

| ITEM NO. | PART NUMBER | QTY. |
|----------|--|------|
| 1 | Assembly Without Plumbing* | 1 |
| 2 | Weldment Assembly* | 1 |
| 3 | Blast Plate* | 1 |
| 4 | Bottom Plumbing* | 1 |
| 5 | Top Plumbing* | 1 |
| 6 | Caster Wheels | 4 |
| 7 | Flexible Tubing to Injector (not imaged) | 2 |
| 8 | Hose Clamp | 4 |
| 9 | Avionics Box Assembly | 1 |
| 10 | Pneumatics System | 1 |

PROPRIETARY AND CONFIDENTIAL

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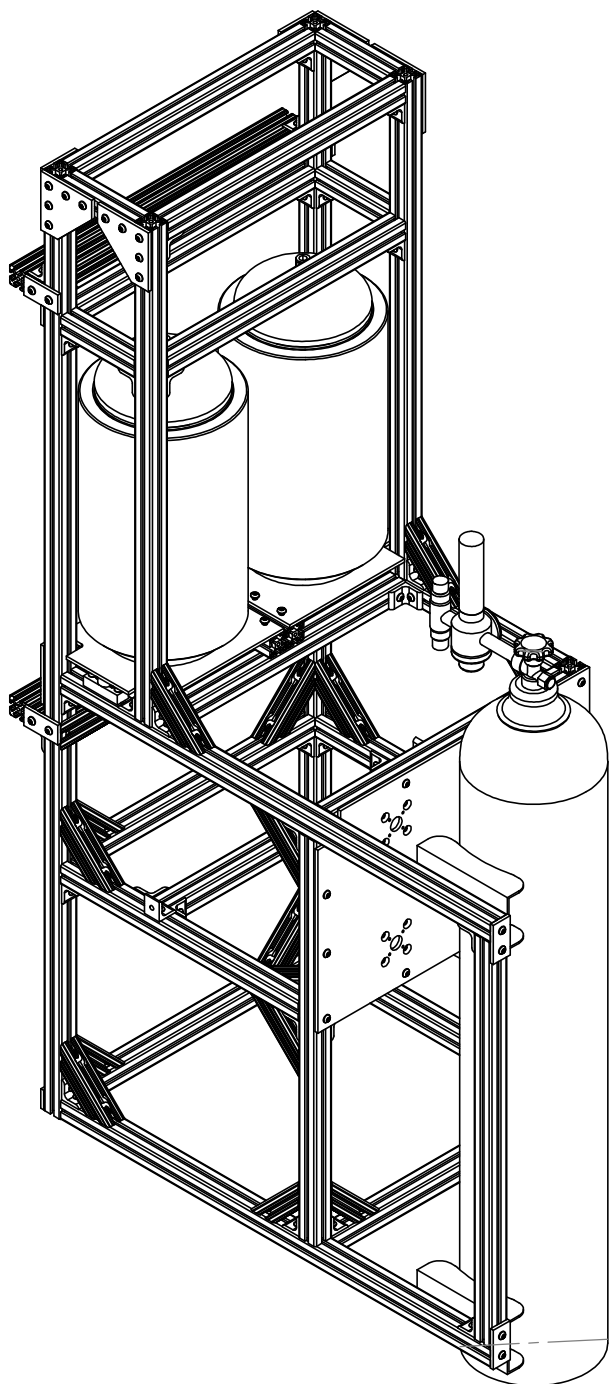
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|-------------|---------|--|--|---------------------------------|------|
| | | DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ± | | NAME | DATE |
| | | MATERIAL | | DRAWN | |
| | | FINISH | | CHECKED | |
| NEXT ASSY | USED ON | | | ENG APPR. | |
| | | | | MFG APPR. | |
| | | | | Q.A. | |
| | | | | COMMENTS: | |
| APPLICATION | | DO NOT SCALE DRAWING | | | |
| | | | | SIZE DWG. NO. REV. | |
| | | | | A Full Assembly Drawing | |
| | | | | SCALE:1:64 WEIGHT: SHEET 1 OF 1 | |

B

B

A

A



| ITEM NO. | PART NUMBER | QTY. |
|----------|-------------------------------|------|
| 1 | 8020_frame | 1 |
| 2 | Tank_Assembly | 2 |
| 3 | Pneumatic Mounting Plate | 1 |
| 4 | Corner Bracket | 2 |
| 5 | 80/20 Screw with Insert | 19 |
| 6 | Tank Mounting Plate | 2 |
| 7 | Long 80/20 Screw with Insert | 8 |
| 8 | FC22 Compression Load Cell | 2 |
| 9 | Level Sensor Mount | 2 |
| 10 | Sensor Mount Screw 4-40x0.25" | 4 |
| 11 | Offset Mount Screw 5/16x1" | 4 |
| 12 | Helium Mounting Bracket | 2 |
| 13 | Gas Bottle | 1 |
| 14 | Avionics Mounting Plate* | 1 |

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES
TOLERANCES:
ALL ± 0.1 INTERPRET GEOMETRIC
TOLERANCING PER:

MATERIAL

N/A

FINISH

N/A

DO NOT SCALE DRAWING

DRAWN

NAME

Brandon

DATE

2/26/20

CHECKED

ENG APPR.

MFG APPR.

Q.A.

COMMENTS:

* part has associated
drawing

TITLE:

Assembly Without
Plumbing

SIZE

A

DWG. NO.

