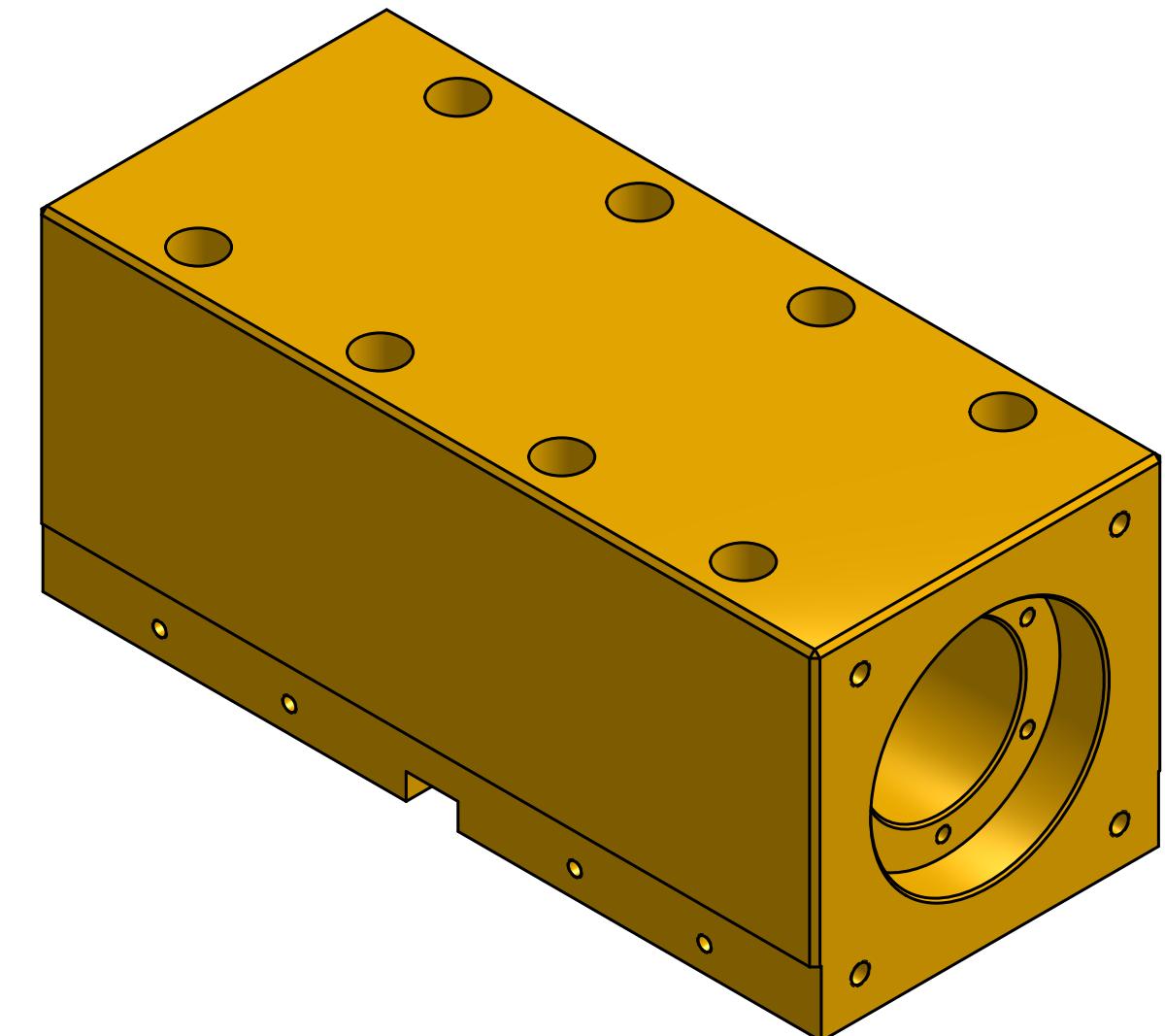
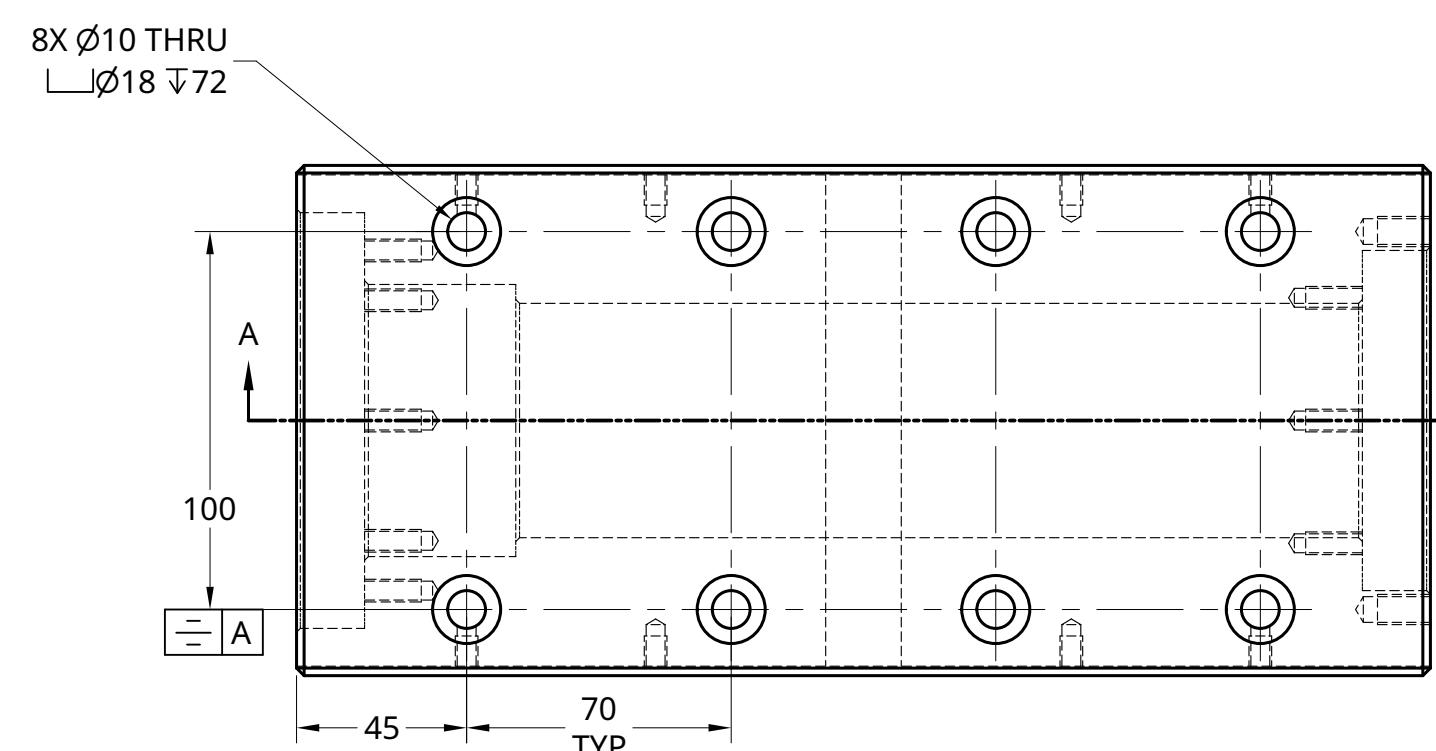
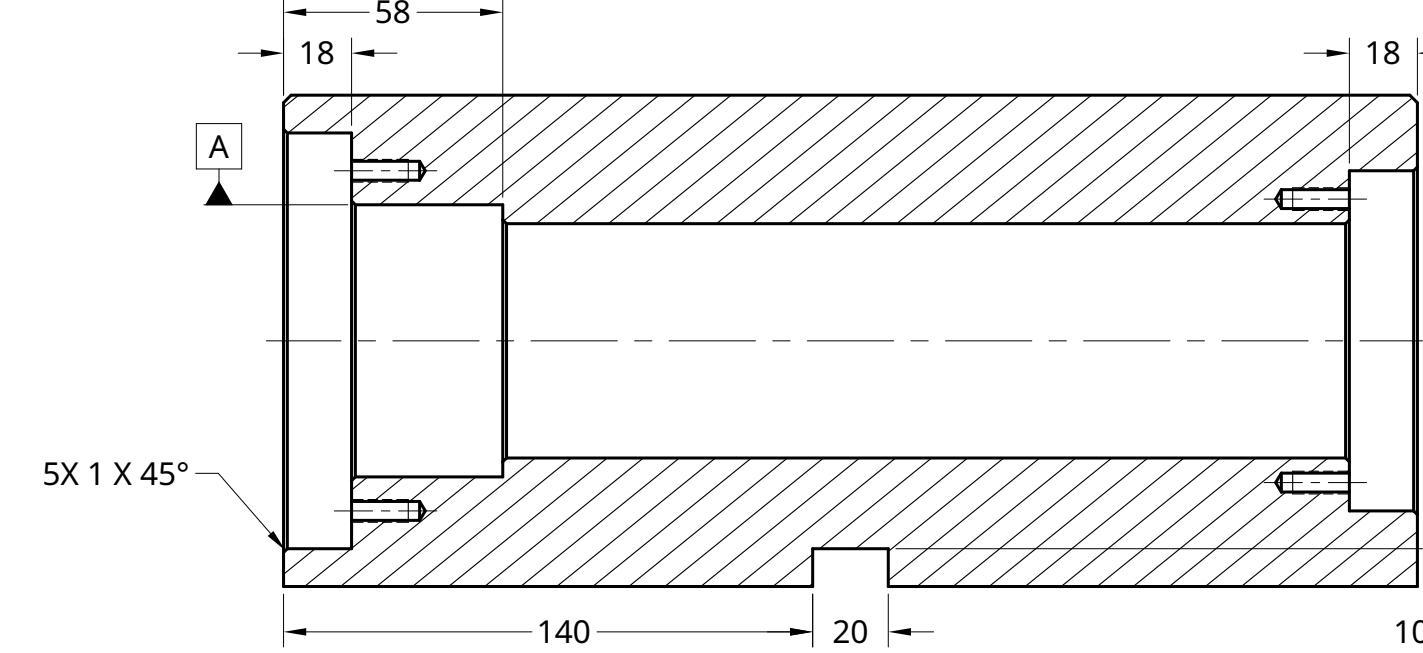
