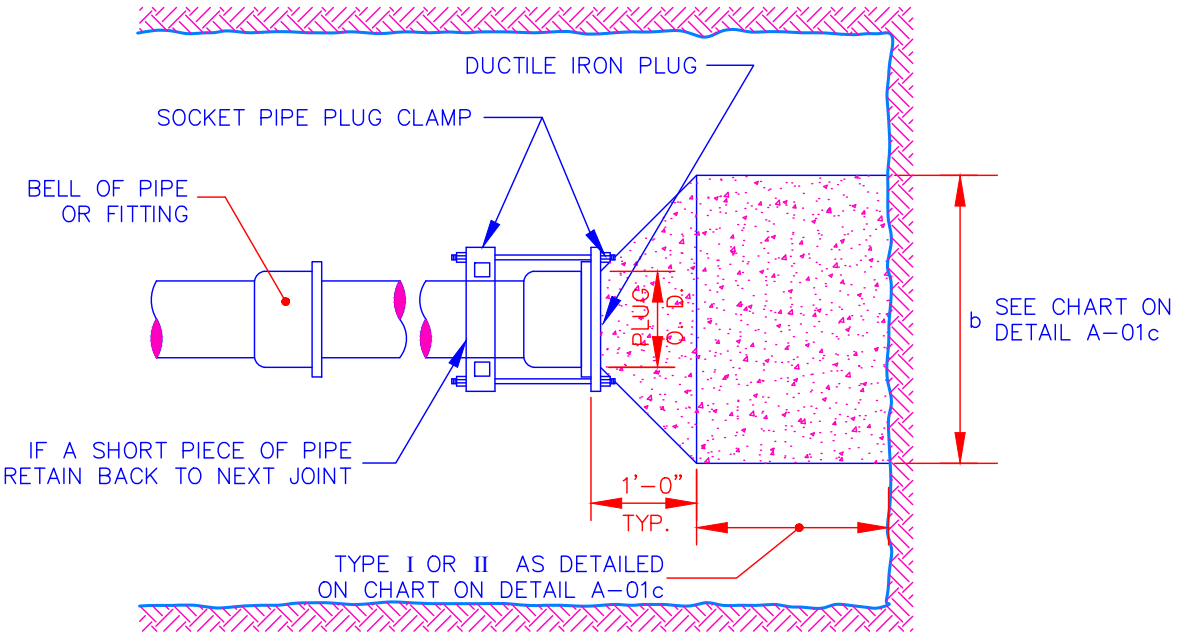
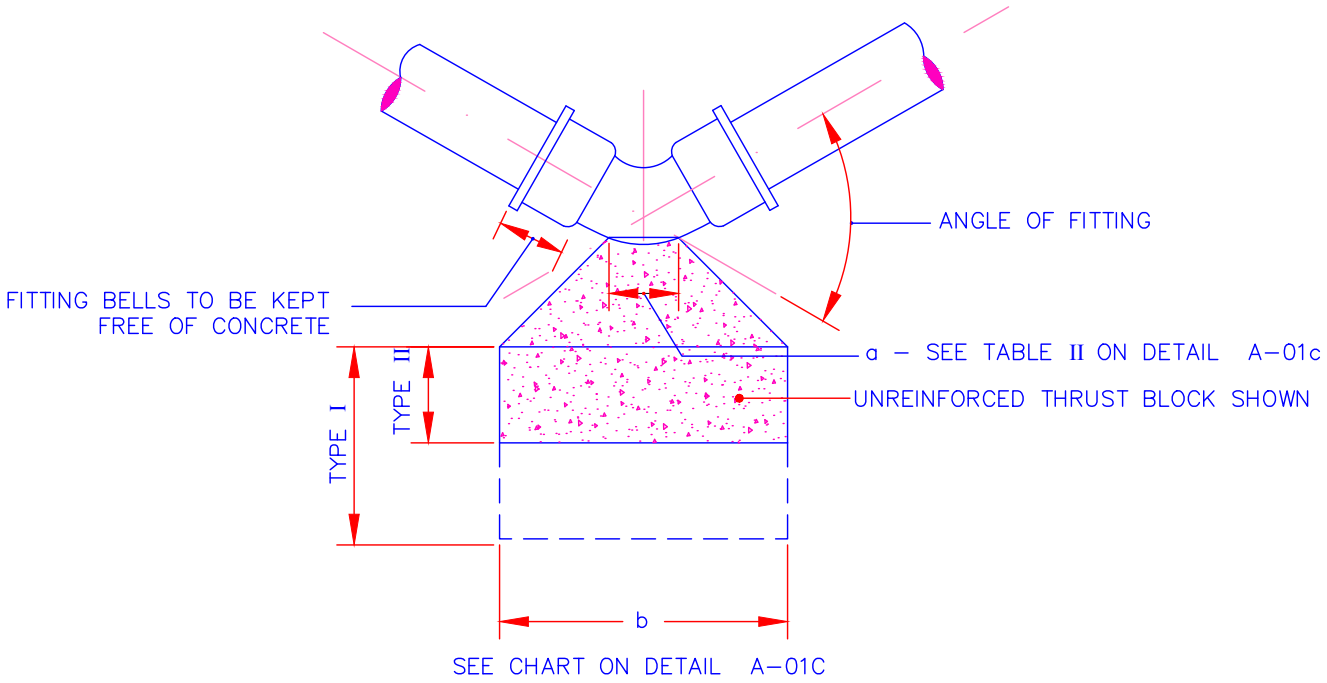


