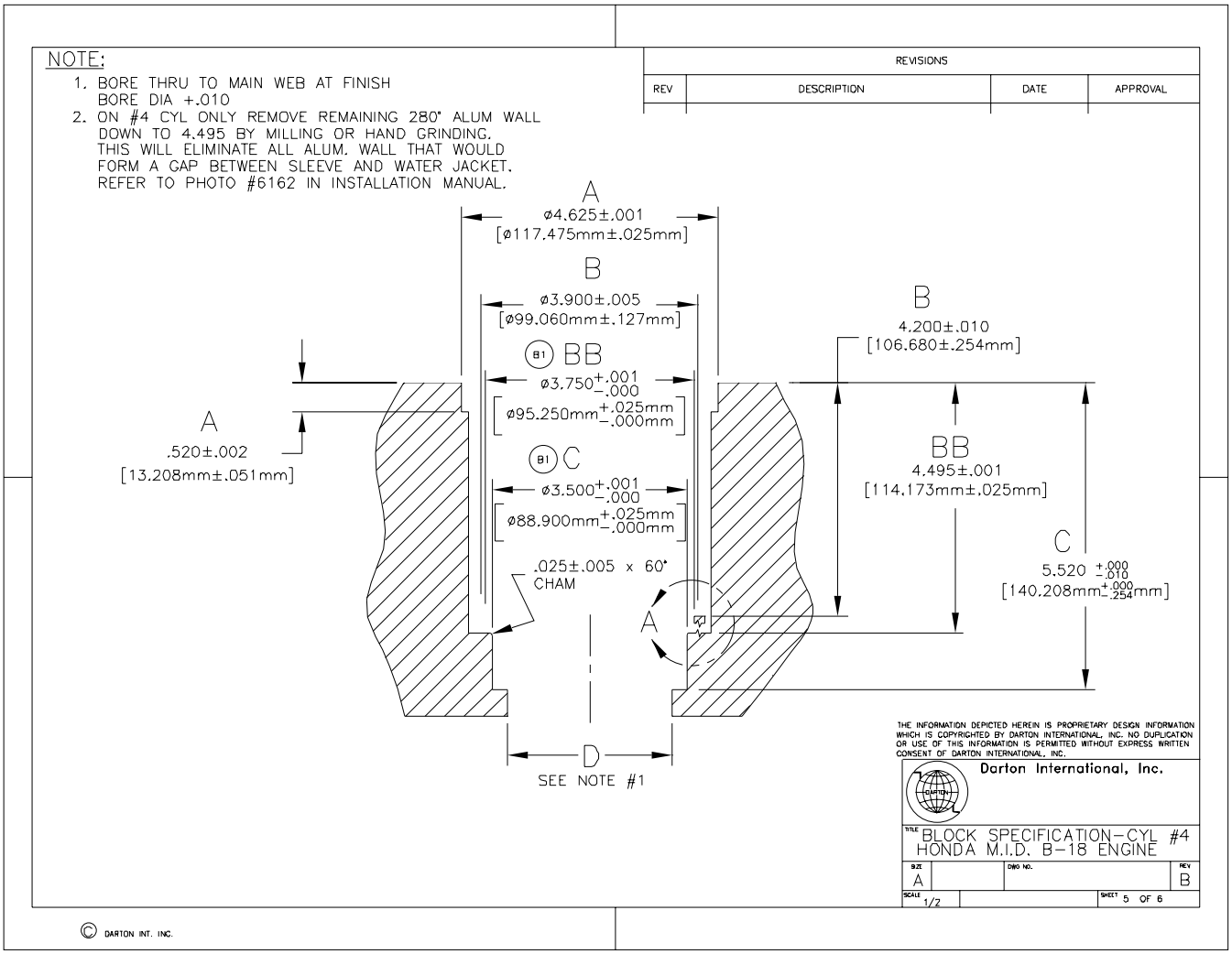
Honda M.I.D. B18-S3
Cylinder #2—3



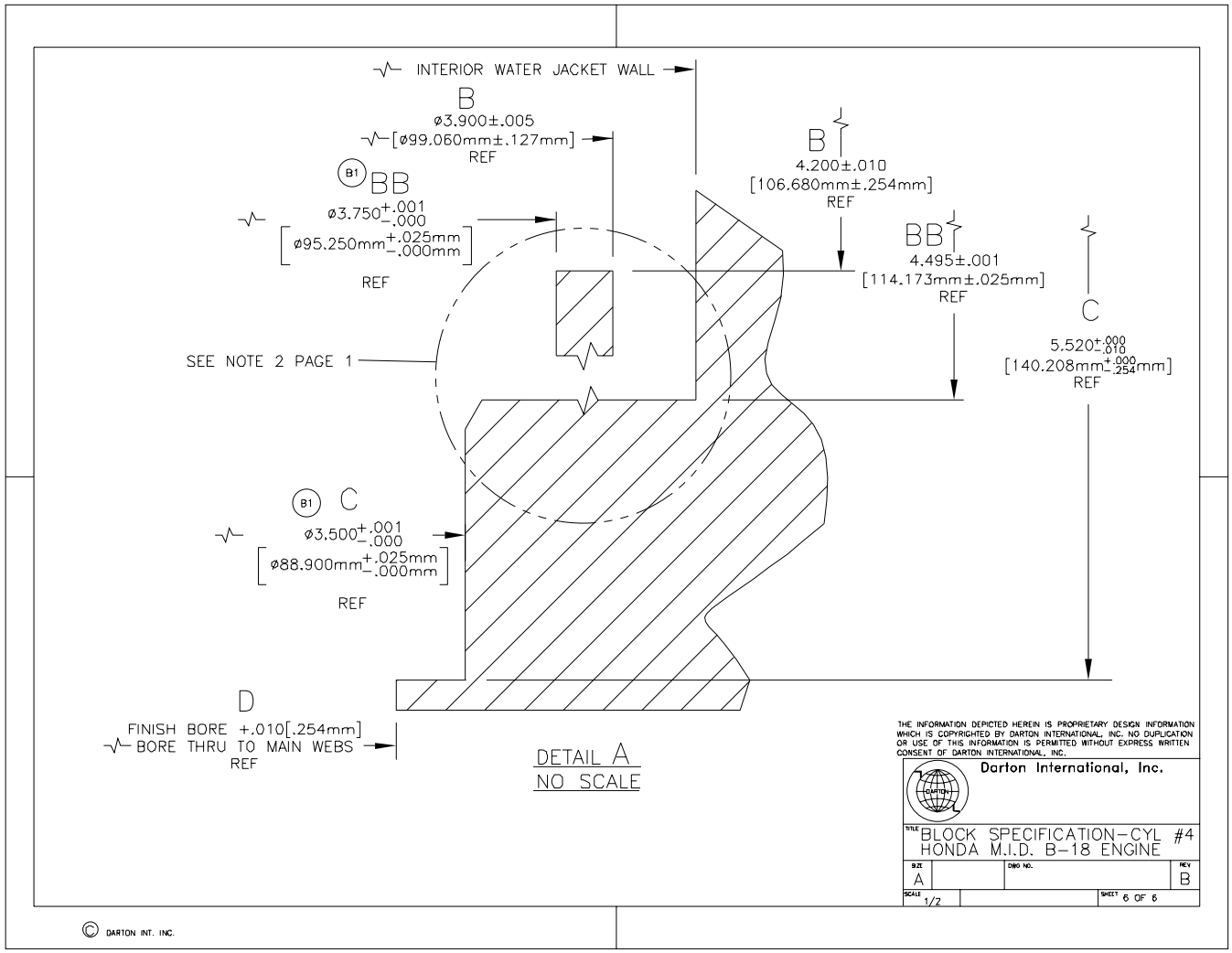
Honda M.I.D. B18-S4
Cylinder #2—3



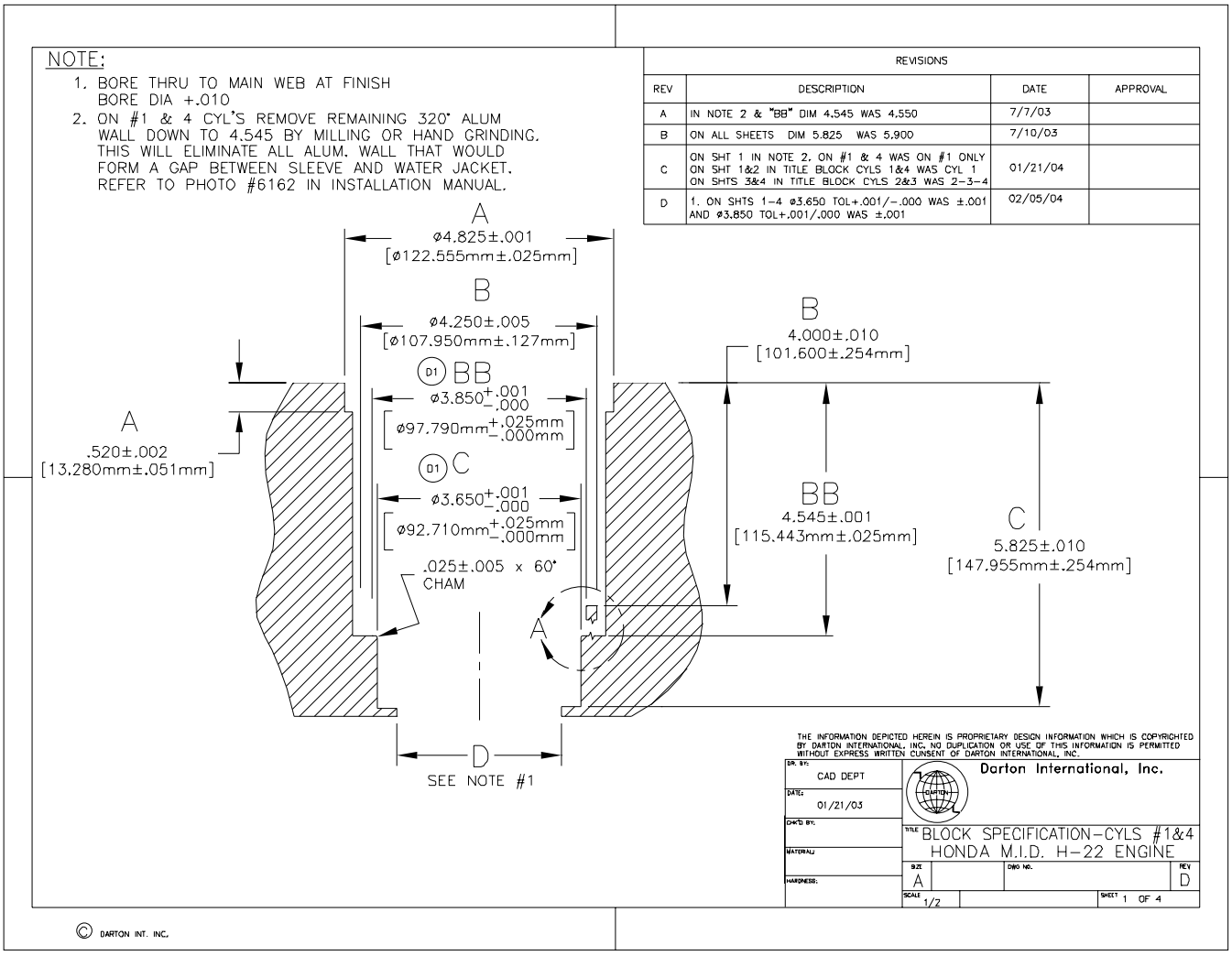