Assembly Without Plumbing

REV

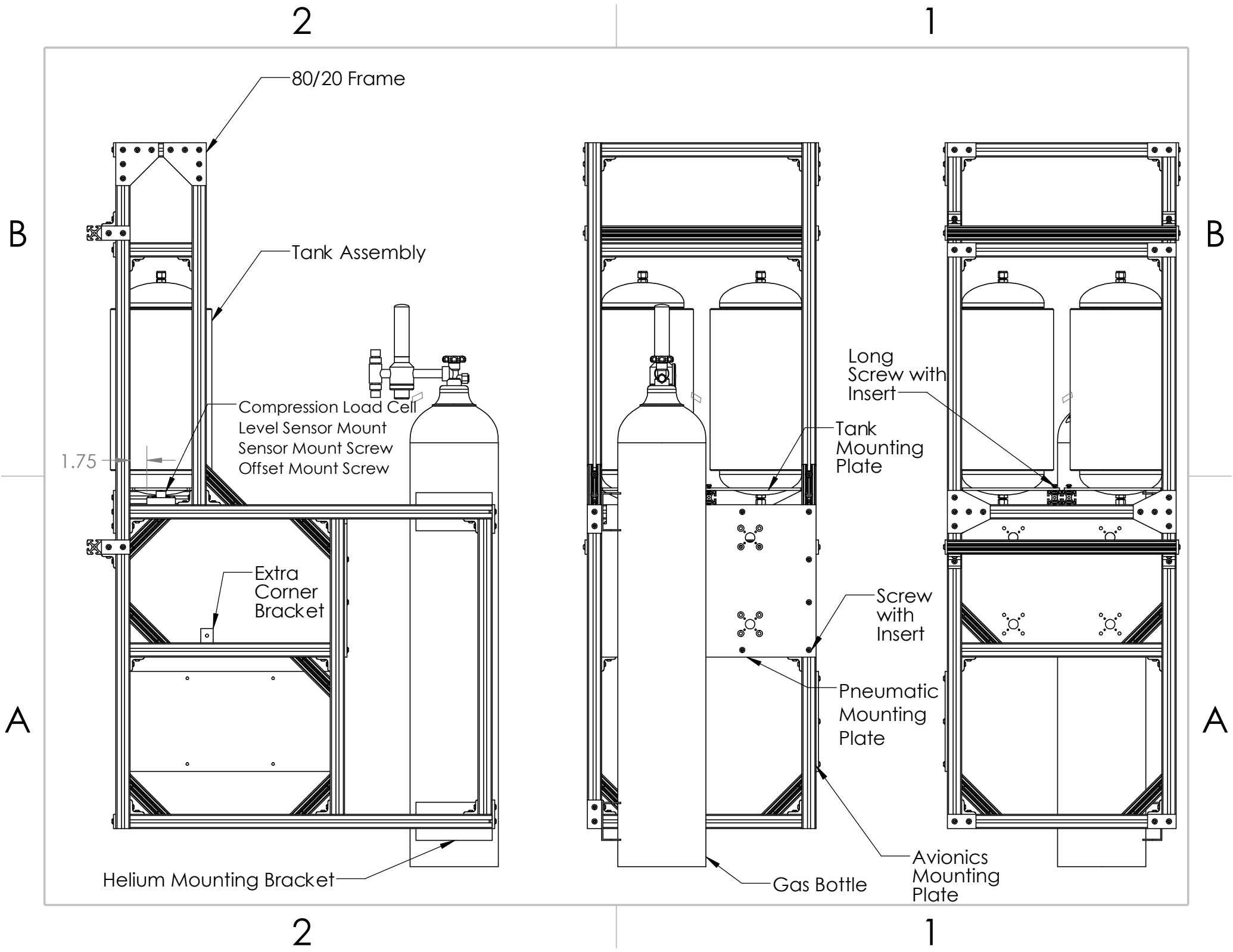
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SCALE: 1:12 WEIGHT:

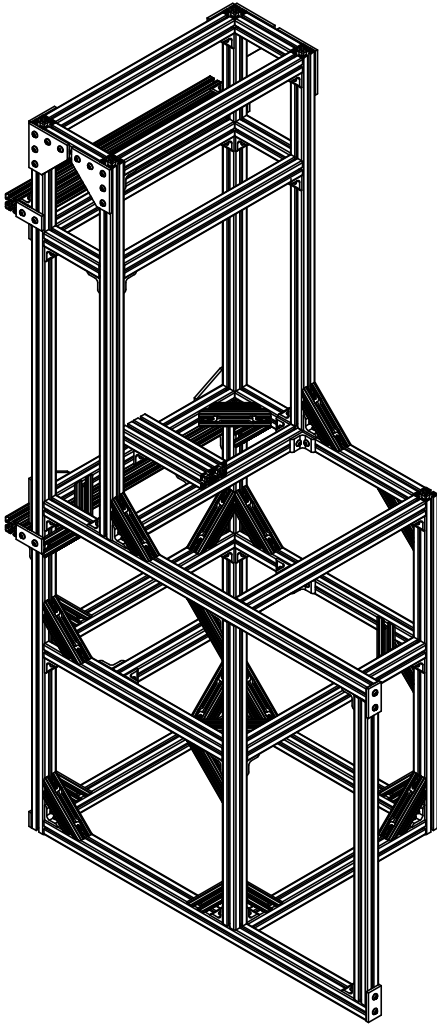
SHEET 2 OF 2

2

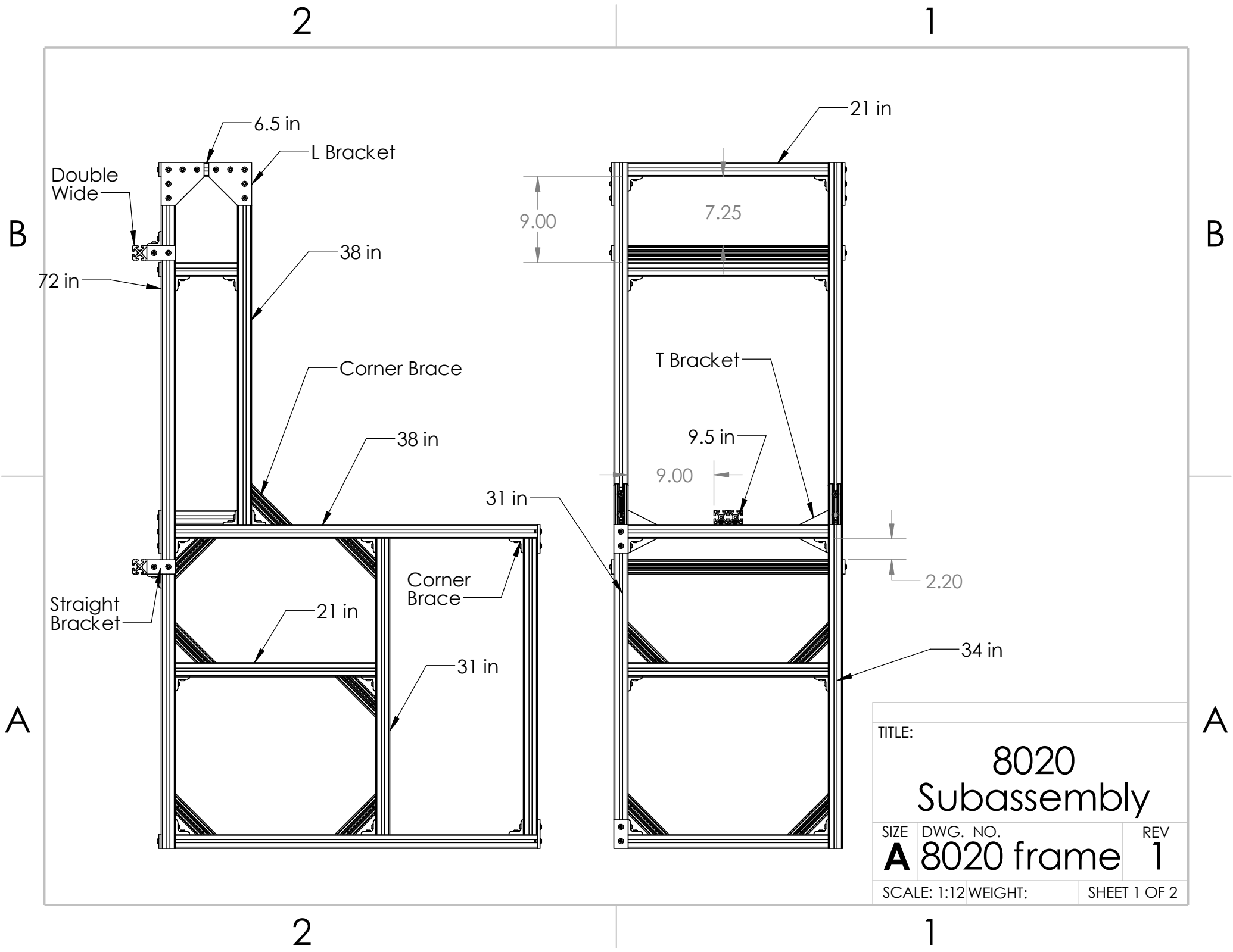
1



| ITEM NO. | PART NUMBER | QTY. |
|----------|-------------------|------|
| 1 | 72in | 2 |
| 2 | 38in | 4 |
| 3 | 21in | 16 |
| 4 | 34 in | 1 |
| 5 | 31 in | 2 |
| 6 | 9.5 in | 2 |
| 7 | 6.5 in | 4 |
| 8 | Double Wide 80/20 | 2 |
| 9 | Corner Bracket | 54 |
| 10 | Straight Bracket | 12 |
| 11 | L Bracket | 4 |
| 12 | T Bracket | 2 |
| 13 | Corner Brace | 24 |
| 14 | Screw with Insert | 210 |