PLAN - DEAD END



PLAN - BEND

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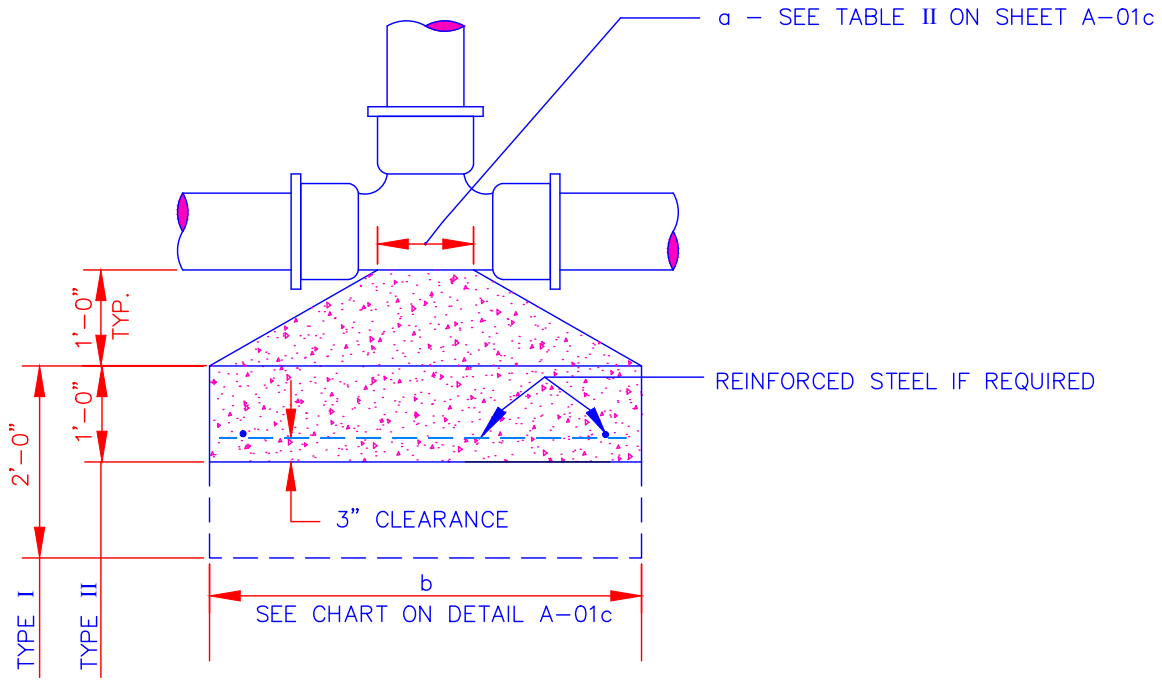
THRUST BLOCK DETAILS