Honda M.I.D. B18-S5
Cylinder #4



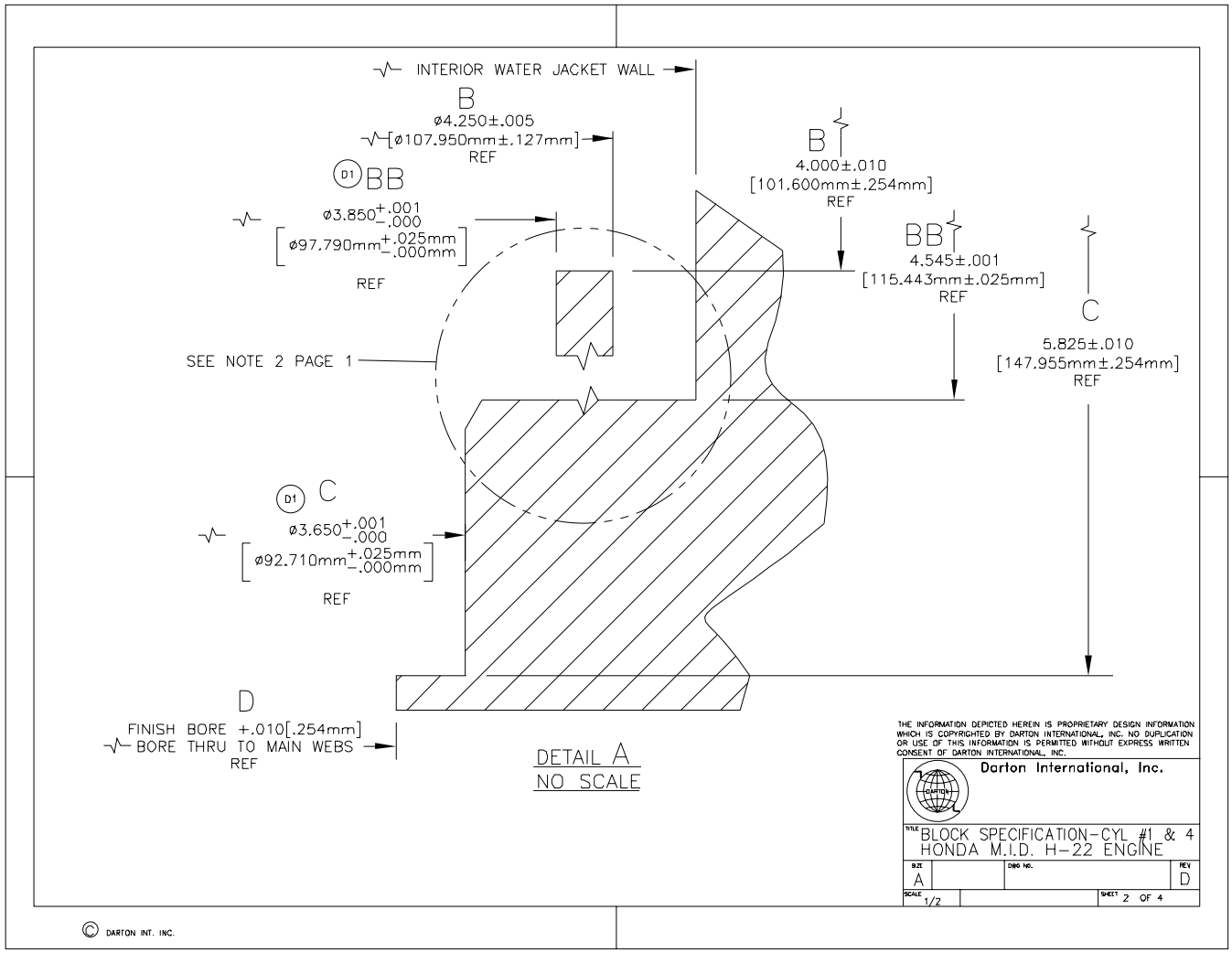
Honda M.I.D. B18-S6
Cylinder #4



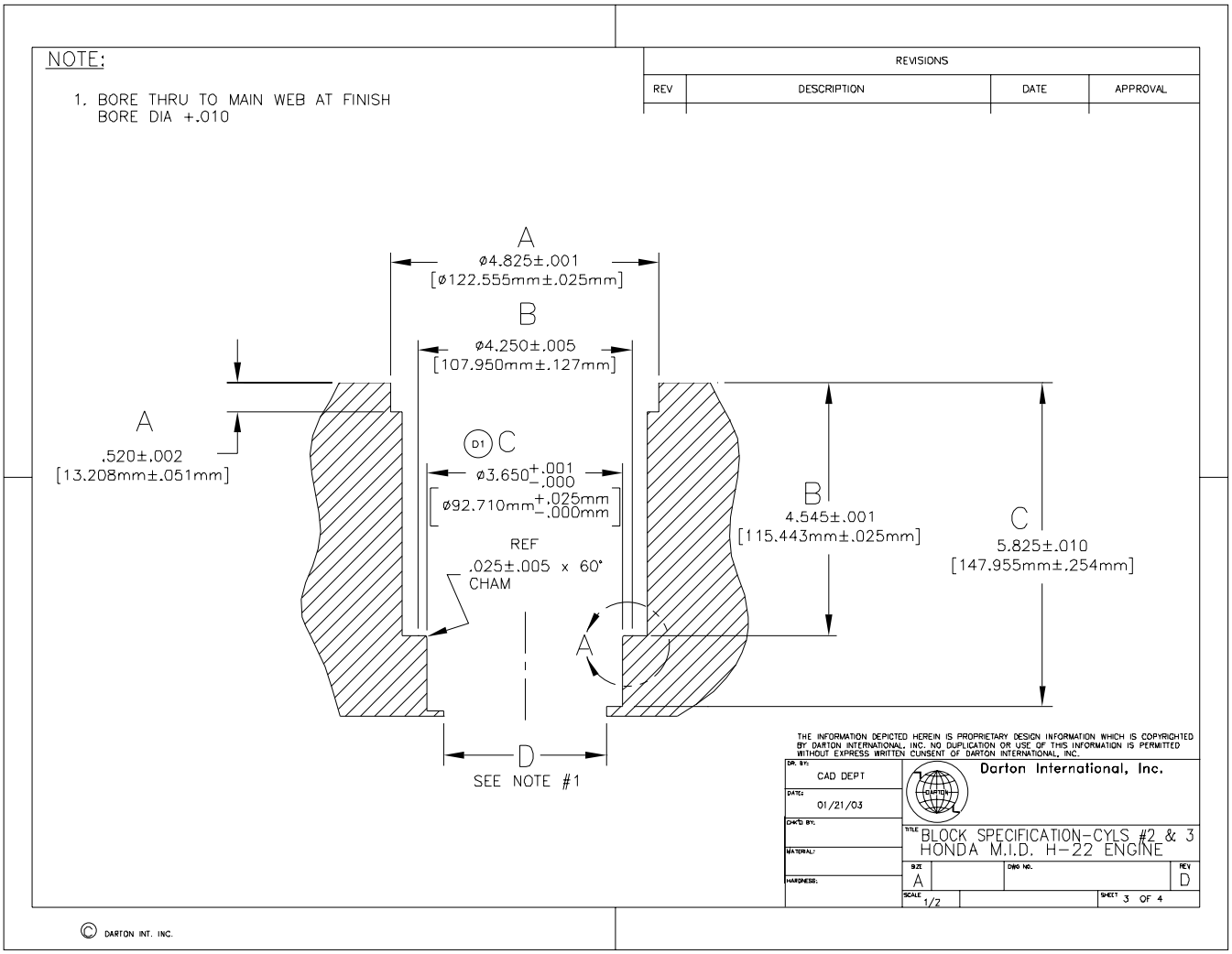
Honda M.I.D. H22-S1