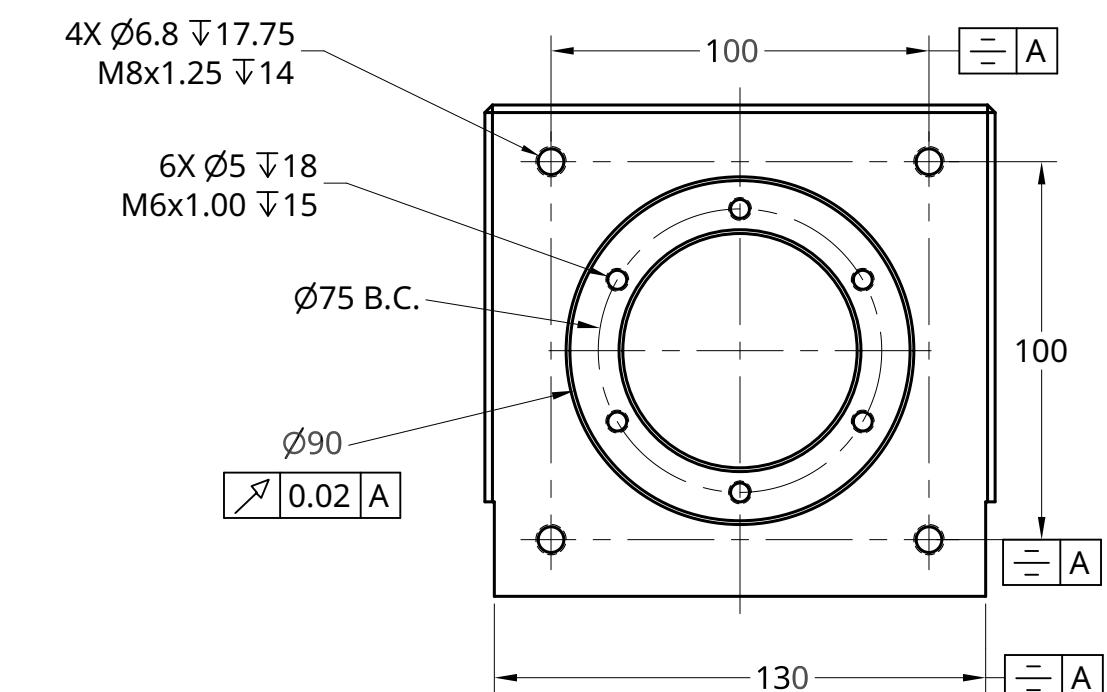
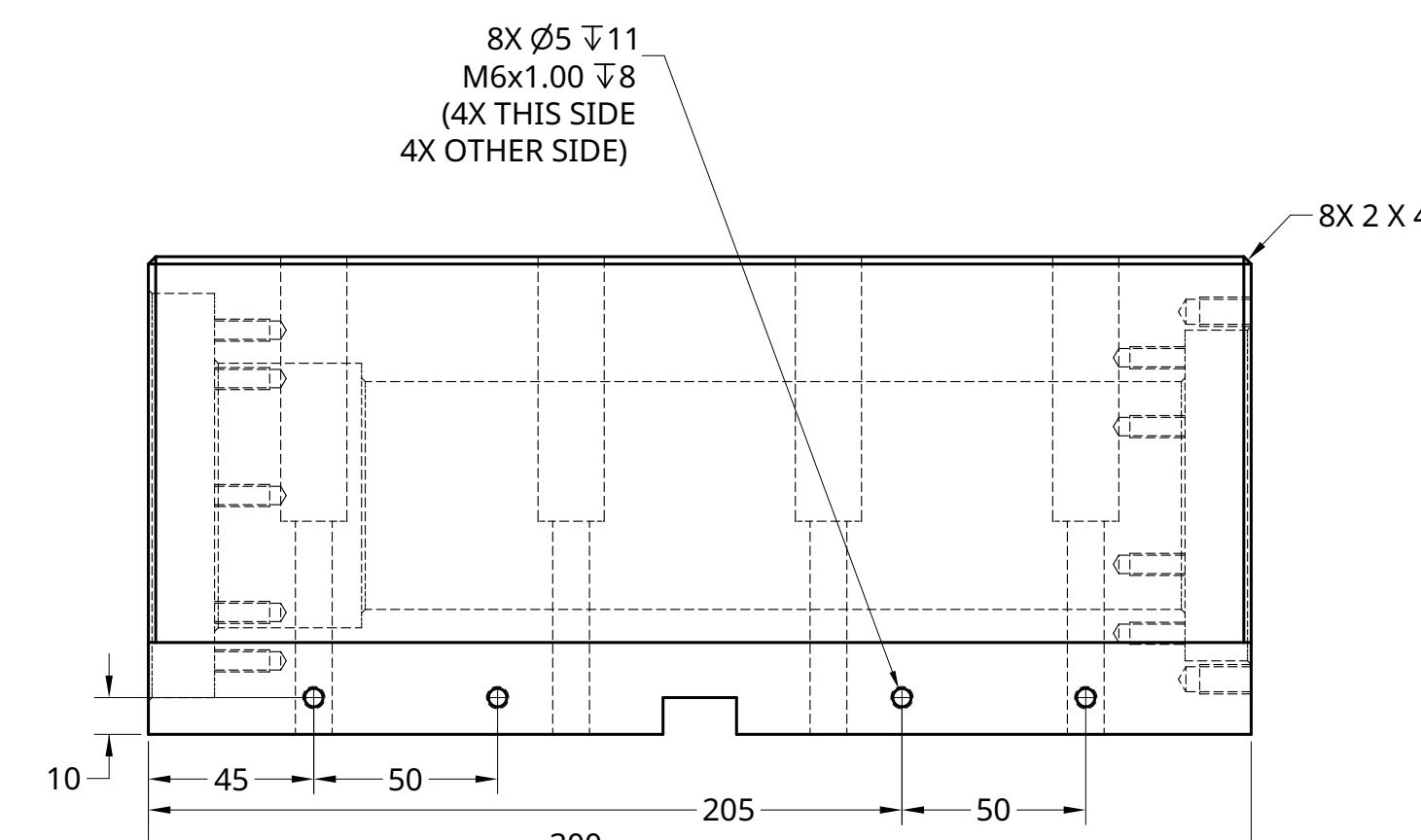
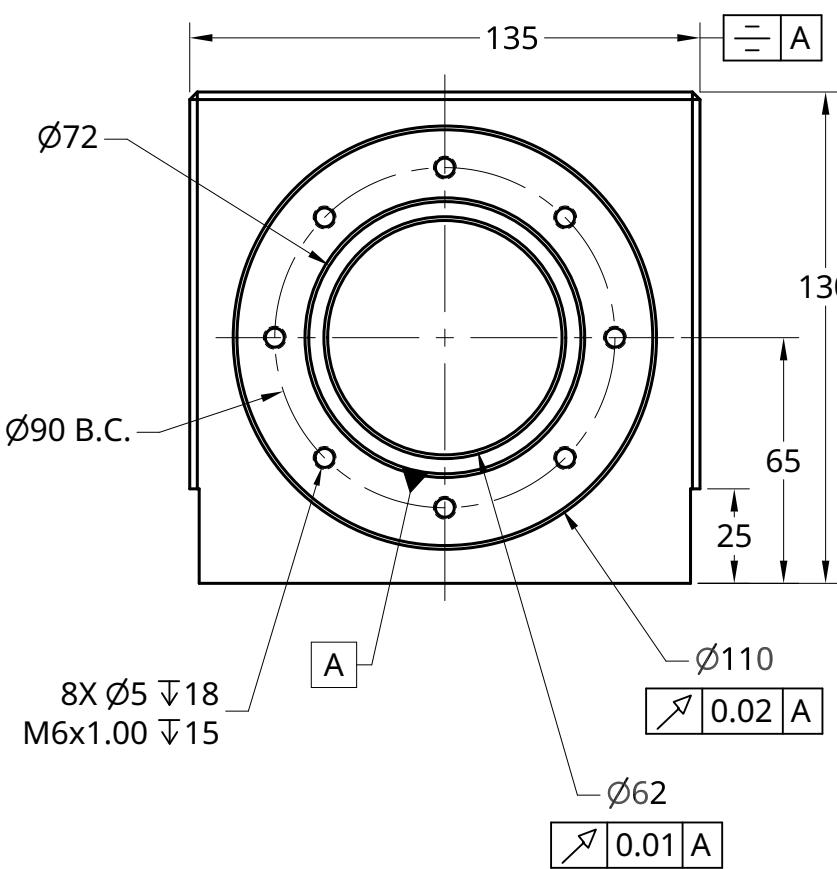