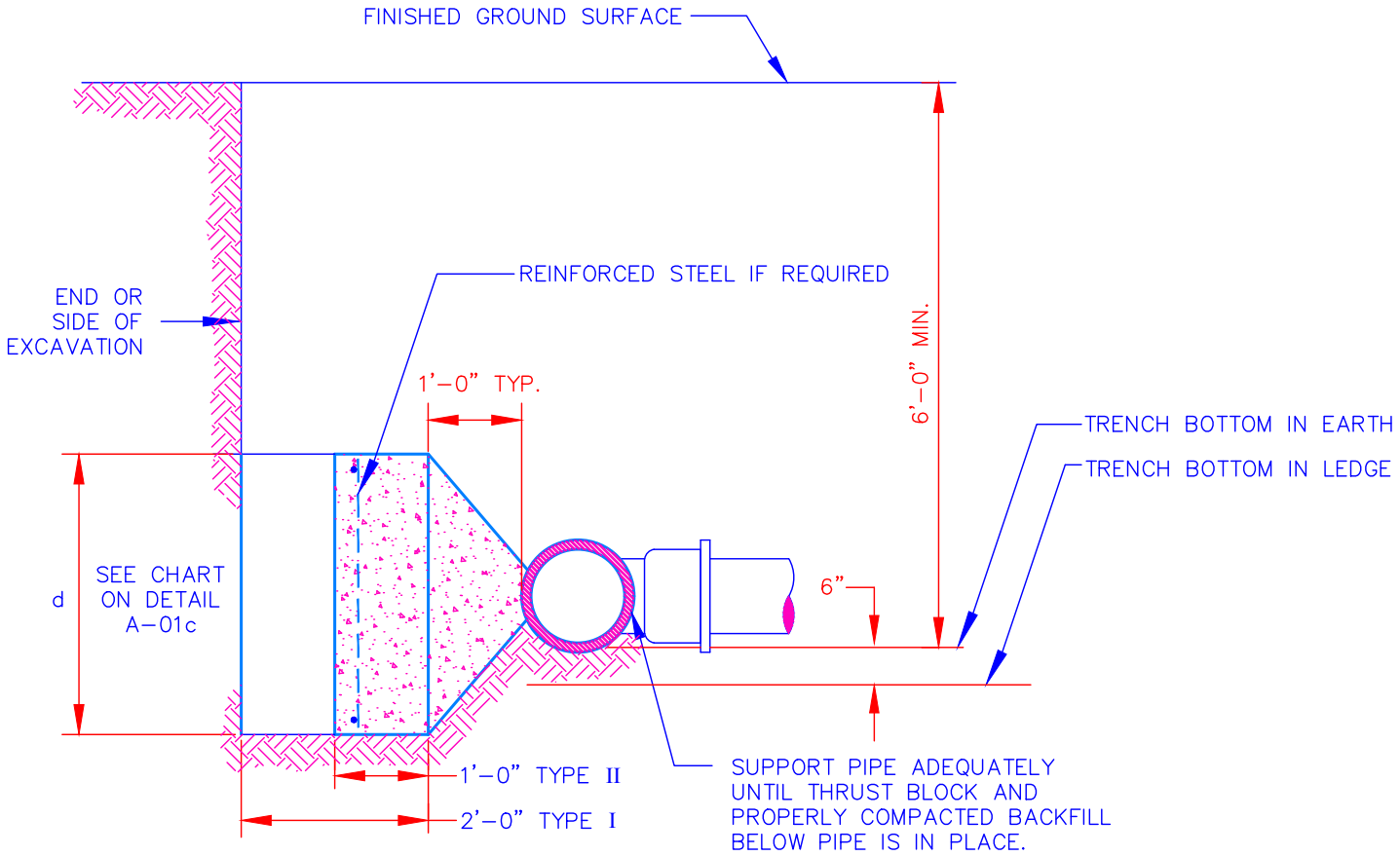
Scale: Not To Scale

DATE: Apr 30, 2012

DETAIL NO. A-01a



PLAN - TEE



TYPICAL SECTION

(FOR TEES, BENDS & DEAD ENDS)