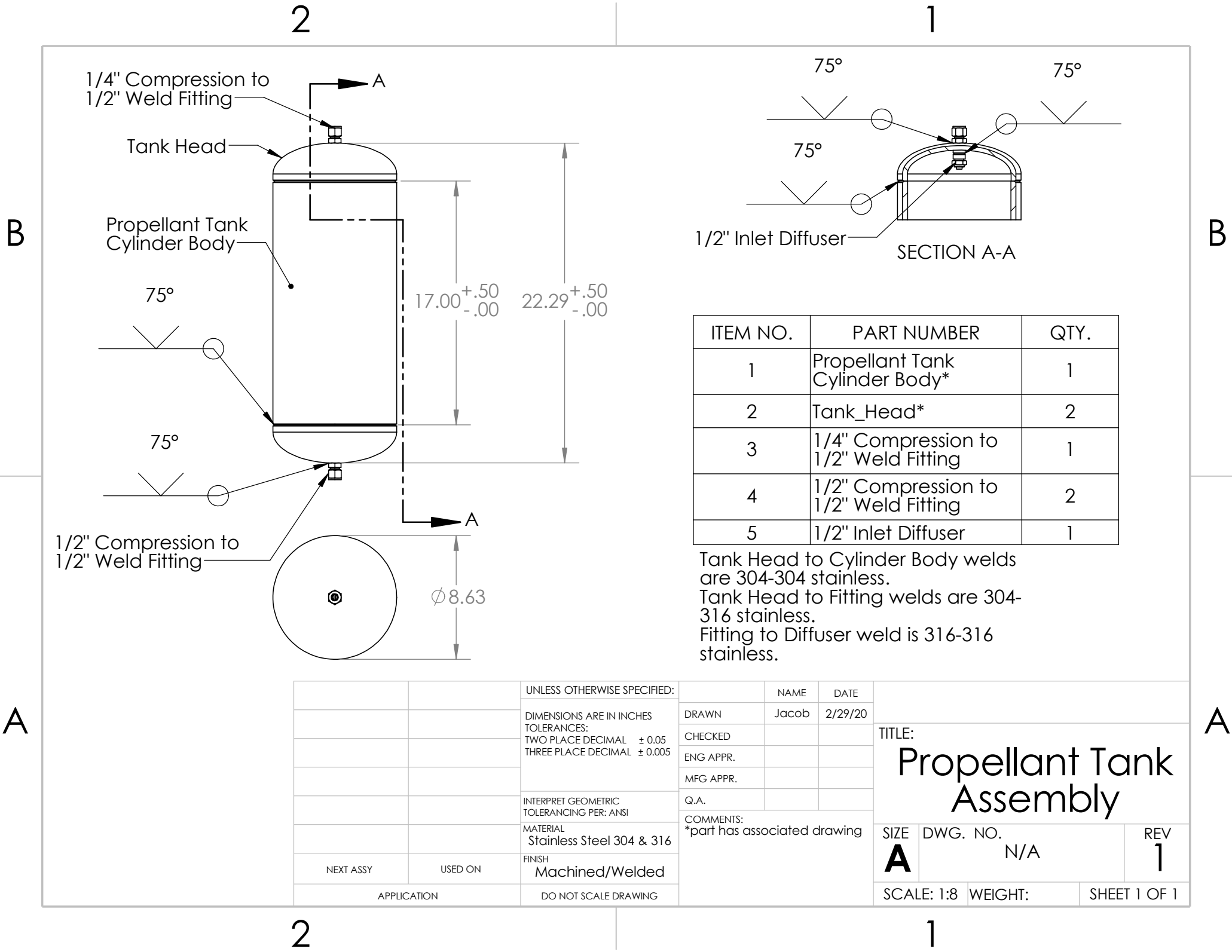
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|-------------|---------|--------------------------------------|-----------|---------|---------|--|--|--|
| | | UNLESS OTHERWISE SPECIFIED: | | NAME | DATE | TITLE: 8020 Subassembly | | |
| | | DIMENSIONS ARE IN INCHES | DRAWN | Brandon | 2/26/20 | | | |
| | | TOLERANCES: | CHECKED | | | | | |
| | | All \pm 0.1 | ENG APPR. | | | | | |
| | | | MFG APPR. | | | | | |
| | | INTERPRET GEOMETRIC TOLERANCING PER: | Q.A. | | | SIZE DWG. NO. REV A 8020 frame | | |
| | | MATERIAL Mostly Aluminum | COMMENTS: | | | | | |
| NEXT ASSY | USED ON | FINISH As assembled | | | | SCALE: 1:24 WEIGHT: SHEET 2 OF 2 | | |
| APPLICATION | | DO NOT SCALE DRAWING | | | | | | |



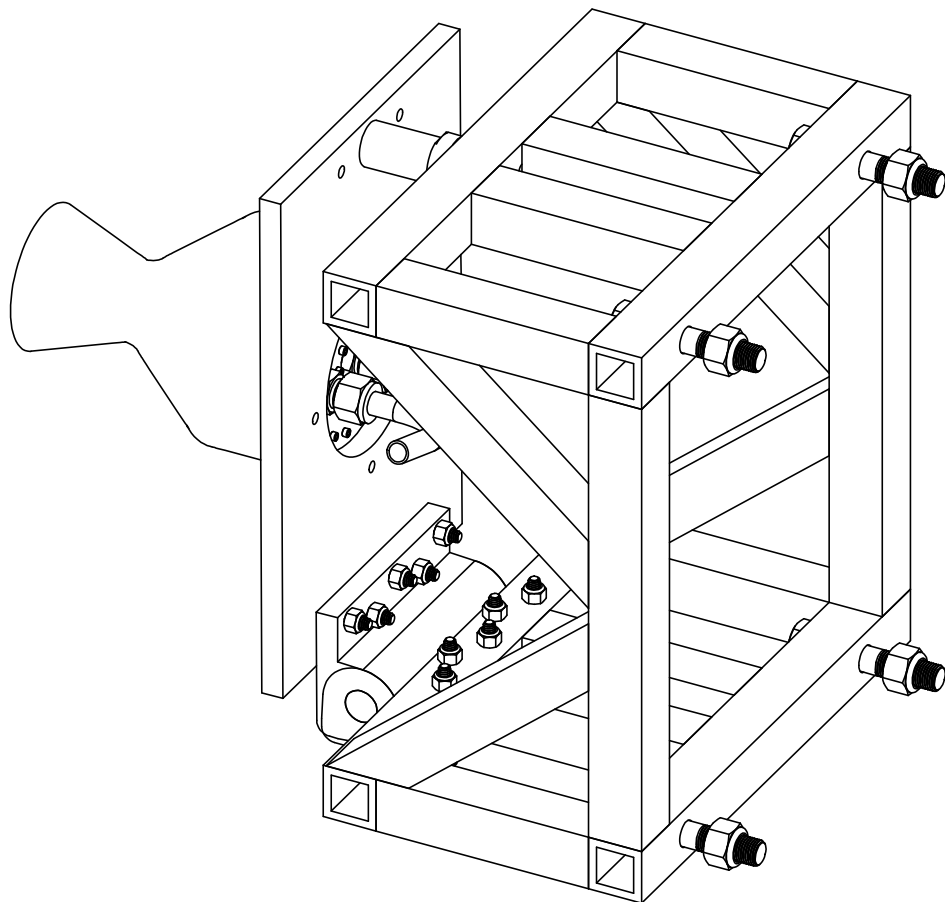
TITLE:

8020 Subassembly

| SIZE | DWG. NO. | REV |
|--------------|------------|---------|
| A | 8020 frame | 1 |
| SCALE: 1:12 | | WEIGHT: |
| SHEET 1 OF 2 | | |



B



A

| ITEM NO. | PART NUMBER | QTY. |
|----------|--------------------------------------|------|
| 1 | Tube - I-beam Mounting* | 2 |
| 2 | Tube - Vertical* | 2 |
| 3 | Tube - Lateral Extension* | 8 |
| 4 | Tube - Load Cell Mount* | 1 |
| 5 | Tube - Hinge Mount* | 1 |
| 6 | Tube - Diagonal* | 4 |
| 8 | I-beam Mounting Screw 9/16-18x3" | 4 |
| 9 | I-beam Mounting Nut | 6 |
| 10 | Heavy Duty Hinge* | 1 |
| 11 | Hinge to Weldment Screw 1/4-20x2.25" | 5 |
| 12 | 1/4-20 Locknut | 10 |
| 13 | Thrust Plate Extension* | 1 |
| 14 | Hinge To Extension Screw 1/4-20x1.5" | 5 |
| 15 | Extension Extender* | 1 |
| 16 | Extension Extender Bolt 1/4-20x1" | 2 |
| 17 | Load Cell | 1 |
| 20 | Load Cell Mounting Screw | 2 |
| 21 | Injector Assembly* | 1 |
| 22 | 1-4 NPT to 1-2 OD Fitting | 2 |
| 23 | Injector Tubing Short* | 1 |
| 24 | Injector Tubing Long* | 1 |