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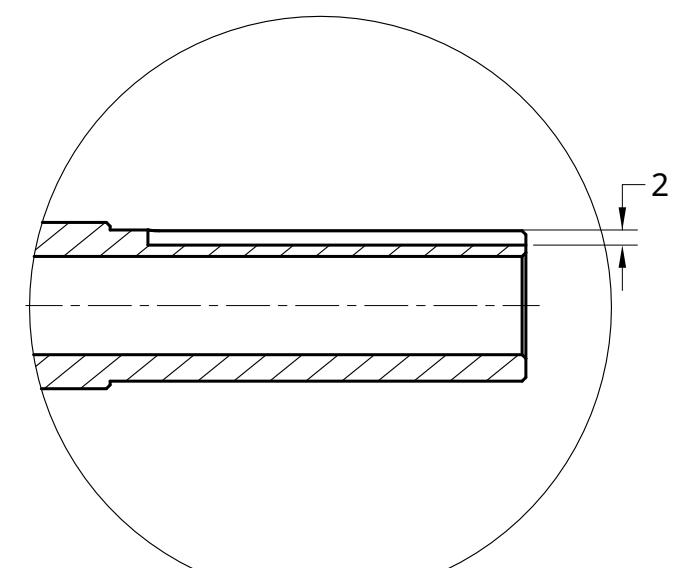
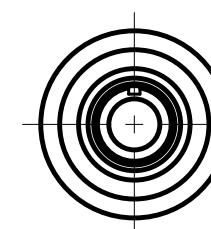
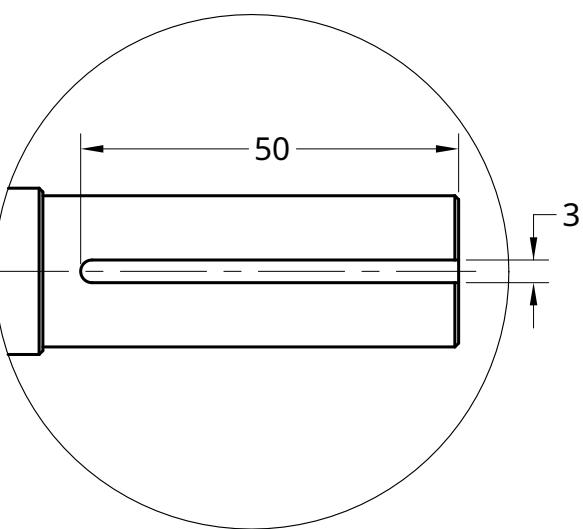
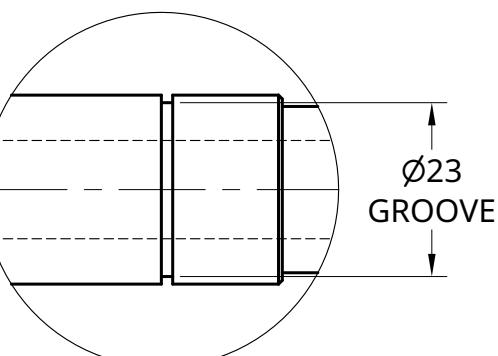
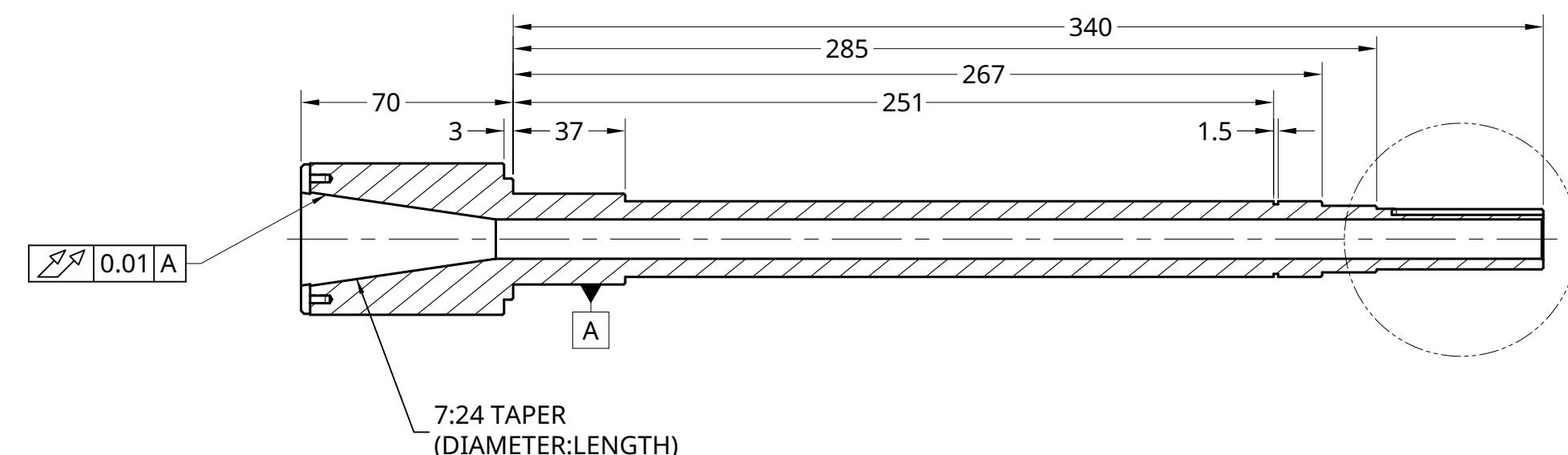
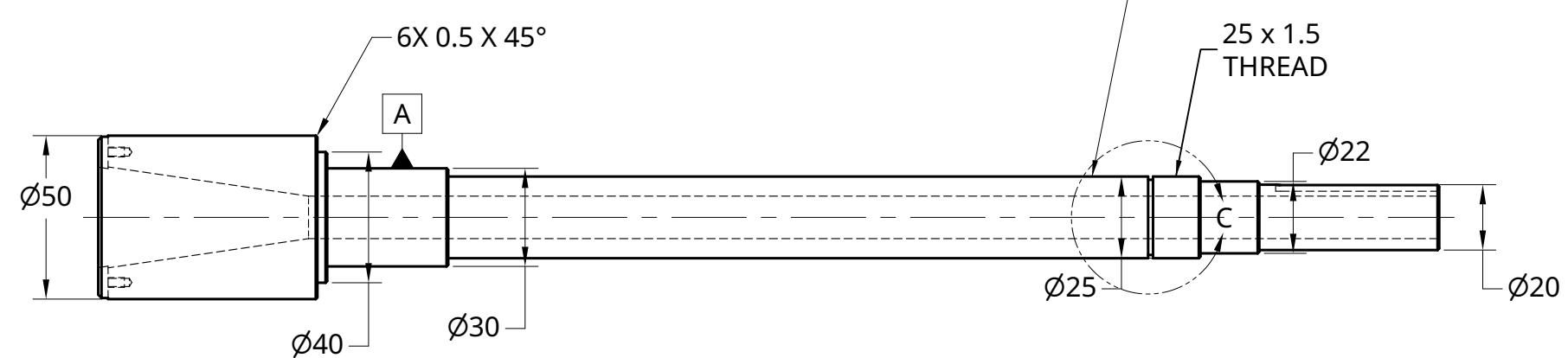
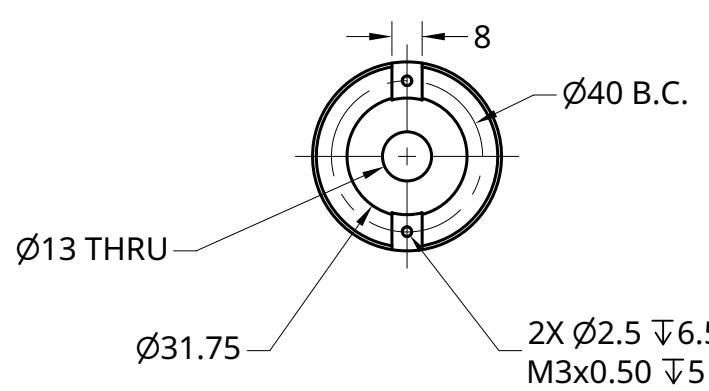
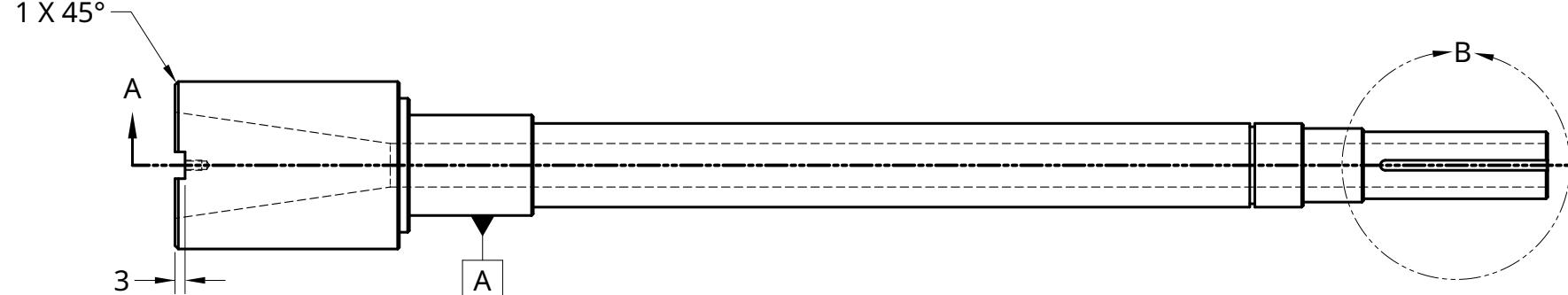
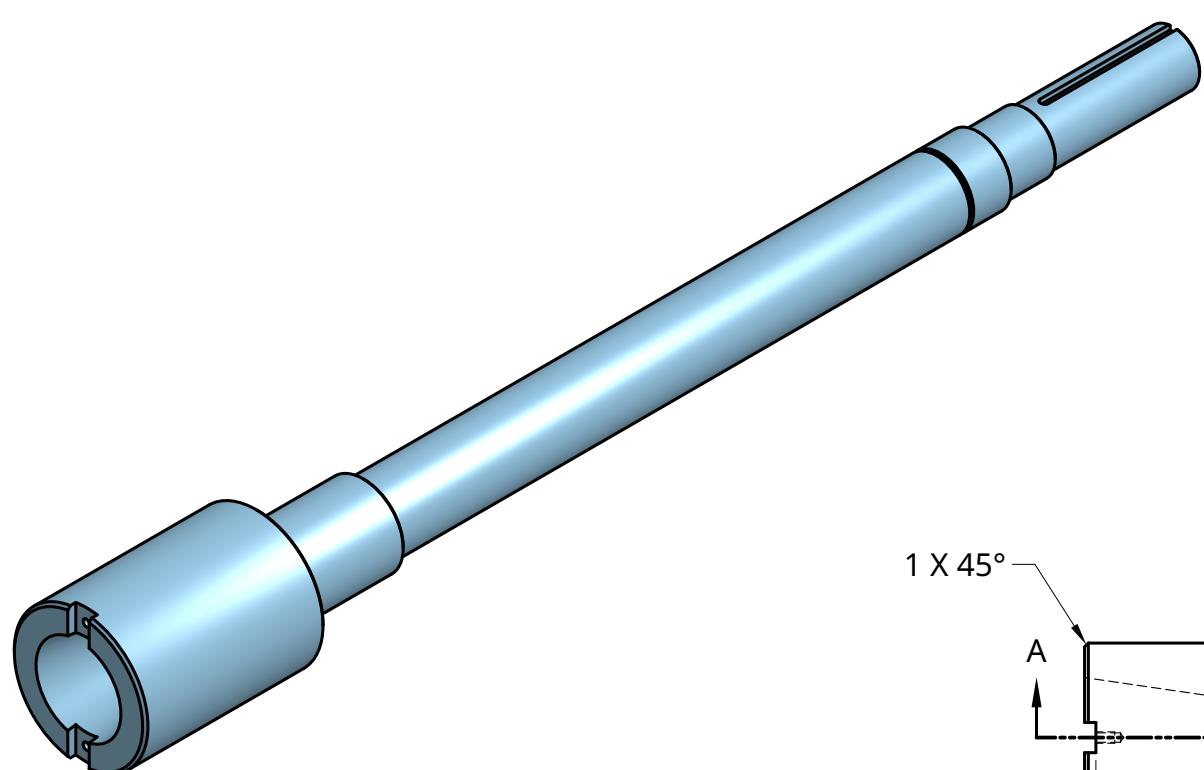