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THRUST BLOCK DETAILS

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DETAIL NO. A-01b

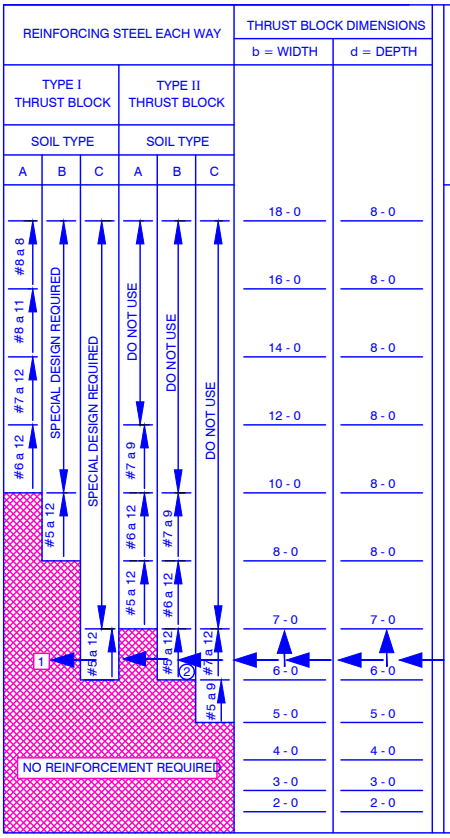
TABLE II - "a" DIMENSION - FEET

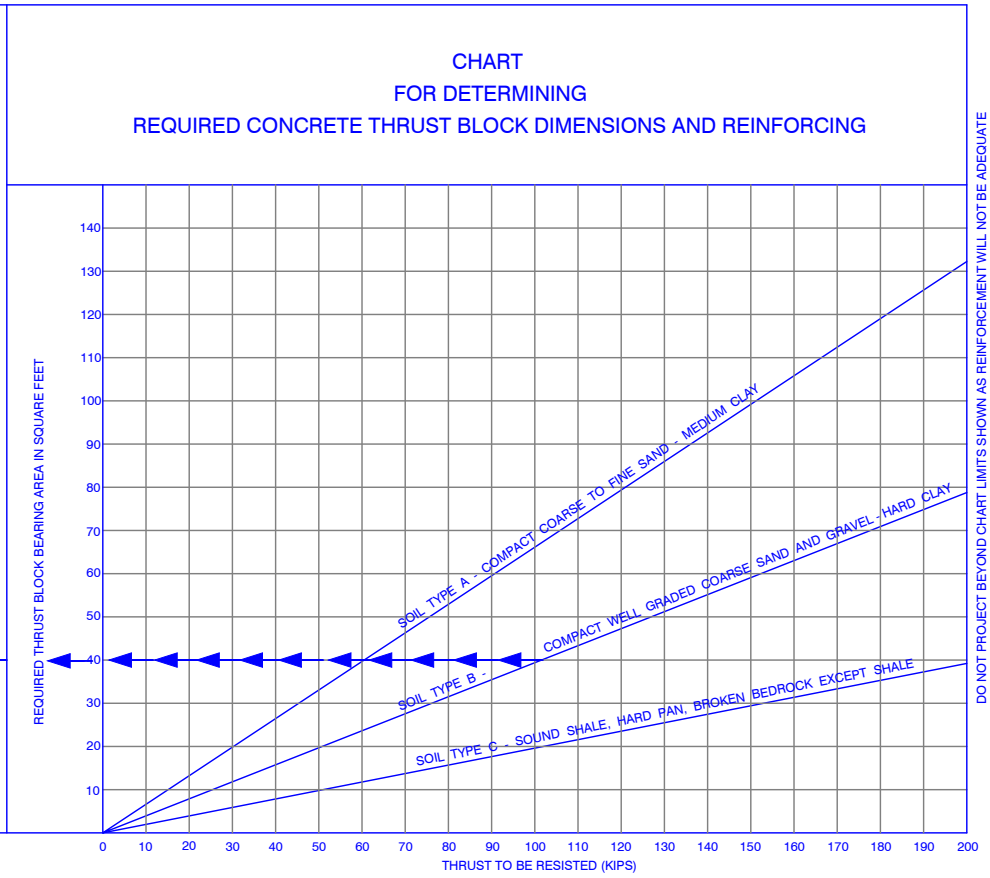
PIPE DIAMETER - INCHES	90° FITTING	OTHERS
6, 8, 10 & 12	1 - 6	1 - 0
16 & 20	2 - 0	1 - 6
24" - 30"	3 - 0	2 - 0

TABLE I - THRUST - KIPS (WATER PRESSURE = 200 P.S.I.)