| 25 | Engine | 1 |

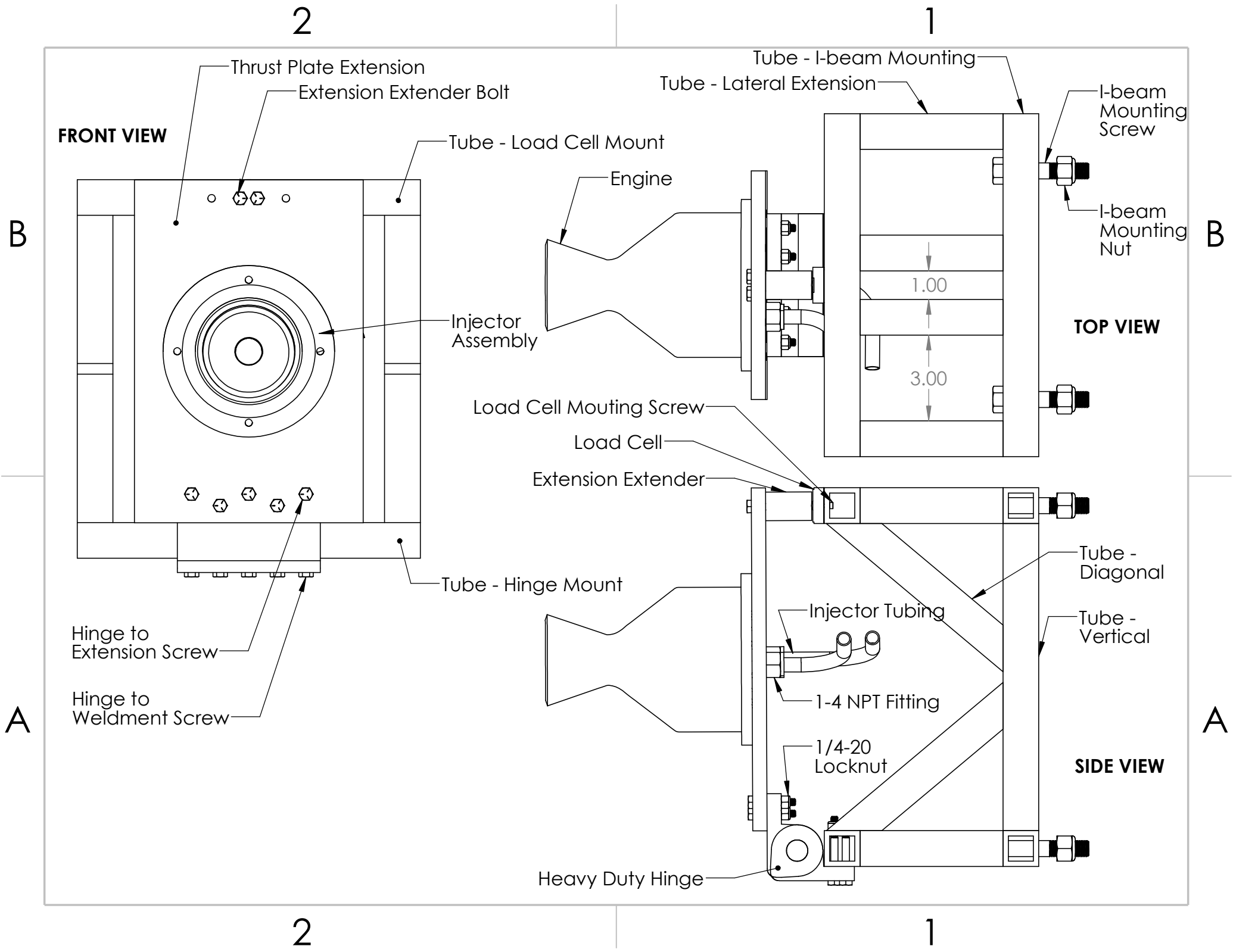
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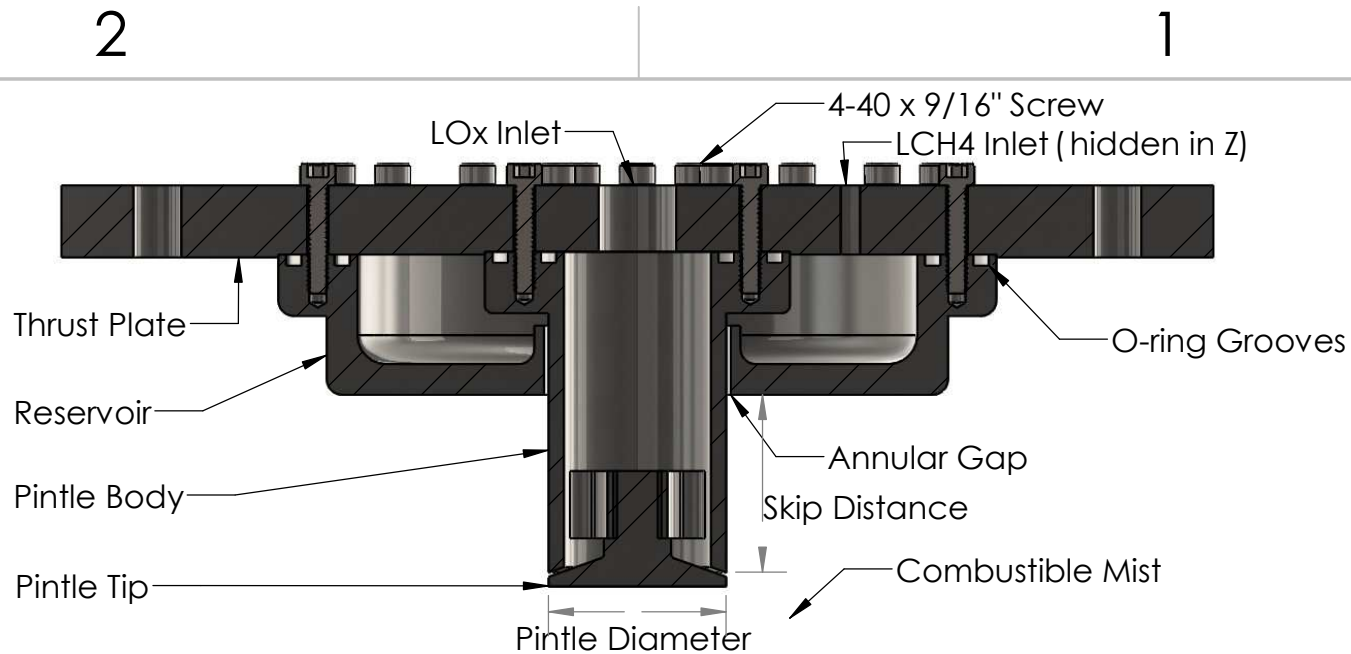
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| | | | | | | | |
|-------------|---------|--|---|------------|---------|--|--------------|
| | | UNLESS OTHERWISE SPECIFIED: | NAME | | DATE | TITLE: <h1 style="text-align: center;">Weldment Assembly</h1> | |
| | | DIMENSIONS ARE IN INCHES TOLERANCES: ALL ± 0.1 | DRAWN | Brandon | 2/27/20 | | |
| | | | CHECKED | | | | |
| | | | ENG APPR. | | | | |
| | | | MFG APPR. | | | | |
| | | INTERPRET GEOMETRIC TOLERANCING PER: | Q.A. | | | SIZE A DWG. NO. WeldmentAssm REV 1 | |
| | | MATERIAL | COMMENTS: * This part has an associated drawing Tube-Tube connections done with TIG welding $h > 3/16$ | | | | |
| | | Mostly Steel | | | | | |
| NEXT ASSY | USED ON | FINISH | | | | | |
| | | Deburr Sharps | | | | | |
| APPLICATION | | DO NOT SCALE DRAWING | | SCALE: 1:4 | | WEIGHT: | SHEET 2 OF 2 |