C



SECTION A - A

| Ferris State University                                                                                                                                        |                                                     |                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------------------|
| DRILL UNIT<br>SPINDLE ASSEMBLY DETAILS<br>SPINDLE HOUSING                                                                                                      |                                                     |                                   |
| SIZE                                                                                                                                                           | DWG NO.                                             | REV.                              |
| C                                                                                                                                                              | BR-549-A-001                                        |                                   |
| SCALE 1:4                                                                                                                                                      | WEIGHT 27.071 kg                                    | Sheet 1 of 8                      |
| UNLESS OTHERWISE SPECIFIED,<br>.XX + .0-.<br>.XXX + .00-.<br>.XXXX + .0000-<br>DIMENSIONS ARE IN INCHES<br>ANGULAR + ± *<br>FRACTIONAL + ±<br>SURFACE FINISH ✓ | NAME<br>DRAWN<br>BRIAN BRADY<br>CHECKED<br>APPROVED | DATE<br>10/16/2019                |
| DO NOT SCALE DRAWING<br>BREAK ALL SHARP EDGES AND<br>REMOVE BURRS                                                                                              |                                                     |                                   |
| THIRD ANGLE PROJECTION                                                                                                                                         | MATERIAL<br>CAST IRON                               | VOLUME<br>3881130 mm <sup>3</sup> |



|                                                                                                                               |                                                    |
|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| UNLESS OTHERWISE SPECIFIED,<br>.XX ± .D.<br>.XXX ± .00.<br>.XXXX ± .000.<br>ANGULAR ± °<br>FRACTIONAL ± #<br>SURFACE FINISH ✓ | NAME<br>DRAWN<br>BRIAN BRADY<br>DATE<br>10/16/2019 |
| CHECKED                                                                                                                       |                                                    |
| APPROVED                                                                                                                      |                                                    |
| DO NOT SCALE DRAWING                                                                                                          |                                                    |
| BREAK ALL SHARP EDGES AND REMOVE BURRS                                                                                        |                                                    |
| THIRD ANGLE PROJECTION                                                                                                        | MATERIAL<br>STEEL 8620<br>VOLUME<br>224786 mm³     |
|                                                                                                                               | SCALE 1:2<br>DWG NO. BR-549-A-002<br>REV.          |

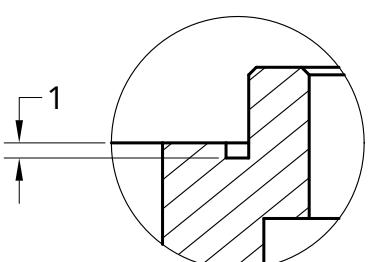
Ferris State University  
DRILL UNIT  
SPINDLE ASSEMBLY DETAILS  
SPINDLE SHAFT  
SIZE C DWG NO. BR-549-A-002 REV.  
SCALE 1:2 WEIGHT 1.765 kg SHEET 2 of 8

