ORNL/TM-2022/2400

# Technical Guidance for Creation of $^{237}$Np Irradiation Target Fabrication Packages


Gretchen K. Toney
Chris L. Jensen

**April 2022**

OAK RIDGE National Laboratory

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**ORNL/TM-2022/2400**

Radioisotope Science and Technology Division

# TECHNICAL GUIDANCE FOR CREATION OF $^{237}$NP TARGET FABRICATION PACKAGES

Gretchen K. Toney
Chris L. Jensen

April 2022

Prepared by
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Oak Ridge, TN 37831
managed by
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for the
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## FIGURES

## ABBREVIATIONS

| | |
|---|---|
| ATR | Advanced Test Reactor |
| BC | weld coupler, bottom |
| CMTR | certified material test report |
| CT | weld coupler, top |
| DI | dimensional inspection |
| FT | finned tube |
| HFIR | High Flux Isotope Reactor |
| INL | Idaho National Laboratory |
| LT | lower transition |
| NASA | National Aeronautics and Space Administration |
| NDE | Non-Destructive Examination (website) |
| ORNL | Oak Ridge National Laboratory |
| PO | purchase order |
| QS | quality significant |
| REVs | revisions |
| Req No | requisition number |
| RRD | Research Reactors Division |
| RTG | radioisotope thermoelectric generator |
| SB | spider body |
| SBC | bottom cup |
| SPH | pintel head |
| STC | top cup |
| TSA | target subassembly |
| UT | upper transition |
| WO | work order |
| WT | Wartburg Tool & Die |
| $^{237}$Np | Neptunium-237 |
| $^{238}$Pu | Plutonium-238 |

## ACKNOWLEDGMENTS

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## OVERVIEW

This document describes the process used to document the fabrication of irradiation targets that may be inserted into either the High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory (ORNL), or the Advanced Test Reactor (ATR) at Idaho National Laboratory (INL). The targets are being irradiated to produce $^{238}$Pu (5.48Mev alpha decay, T1/2 = 87.7 y) used in the fabrication of radioisotope thermoelectric generators (RTGs). RTGs powered by $^{238}$Pu are an established power source technology for National Aeronautics and Space Administration space missions where solar power is not viable. The documentation included in fabrication files demonstrates full traceability of all materials, components, and assemblies used to build $^{237}$Np targets. To accomplish this, all documentation (e.g., certified material test reports, weld reports, leak test reports) will be maintained and reviewed throughout materials procurement, component fabrication, and target assembly. Figures 1 and 2 depict the components and steps employed during each stage of target fabrication and loading.