Cylinder #1 & 4



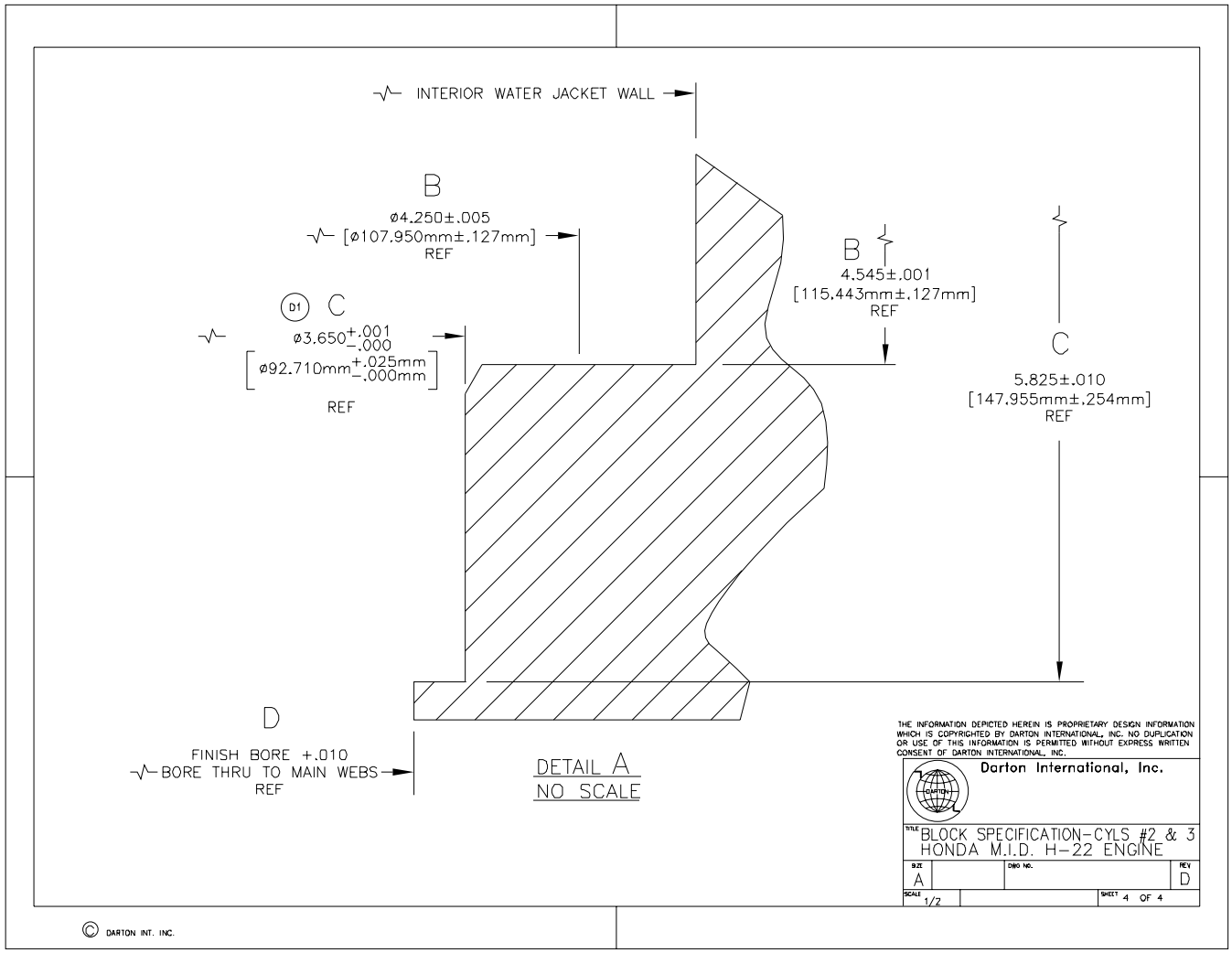
Honda M.I.D. H22-S2
Cylinder #1 & 4



Honda M.I.D. H22-S3
Cylinder #2—3



Honda M.I.D. H-22-S4
Cylinder #2—3

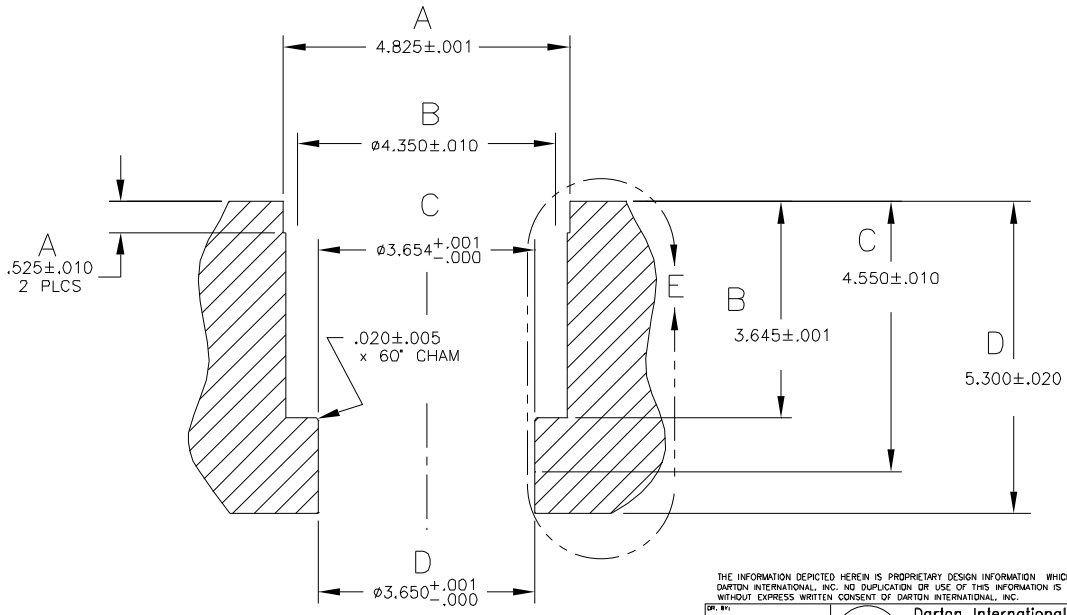


Honda M.I.D. K20-S1
Cylinder #1-4

NOTE:

1. DECK BLOCK SURFACE AFTER SLEEVE INSTALLATION.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVAL
A	ON SHT 1 & 2 ø3.654+.001/-.000 WAS 3.653±.001	2/15/07	
B	ON SHT 1 & 2 5.300±.020 WAS 5.250±.020 ON SHT 2 REMOVED METRIC DIMENSIONS	8/31/2010	



DR. BY: CAD DEPT
DATE: 02/20/04
CHK'D BY:
MATERIAL:
HARDNESS:

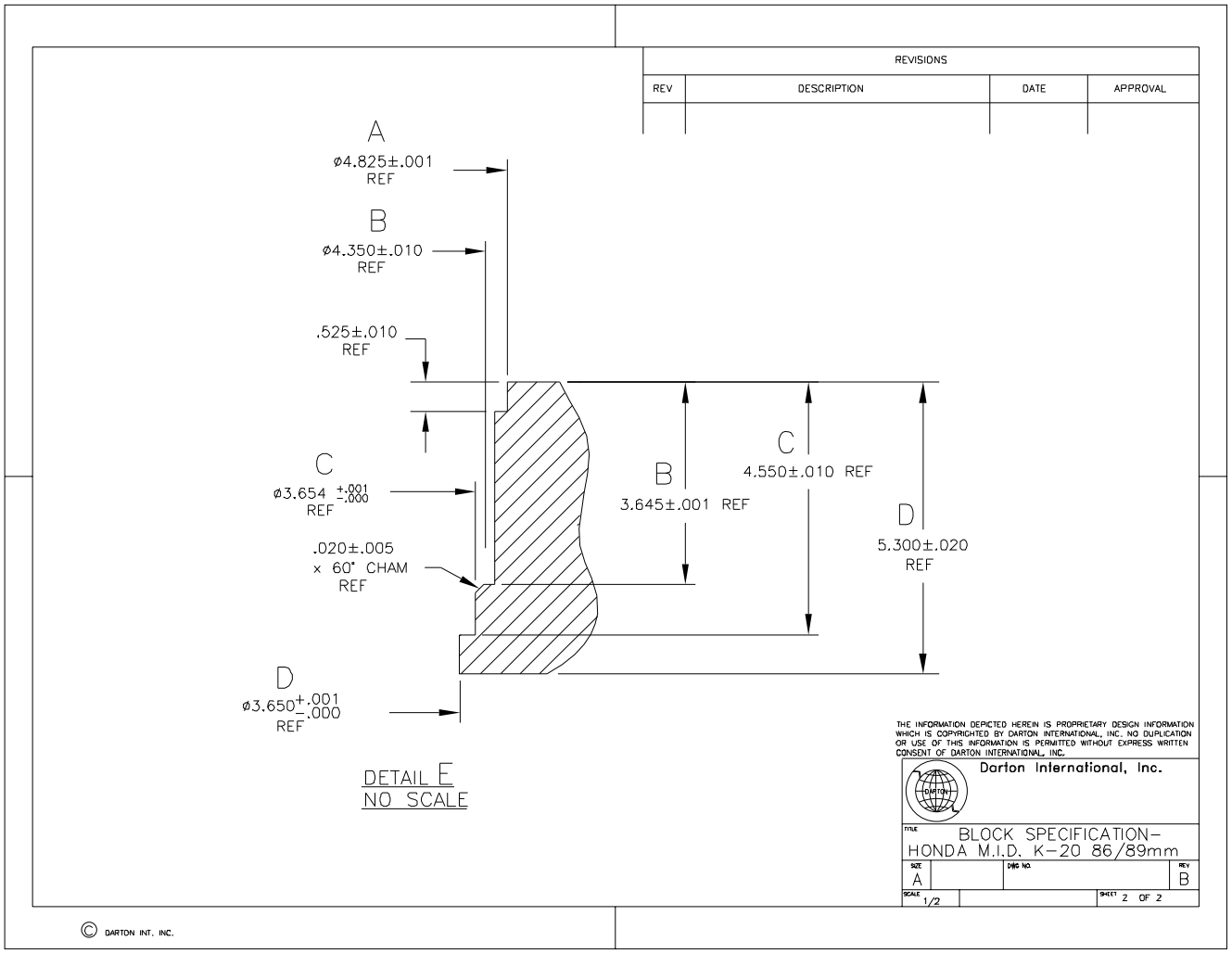
Darton International, Inc.