4

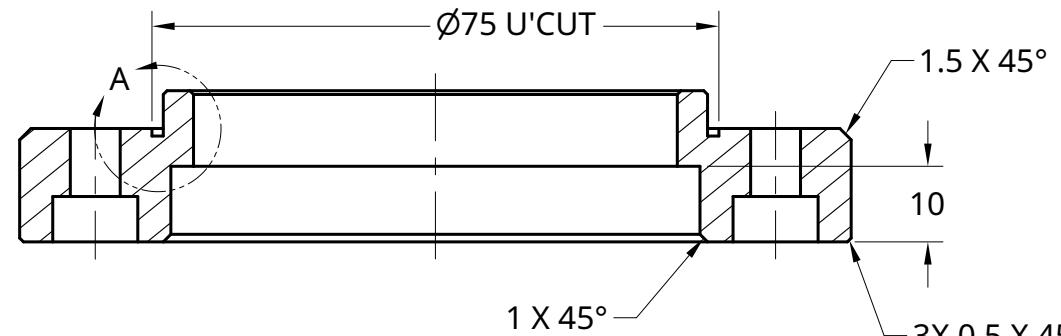
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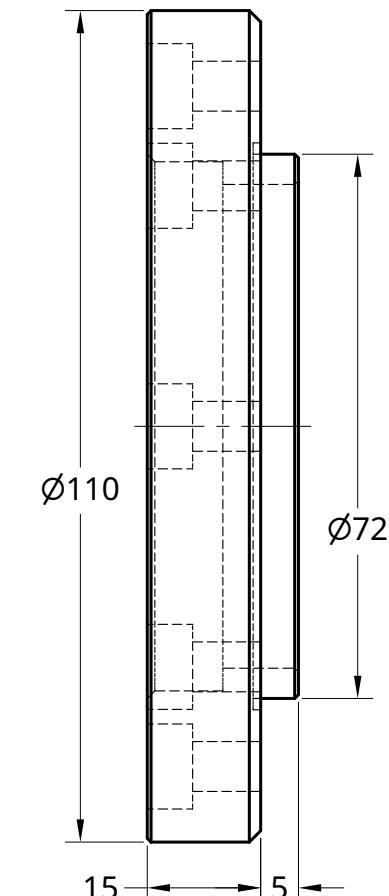
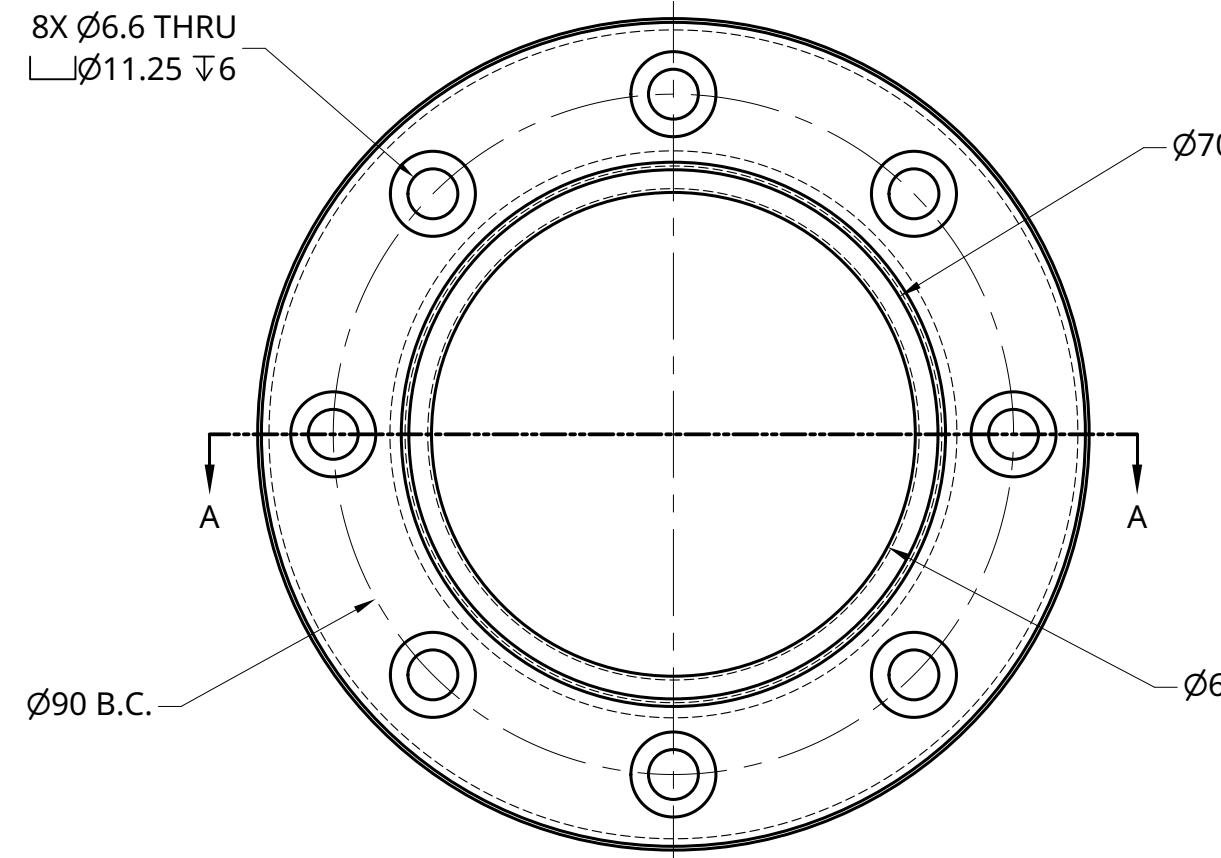
1



DETAIL A  
SCALE 2:1



SECTION A - A



UNLESS OTHERWISE SPECIFIED,  
DIMENSIONS ARE IN INCHES  
.XX = ±.0-  
.XXX = ±.00-  
.XXXX = ±.000- ANGULAR = ± °  
FRACTIONAL = ±

SURFACE FINISH ✓

DO NOT SCALE DRAWING

BREAK ALL SHARP EDGES AND REMOVE BURRS

THIRD ANGLE PROJECTION



DRAWN BRIAN BRADY DATE 10/16/2019  
CHECKED \_\_\_\_\_  
APPROVED \_\_\_\_\_

TITLE DRILL UNIT  
SPINDLE ASSEMBLY DETAILS  
FRONT BEARING CAP

SIZE B DWG NO. BR-549-A-003 REV.

MATERIAL STEEL 4130 VOLUME 84079 mm³

SCALE 1:1 WEIGHT 0.660 kg SHEET 3 of 8

A

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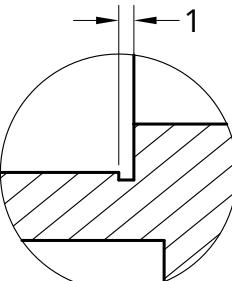
Ferris State University