2

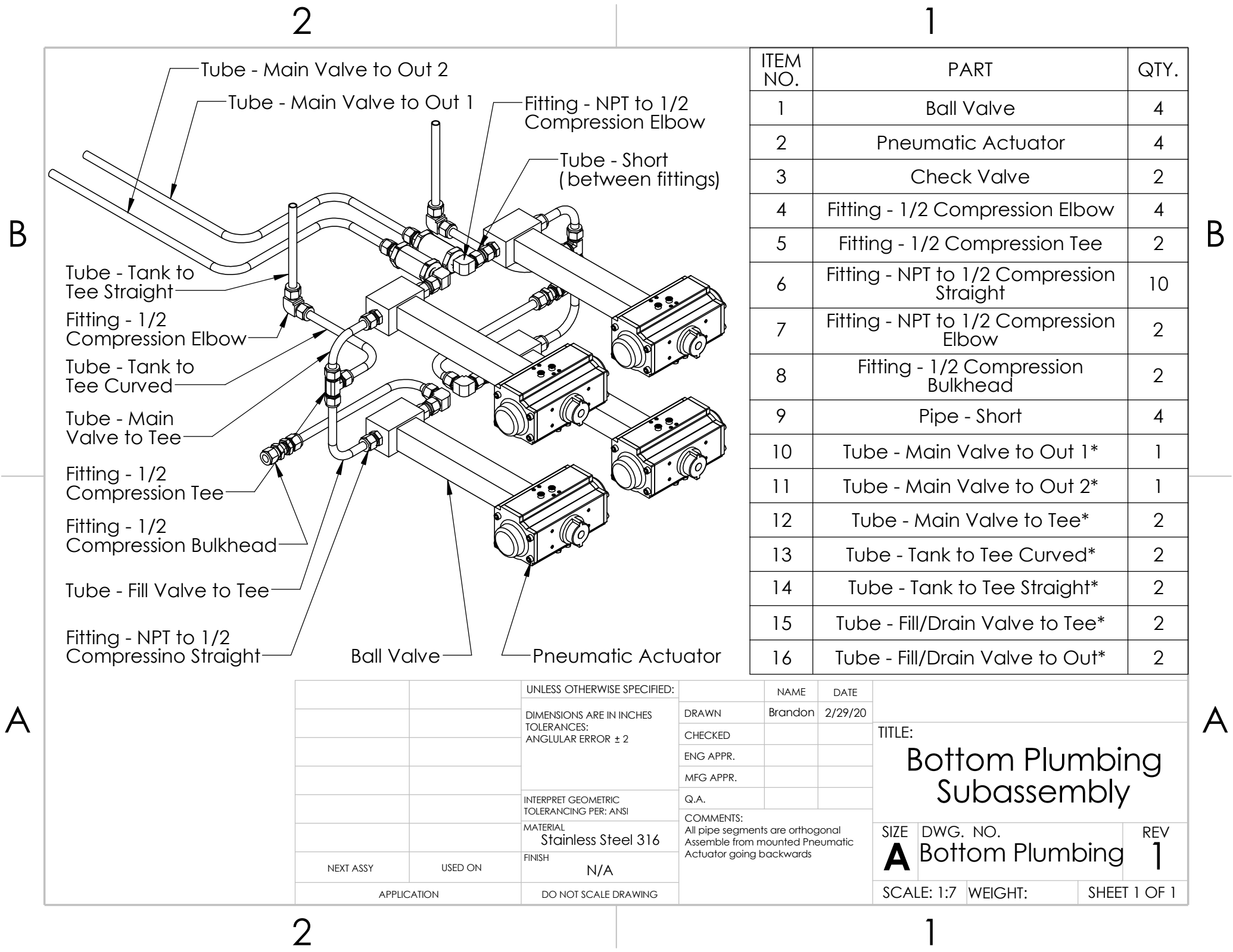
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| ITEM NO. | PART NUMBER | DESCRIPTION | QTY. |
|----------|--------------------|--------------------------|------|
| 1 | Thrust Plate* | | 1 |
| 2 | Reservoir* | | 1 |
| 3 | Pintle Body* | | 1 |
| 4 | Pintle Tip* | | 1 |
| 5 | 4-40 x 9/16" Screw | | 26 |
| 6 | O-Ring | 4 different sizes in BOM | 4 |

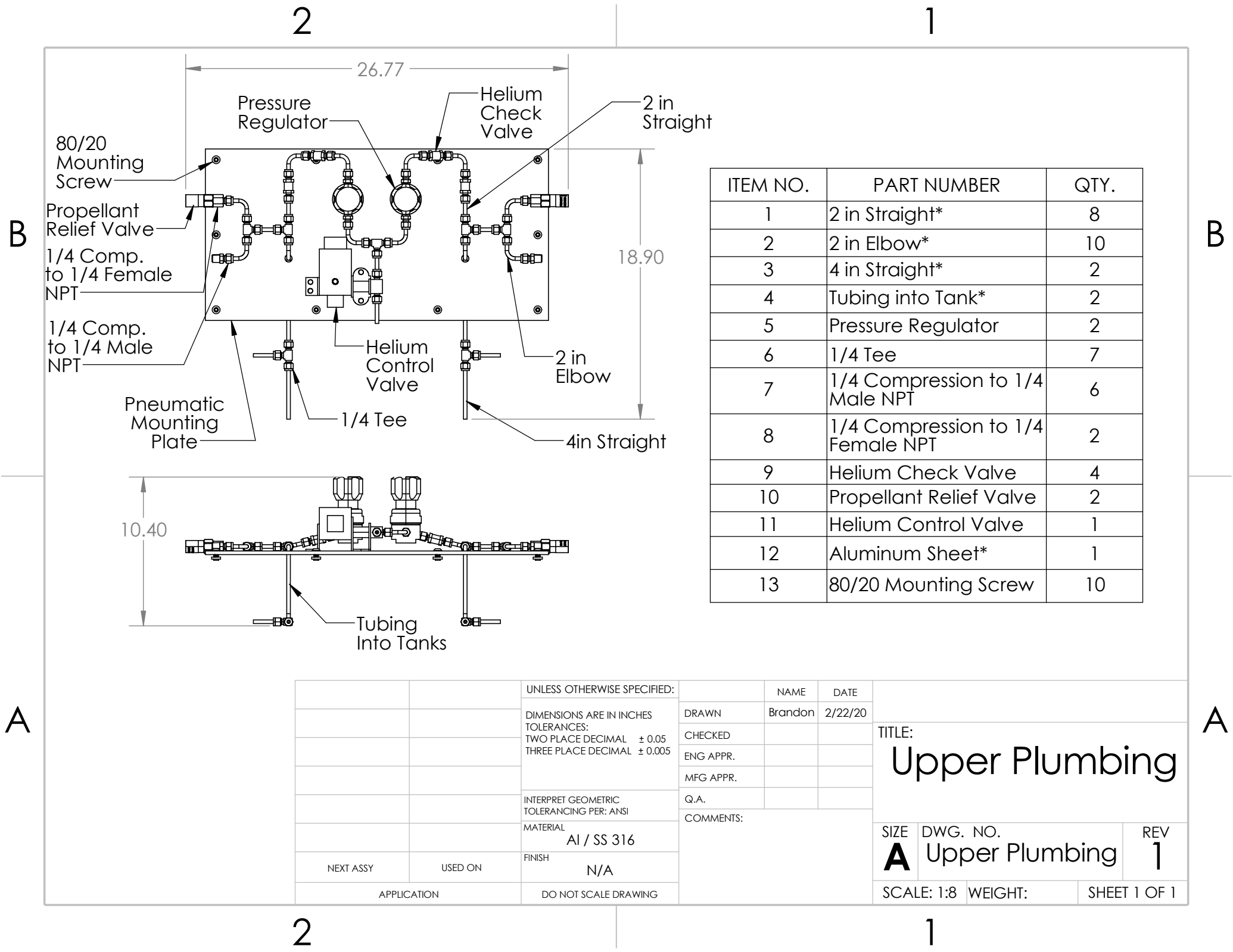
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|-----------|---------|---|---|------------|---------|---|---------|--------------|
| | | UNLESS OTHERWISE SPECIFIED: | | NAME | DATE | TITLE: <h1>Injector</h1> | | |
| | | DIMENSIONS ARE IN INCHES | DRAWN | Brandon | 2/26/20 | | | |
| | | TOLERANCES: | CHECKED | | | | | |
| | | TWO PLACE DECIMAL ± 0.05 | ENG APPR. | | | | | |
| | | THREE PLACE DECIMAL ± 0.005 | MFG APPR. | | | | | |
| | | INTERPRET GEOMETRIC TOLERANCING PER: ANSI | Q.A. | | | SIZE A DWG. NO. Injector Full REV 1 | | |
| | | MATERIAL Stainless Steel | COMMENTS: * part has an associated drawing | | | | | |
| | | FINISH As Machined | | | | | | |
| NEXT ASSY | USED ON | APPLICATION | DO NOT SCALE DRAWING | SCALE: 1:4 | | | WEIGHT: | SHEET 1 OF 1 |