TITLE: BLOCK SPECIFICATION– HONDA M.I.D. K-20 86/89mm

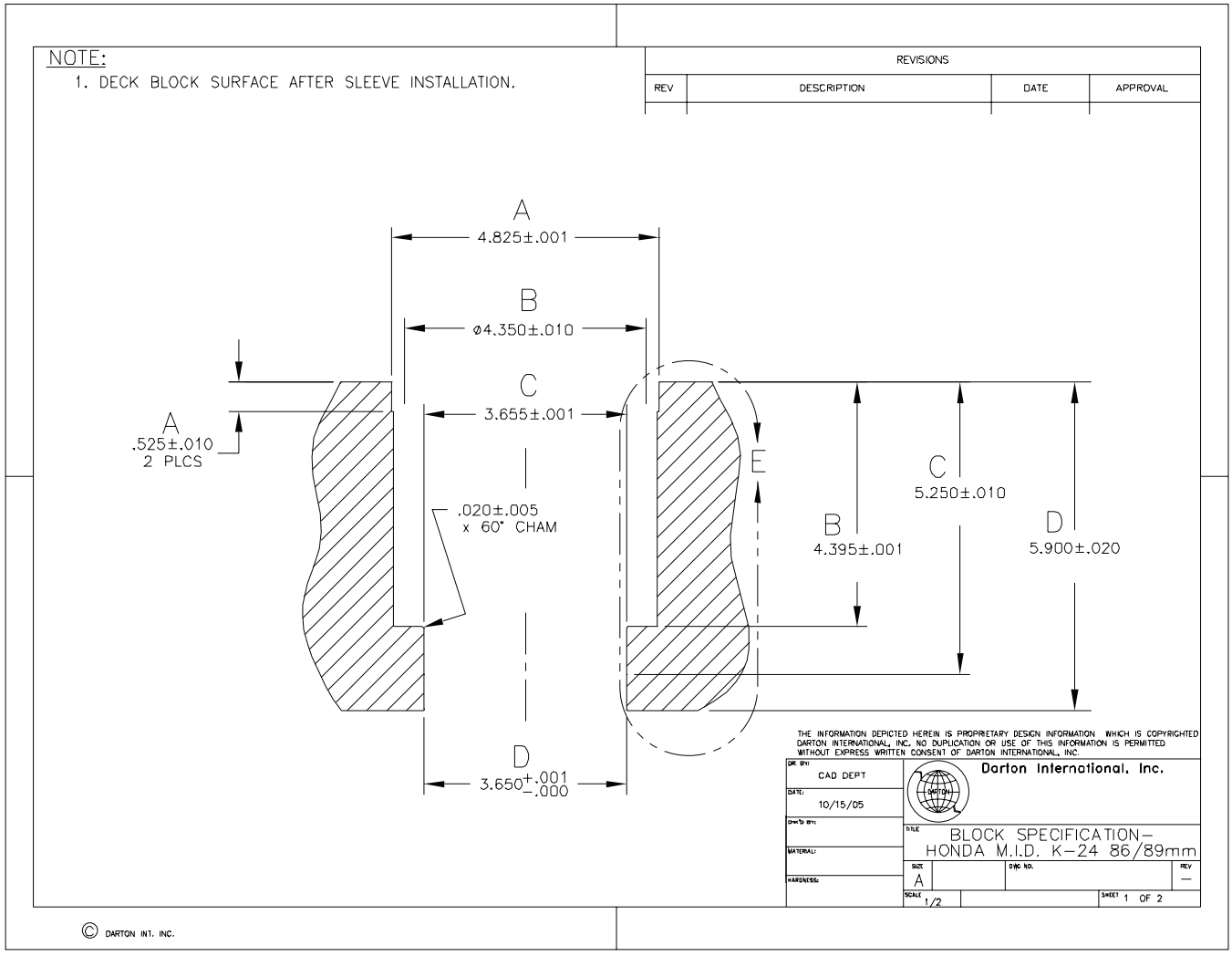
SIZE A | DWG NO. | REV B

SCALE 1/2 | SHEET 1 OF 2

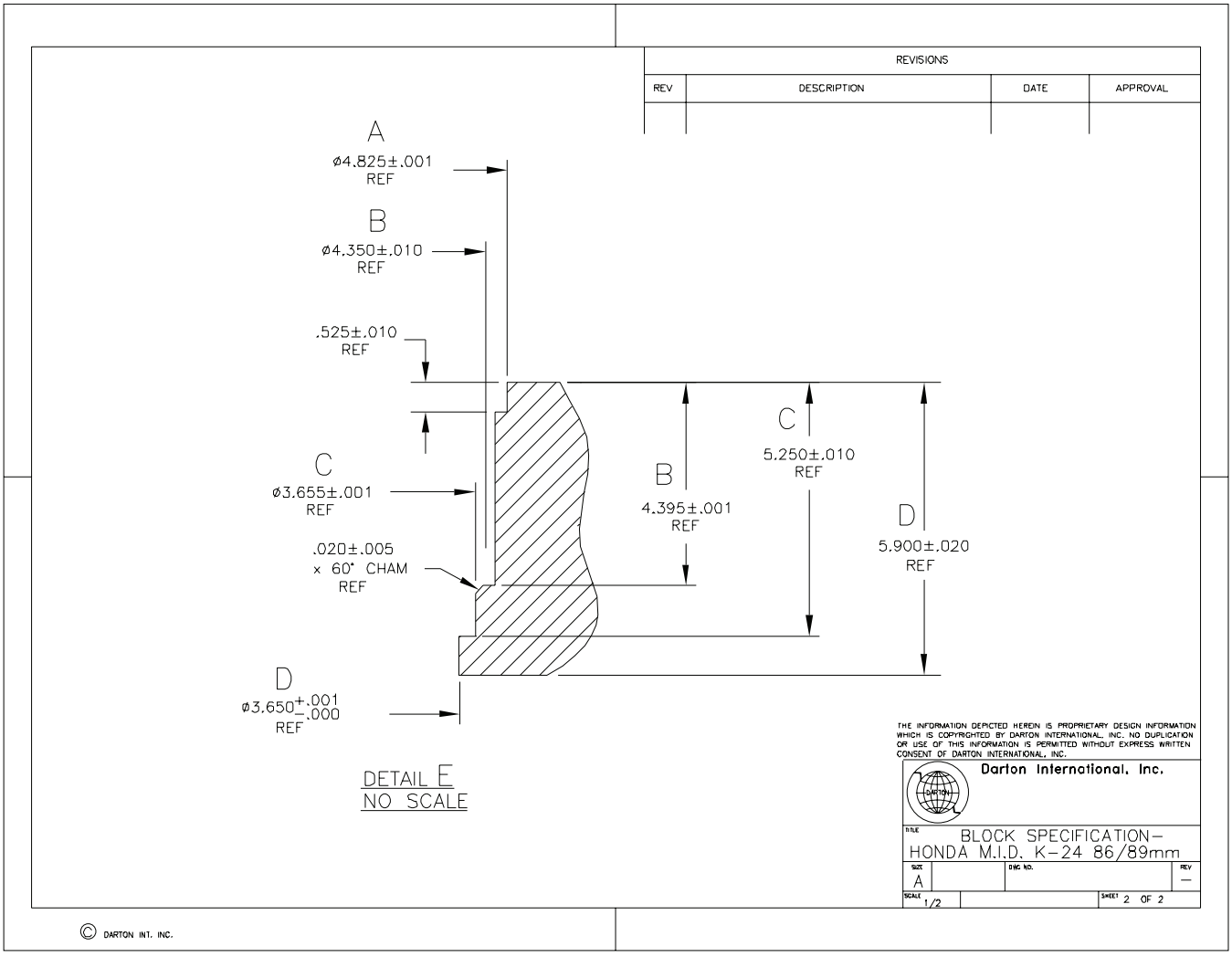
Honda M.I.D. K20-S2