4

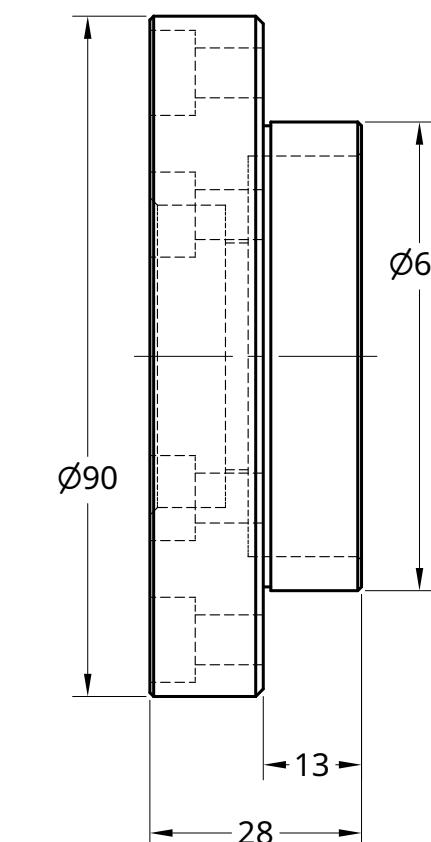
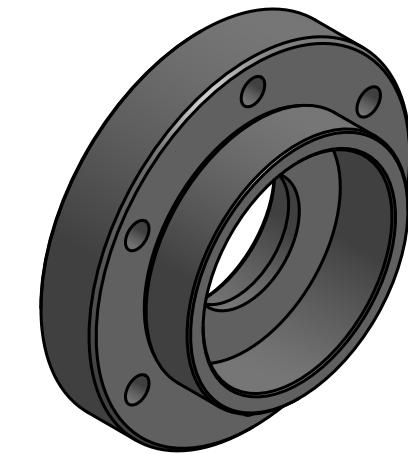
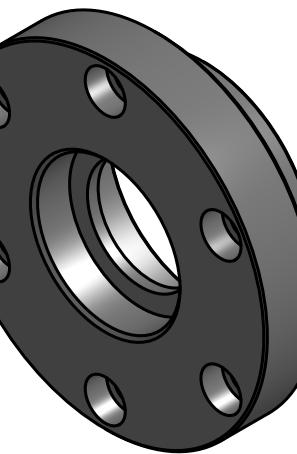
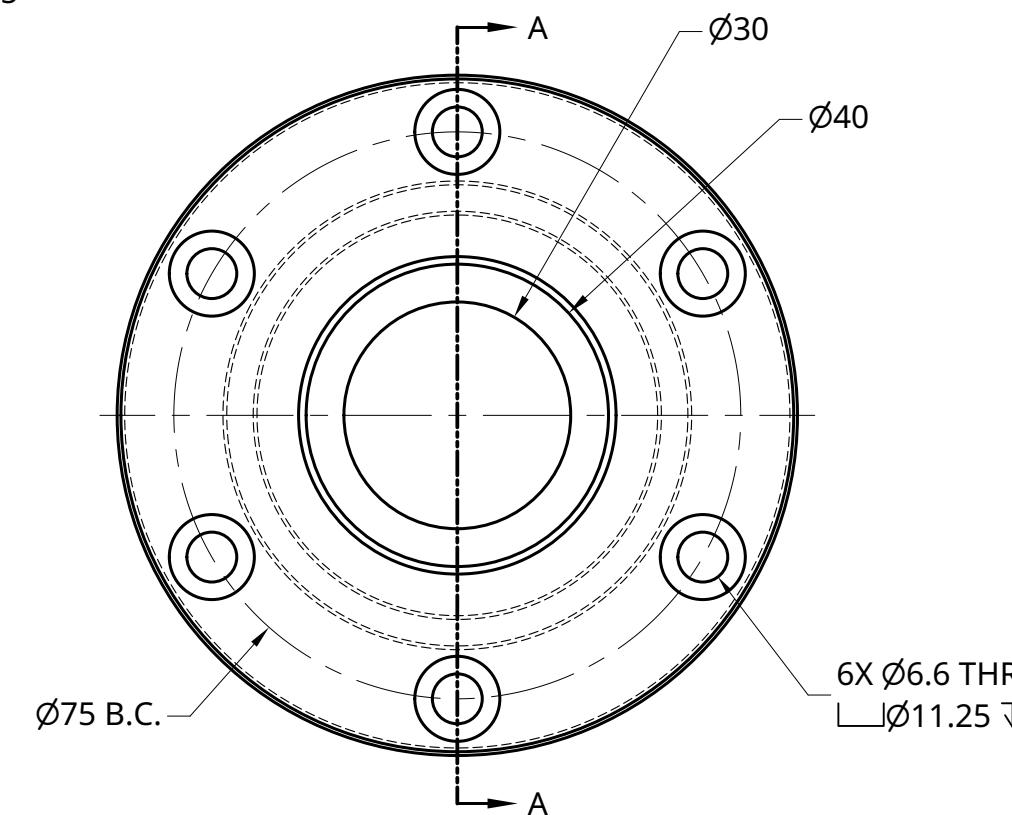
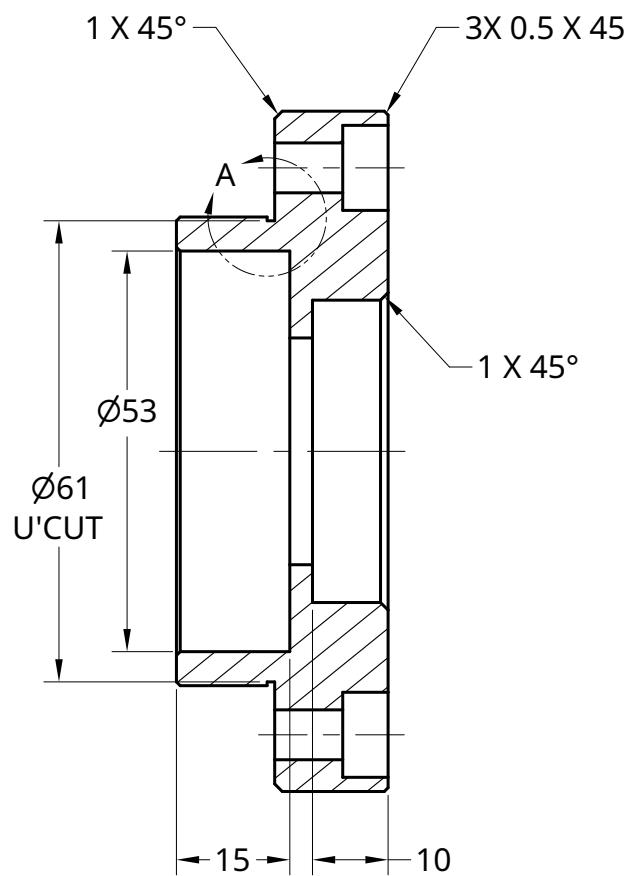
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DETAIL A  
SCALE 2:1



SECTION A - A

|                                                                                                                                         |                      |                       |            |
|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------|------------|
| UNLESS OTHERWISE SPECIFIED,<br>DIMENSIONS ARE IN INCHES<br>.XX = ±.0-<br>.XXX = ±.00-<br>.XXXX = ±.000- ANGULAR = ± °<br>FRACTIONAL = ± |                      | NAME                  | DATE       |
| SURFACE FINISH ✓                                                                                                                        | DRAWN                | BRIAN BRADY           | 10/16/2019 |
| DO NOT SCALE DRAWING                                                                                                                    | CHECKED              |                       |            |
| BREAK ALL SHARP EDGES AND REMOVE BURRS                                                                                                  | APPROVED             |                       |            |
| THIRD ANGLE PROJECTION                                                                                                                  | MATERIAL             | VOLUME                |            |
|                                                                                                                                         | STEEL 4130           | 81087 mm <sup>3</sup> | REV.       |
|                                                                                                                                         | SCALE 1:1            | WEIGHT 0.637 kg       | 4 of 8     |
|                                                                                                                                         | DWG NO. BR-549-A-004 |                       |            |

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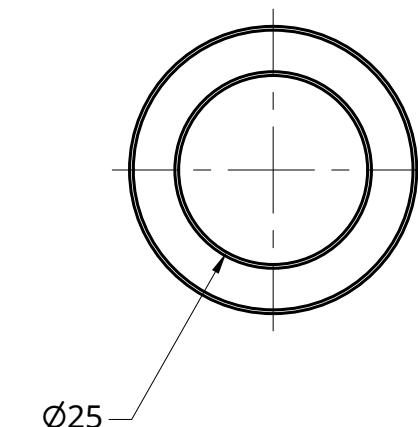
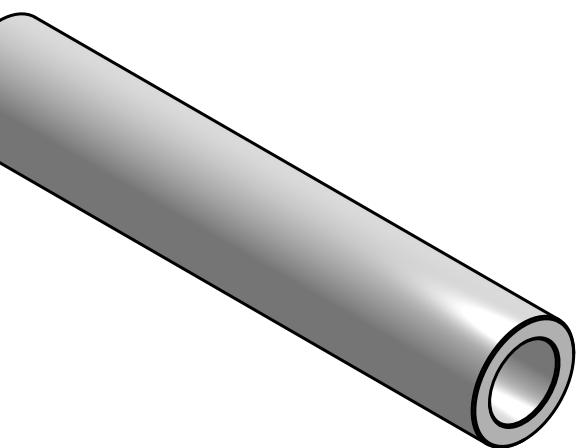
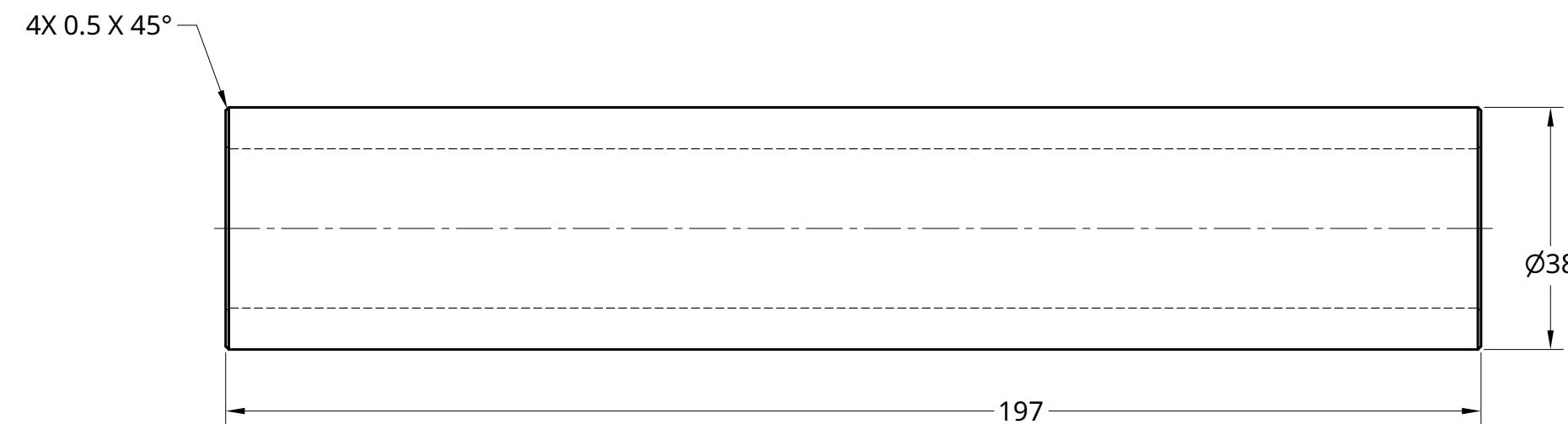
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|                                                                                                                                         |  |                                           |            |            |                                                                |              |
|-----------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------|------------|------------|----------------------------------------------------------------|--------------|
| UNLESS OTHERWISE SPECIFIED,<br>DIMENSIONS ARE IN INCHES<br>.XX = ±.0-<br>.XXX = ±.00-<br>.XXXX = ±.000- ANGULAR = ± °<br>FRACTIONAL = ± |  | DRAWN                                     | NAME       | DATE       | Ferris State University                                        |              |
|                                                                                                                                         |  | CHECKED                                   |            | 10/16/2019 |                                                                |              |
|                                                                                                                                         |  | APPROVED                                  |            |            |                                                                |              |
|                                                                                                                                         |  | DO NOT SCALE DRAWING                      |            |            |                                                                |              |
|                                                                                                                                         |  | BREAK ALL SHARP EDGES AND<br>REMOVE BURRS |            |            | DRILL UNIT<br>SPINDLE ASSEMBLY DETAILS<br>INNER BEARING SPACER |              |
|                                                                                                                                         |  | THIRD ANGLE PROJECTION                    | MATERIAL   | VOLUME     | SIZE                                                           | DWG NO.      |
|                                                                                                                                         |  |                                           | STEEL 1020 | 126669 mm³ | B                                                              | BR-549-A-005 |
|                                                                                                                                         |  |                                           | SCALE      | 1:1        | WEIGHT                                                         | 0.997 kg     |
|                                                                                                                                         |  |                                           |            |            | SHEET                                                          | 5 of 8       |