PIPE DIAMETER INCHES		6	8	10	12	16	20	24	30	36	42
DEAD ENDS AND TEES		5.6	10	15.8	22.6	40.2	62.8	90.4	141.0	203.6	277.0
ANGLE FITTINGS	90°	7.9	14.2	22.4	32.0	56.8	88.8	127.7	199.0	288.0	392.0
	67 1/2°	-	11.1	17.6	25.1	44.7	70.0	100.2	157.0	226.0	308.0
	56 1/4°	-	-	14.9	21.2	37.9	59.2	85.1	133.0	192.0	261.0
	45°	-	-	-	17.3	30.8	48.1	69.0	108.0	156.0	212.0
	33 3/4°	-	-	-	13.1	23.3	36.5	52.5	82.0	118.0	161.0
	22 1/2°	-	-	-	8.8	15.7	24.5	35.2	55.0	79.5	108.0

DESIGN THRUST BLOCKS OR OTHER SUITABLE ANCHORAGE TO SUIT ACTUAL CONDITIONS





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THRUST BLOCK DIMENSIONS, TABLE AND CHART

Scale: Not To Scale

DATE: Apr 30, 2012

DETAIL NO. A-01c

NOTES :

All fittings shall be anchored by mechanical means or by concrete thrust blocks, or both, if required by the Boston Water and Sewer Commission or as noted on the contract plans.
All exposed metal shall be painted or coated. Concrete shall develop a minimum compressive stress of 3,000 p.s.i. at 28 days. Reinforcing steel shall be A.S.T.M. A615 Grade 40. Water pressure in Table 1 includes water hammer allowance.

The actual method of restraint must be determined by actual field conditions. These are typical installations to be used as a guide to the designer. Final designs are subject to review by the Boston Water and Sewer Commission.

ILLUSTRATIVE PROBLEM

Design a thrust block for a 67-1/2° bend,
a 24-inch diameter water main,
carrying a maximum pressure of 200 p.s.i.
Soil classified as a well graded
compact coarse sand and gravel.

SOLUTION

1. Enter Table I at 24-inch pipe diameter - go vertically down column until opposite 67-1/2° angle fitting. read thrust = 100.2 kips.
2. See chart immediately below Table I - select soil type curve reflecting actual soil classification. Type B for this problem.
3. Enter chart at thrust to be resisted and go vertically to soil type curve selected in 2 above - see chart and follow illustrative problem arrow line from 100.2 kip thrust to soil Type B curve.
4. From this intersection go horizontally following arrow line to intersection with required thrust block bearing area in square feet - 40 square feet minimum is required to resist thrust.
5. Continue horizontally to "thrust block dimensions" column and select dimensions "**b**" and "**d**" immediately above horizontal arrow line projection.
   7' - 0" square thrust block required for this problem.
6. Continue horizontally to "**reinforcing steel - each way**" column, noting columns further classification by soil type and footing type.
   (see "**thrust block detail**", for type I and type II requirements.)
   Two solutions to illustrative problem are acceptable:
   solution 1 - type I thrust block and soil type B indicate no reinforcement required.
   solution 2 - type II thrust block and soil type B indicate #5 A 12 each way required.