Cylinder #1-4



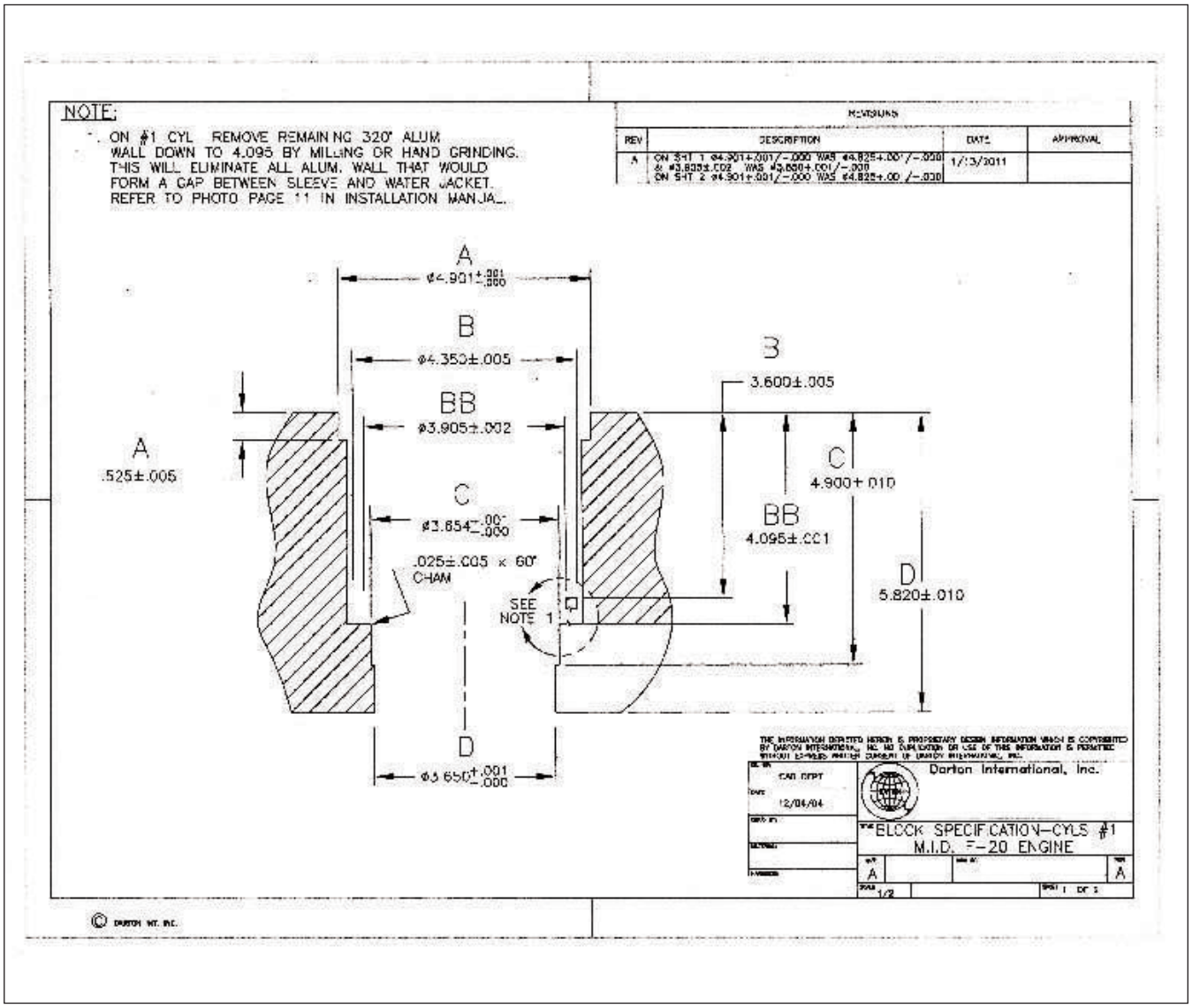
Honda M.I.D. K-24
Cylinder #S1



Honda M.I.D. K-24
Cylinder #S2



Honda M.I.D. F20-22 - S1
Cylinder #1



Honda M.I.D. F20-22 - S2
Cylinder #2-3-4