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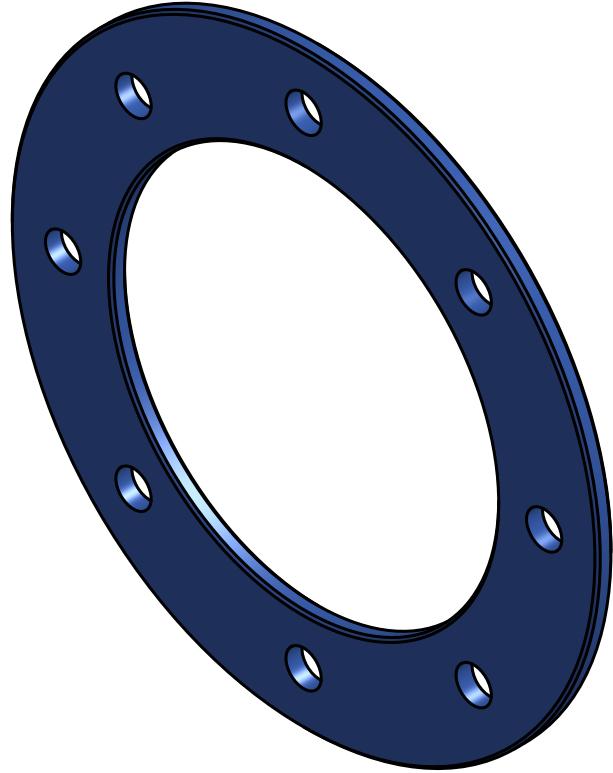
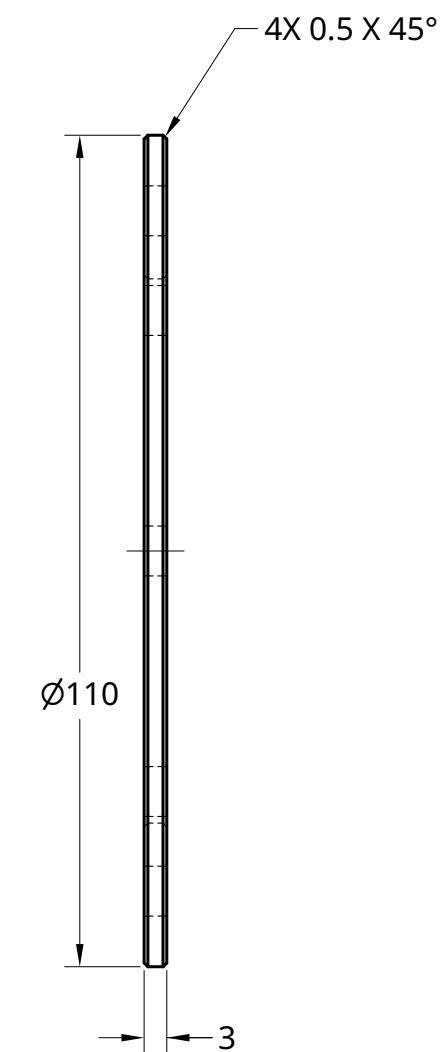
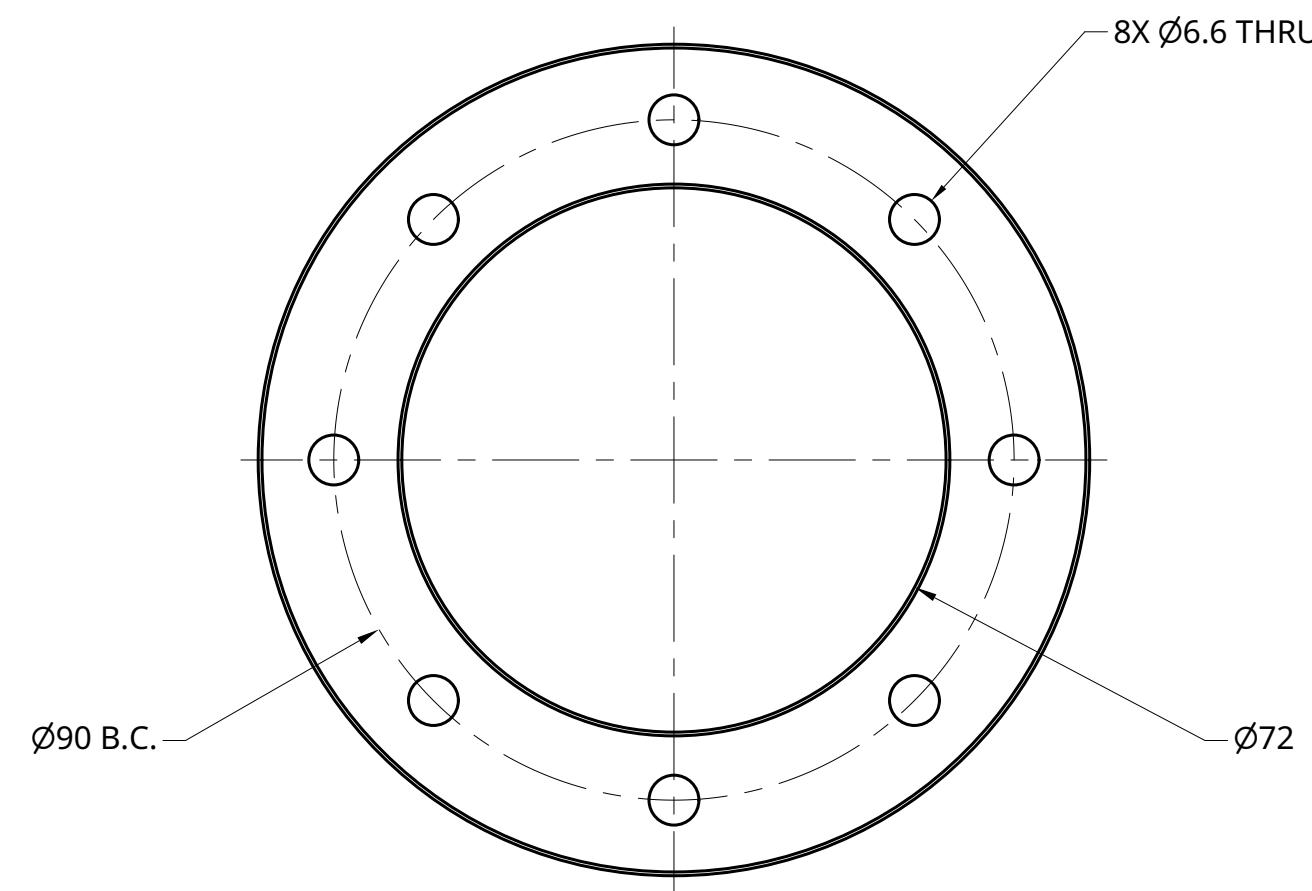
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|                                                                                                                                         |             |                     |            |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------|------------|
| UNLESS OTHERWISE SPECIFIED,<br>DIMENSIONS ARE IN INCHES<br>.XX = ±.0-.<br>.XXX = ±.00-. ANGULAR = ± °<br>.XXXX = ±.000-. FRACTIONAL = ± |             |                     |            |
| DRAWN                                                                                                                                   | BRIAN BRADY | DATE                | 10/16/2019 |
| CHECKED                                                                                                                                 |             |                     |            |
| APPROVED                                                                                                                                |             |                     |            |
| <b>Ferris State University</b>                                                                                                          |             |                     |            |
| <b>DRILL UNIT</b>                                                                                                                       |             |                     |            |
| <b>SPINDLE ASSEMBLY DETAILS</b>                                                                                                         |             |                     |            |
| <b>FRONT FITTING SPACER</b>                                                                                                             |             |                     |            |
| SIZE                                                                                                                                    | DWG NO.     | <b>BR-549-A-006</b> |            |
| B                                                                                                                                       |             |                     |            |
| SCALE                                                                                                                                   | 1:1         | WEIGHT              | 0.121 kg   |
|                                                                                                                                         |             | SHEET               | 6 of 8     |