| ITEM NO. | PART | QTY. |
|----------|---|------|
| 1 | Ball Valve | 4 |
| 2 | Pneumatic Actuator | 4 |
| 3 | Check Valve | 2 |
| 4 | Fitting - 1/2 Compression Elbow | 4 |
| 5 | Fitting - 1/2 Compression Tee | 2 |
| 6 | Fitting - NPT to 1/2 Compression Straight | 10 |
| 7 | Fitting - NPT to 1/2 Compression Elbow | 2 |
| 8 | Fitting - 1/2 Compression Bulkhead | 2 |
| 9 | Pipe - Short | 4 |
| 10 | Tube - Main Valve to Out 1* | 1 |
| 11 | Tube - Main Valve to Out 2* | 1 |
| 12 | Tube - Main Valve to Tee* | 2 |
| 13 | Tube - Tank to Tee Curved* | 2 |
| 14 | Tube - Tank to Tee Straight* | 2 |
| 15 | Tube - Fill/Drain Valve to Tee* | 2 |
| 16 | Tube - Fill/Drain Valve to Out* | 2 |

| | | | | | |
|-------------|---------|--|--|---------|---------|
| | | UNLESS OTHERWISE SPECIFIED: | | NAME | DATE |
| | | DIMENSIONS ARE IN INCHES TOLERANCES: ANGULAR ERROR ± 2 | DRAWN | Brandon | 2/29/20 |
| | | | CHECKED | | |
| | | | ENG APPR. | | |
| | | | MFG APPR. | | |
| | | INTERPRET GEOMETRIC TOLERANCING PER: ANSI | Q.A. | | |
| | | MATERIAL Stainless Steel 316 | COMMENTS: All pipe segments are orthogonal Assemble from mounted Pneumatic Actuator going backwards | | |
| | | FINISH N/A | | | |
| NEXT ASSY | USED ON | | | | |
| APPLICATION | | DO NOT SCALE DRAWING | | | |

| | | | |
|-----------------------------|-----------------|---------|--------------|
| TITLE: | | | |
| Bottom Plumbing Subassembly | | | |
| SIZE | DWG. NO. | REV | |
| A | Bottom Plumbing | 1 | |
| SCALE: 1:7 | | WEIGHT: | SHEET 1 OF 1 |



| ITEM NO. | PART NUMBER | QTY. |
|----------|-----------------------------------|------|
| 1 | 2 in Straight* | 8 |
| 2 | 2 in Elbow* | 10 |
| 3 | 4 in Straight* | 2 |
| 4 | Tubing into Tank* | 2 |
| 5 | Pressure Regulator | 2 |
| 6 | 1/4 Tee | 7 |
| 7 | 1/4 Compression to 1/4 Male NPT | 6 |
| 8 | 1/4 Compression to 1/4 Female NPT | 2 |
| 9 | Helium Check Valve | 4 |
| 10 | Propellant Relief Valve | 2 |
| 11 | Helium Control Valve | 1 |
| 12 | Aluminum Sheet* | 1 |
| 13 | 80/20 Mounting Screw | 10 |

| | | | | | | | | |
|-------------|---------|--|-----------|---------|-------------------------------------|---------------------------------------|---------------------|--------------|
| | | UNLESS OTHERWISE SPECIFIED: | NAME | DATE | TITLE: <div>Upper Plumbing</div> | | | |
| | | DIMENSIONS ARE IN INCHES | DRAWN | Brandon | | | | 2/22/20 |
| | | TOLERANCES: TWO PLACE DECIMAL ± 0.05 THREE PLACE DECIMAL ± 0.005 | CHECKED | | | | | |
| | | | ENG APPR. | | | | | |
| | | | MFG APPR. | | | | | |
| | | INTERPRET GEOMETRIC TOLERANCING PER: ANSI | Q.A. | | | SIZE <div>A</div> | | |
| | | MATERIAL Al / SS 316 | COMMENTS: | | | | | |
| | | FINISH N/A | | | | | | |
| NEXT ASSY | USED ON | | | | | DWG. NO. <div>Upper Plumbing</div> | REV <div>1</div> | |
| APPLICATION | | DO NOT SCALE DRAWING | | | | SCALE: 1:8 | WEIGHT: | SHEET 1 OF 1 |