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THRUST BLOCK NOTES AND ILLUSTRATIVE PROBLEM

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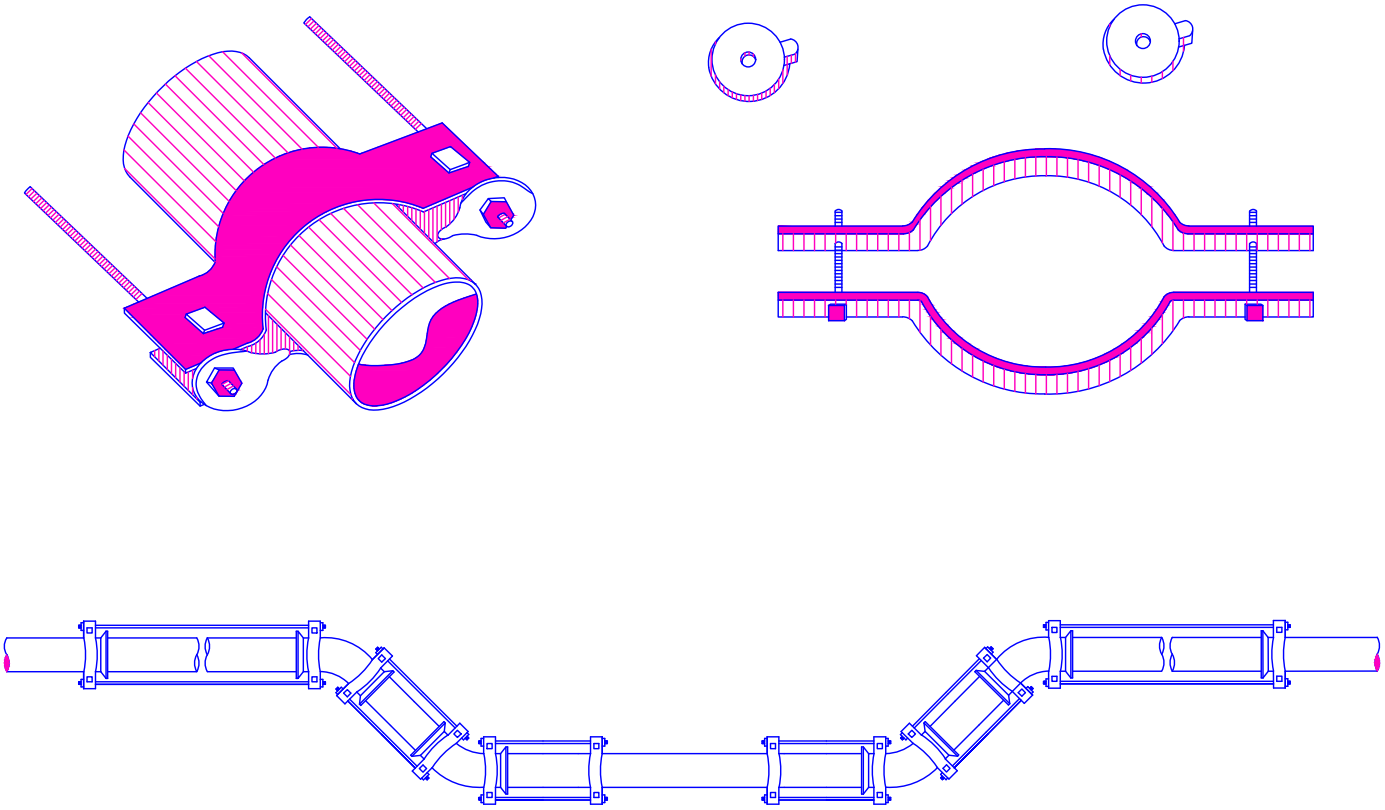
DETAIL NO. A-01d

SCHEDULE OF TIE RODS

PIPE SIZE	NUMBER OF RODS PER FITTING	DIAMETER OF RODS
4" - 12"	2	3/4"
16"	4	3/4"
20" - 24"	4	1 1/2"
36"	6	1 1/2"



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TYPICAL THRUST RESTRAINTS USING TIE RODS AND FRICTION CLAMPS

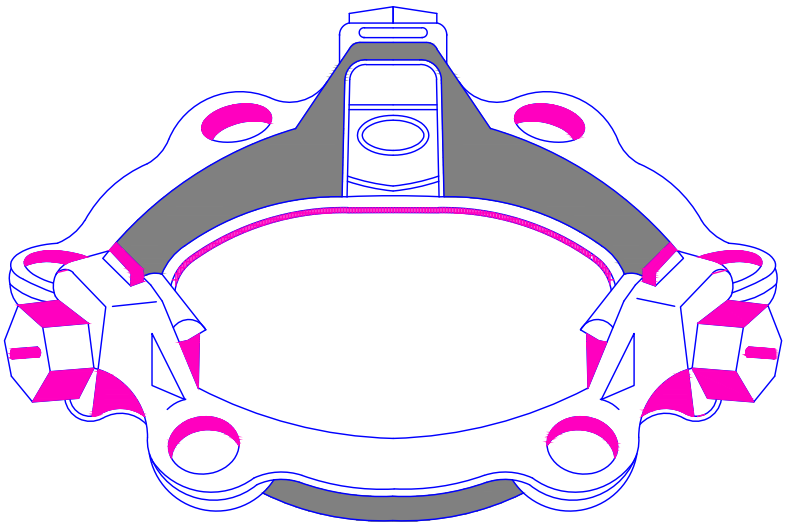
Scale: Not To Scale

DATE: Apr 30, 2012

DETAIL NO. A-01e

NOTE :

Devices need to be placed beyond the area of restraints in accordance with manufactures recommendations.



WEDGE ACTION
RESTRAINT DEVICE

TYPICAL THRUST RESTRAINT USING
WEDGE ACTION RESTRAINT DEVICE

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TYPICAL THRUST RESTRAINT WEDGE ACTION RESTRAINT TYPE JOINTS

Scale: Not To Scale

DATE:	DETAIL NO.
Apr 30, 2012	A-01f