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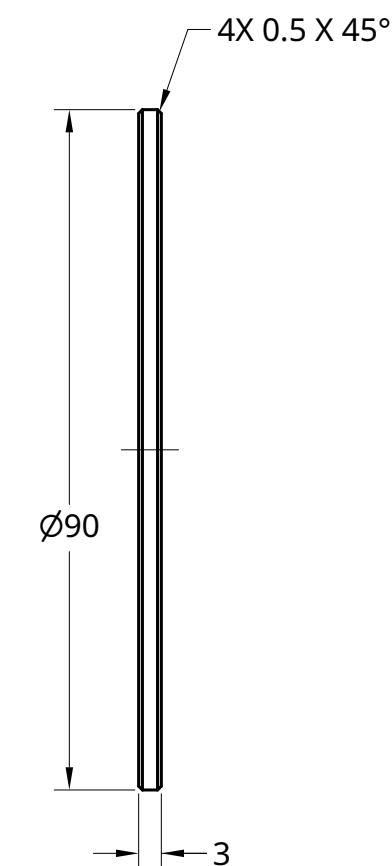
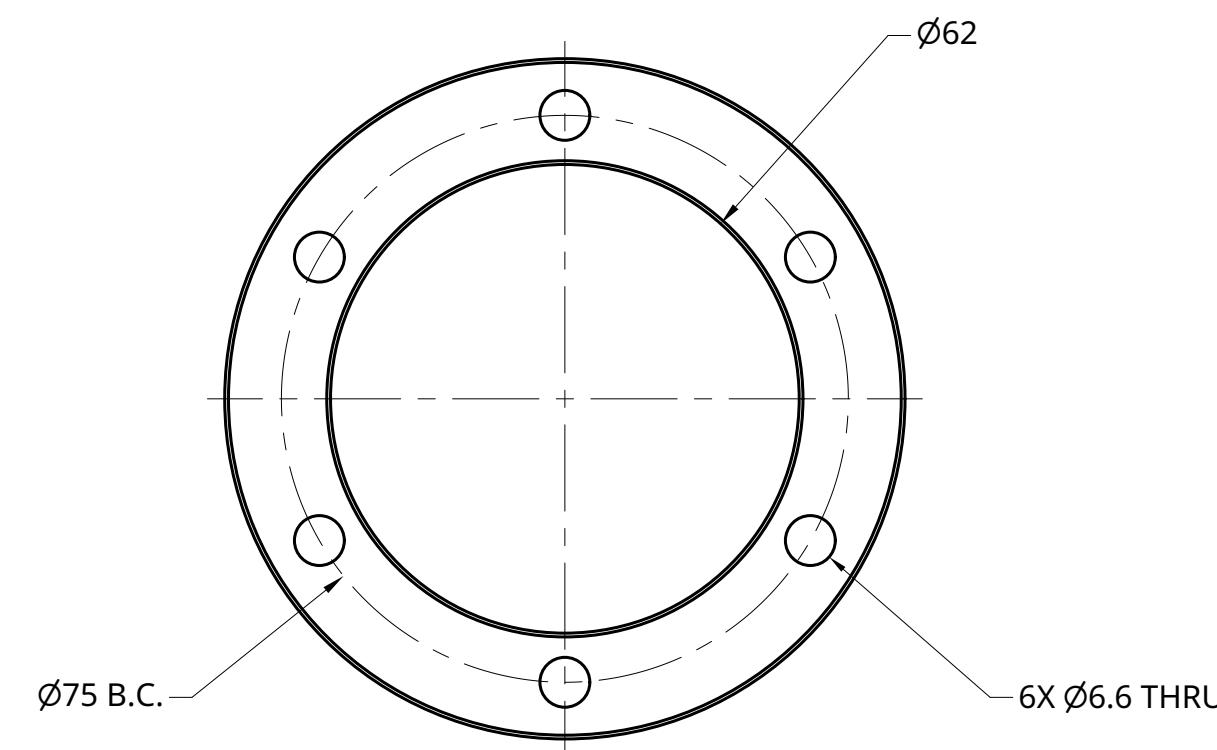
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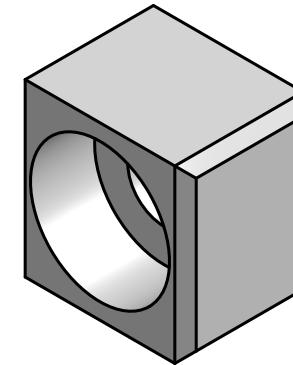
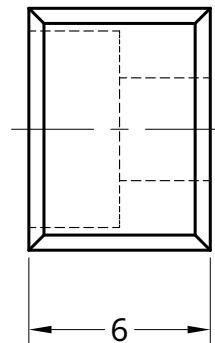
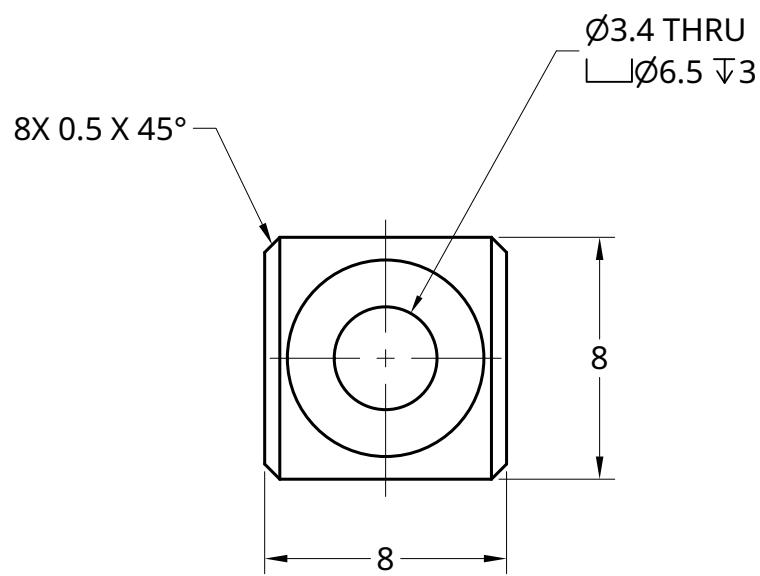
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|                                                                                                                                         |  |  |                                           |            |                      |
|-----------------------------------------------------------------------------------------------------------------------------------------|--|--|-------------------------------------------|------------|----------------------|
| UNLESS OTHERWISE SPECIFIED,<br>DIMENSIONS ARE IN INCHES<br>.XX = ±.0-.<br>.XXX = ±.00-. ANGULAR = ± °<br>.XXXX = ±.000-. FRACTIONAL = ± |  |  | DRAWN                                     | NAME       | DATE                 |
|                                                                                                                                         |  |  | CHECKED                                   |            |                      |
|                                                                                                                                         |  |  | APPROVED                                  |            |                      |
|                                                                                                                                         |  |  | DO NOT SCALE DRAWING                      |            |                      |
|                                                                                                                                         |  |  | BREAK ALL SHARP EDGES AND<br>REMOVE BURRS |            |                      |
|                                                                                                                                         |  |  | THIRD ANGLE PROJECTION                    | MATERIAL   | VOLUME               |
|                                                                                                                                         |  |  |                                           | STEEL 1020 | 9293 mm <sup>3</sup> |
|                                                                                                                                         |  |  | SCALE                                     | 1:1        | WEIGHT               |
|                                                                                                                                         |  |  |                                           | 0.073 kg   | SHEET                |
|                                                                                                                                         |  |  |                                           |            | 7 of 8               |

4 3 2 1



B

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|                                                                                                                                                             |            |                     |             |  |                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------|-------------|--|----------------------------------------|
| <small>UNLESS OTHERWISE SPECIFIED,<br/>DIMENSIONS ARE IN INCHES</small><br><small>.XX = ±.0-<br/>XXX = ±.00-<br/>XXXX = ±.000-<br/>SURFACE FINISH ✓</small> |            | DRAWN               | NAME        |  | DATE                                   |
|                                                                                                                                                             |            |                     | BRIAN BRADY |  | 10/16/2019                             |
| CHECKED                                                                                                                                                     |            |                     |             |  | TITLE                                  |
| APPROVED                                                                                                                                                    |            |                     |             |  |                                        |
| DO NOT SCALE DRAWING                                                                                                                                        |            |                     |             |  |                                        |
| BREAK ALL SHARP EDGES AND<br>REMOVE BURRS                                                                                                                   |            |                     |             |  |                                        |
| THIRD ANGLE PROJECTION                                                                                                                                      | MATERIAL   | VOLUME              |             |  | SIZE A DWG NO. BR-549-A-008 REV.       |
|                                                                                                                                                             | STEEL 4130 | 251 mm <sup>3</sup> |             |  | SCALE 4:1 WEIGHT 0.002 kg SHEET 8 of 8 |