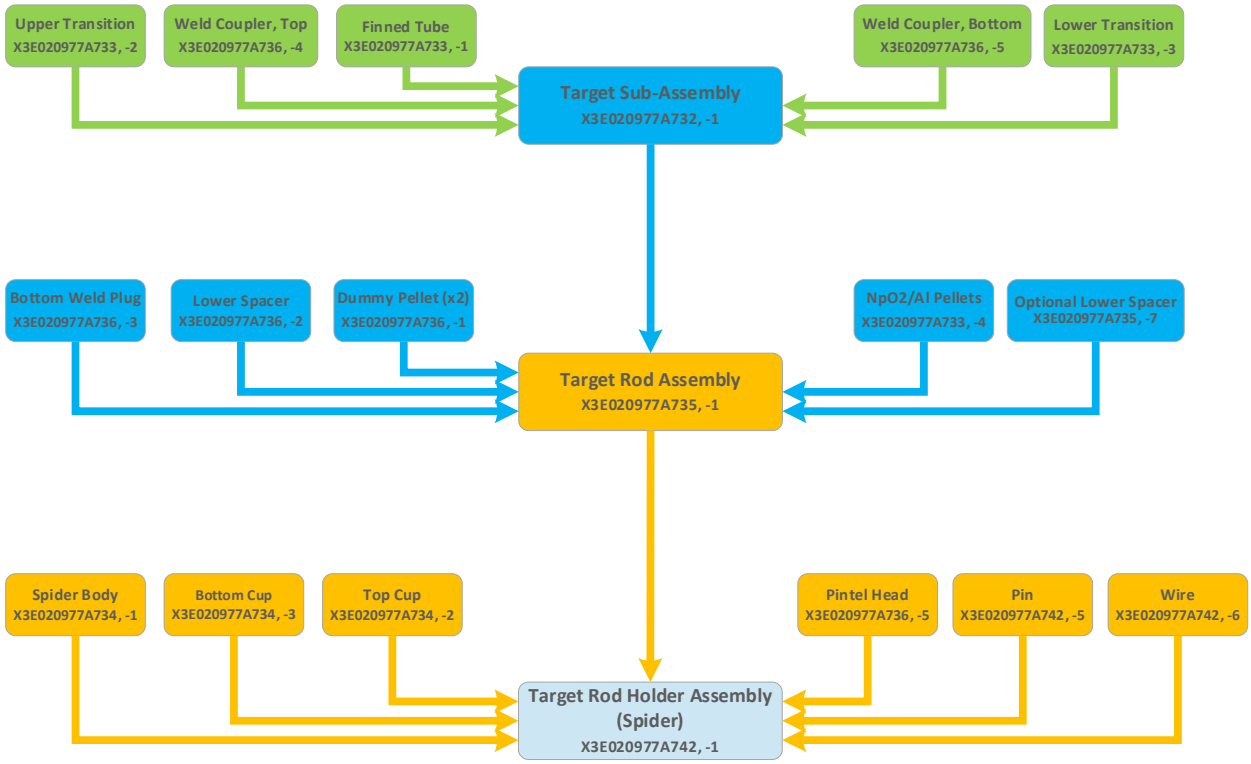



**Figure 1. HFIR Generation 2 target fabrication flow path.**

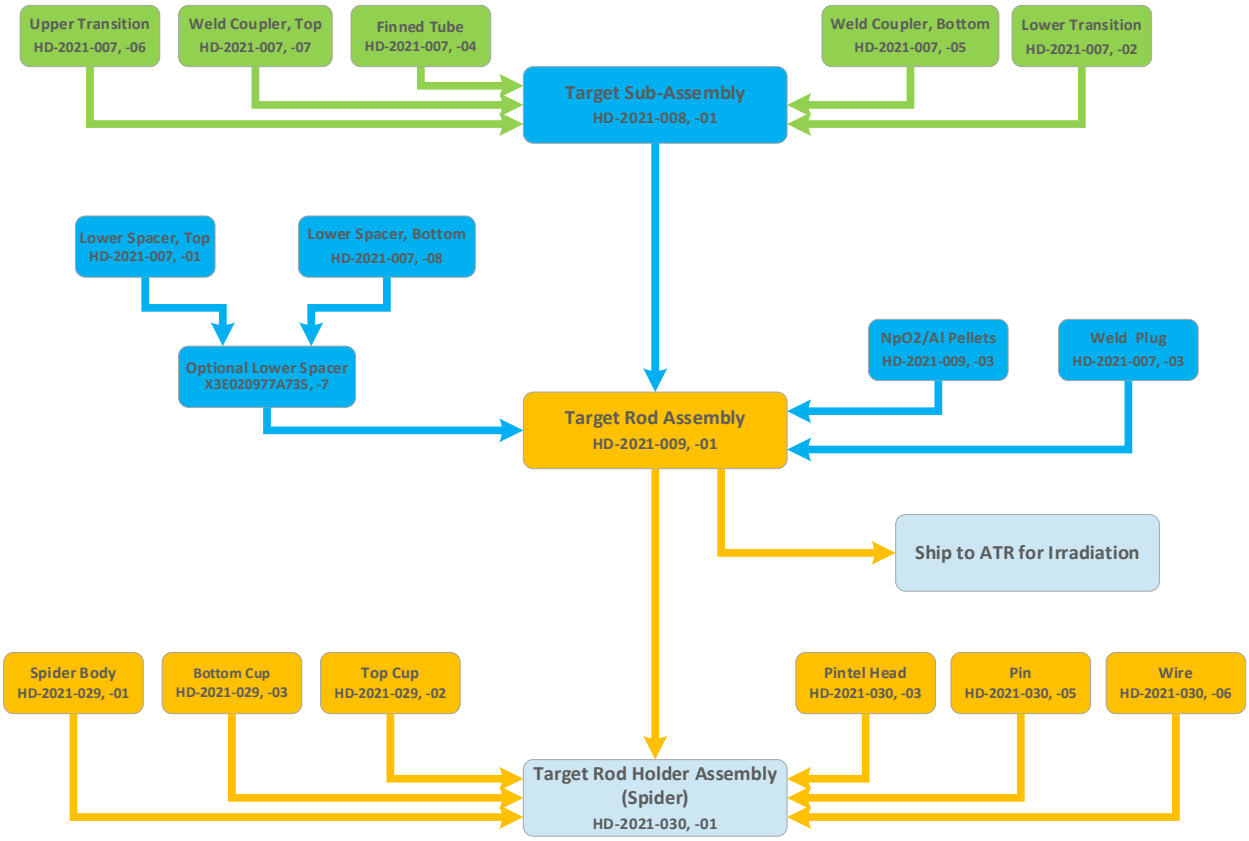



**Figure 2. ATR Generation 1/HFIR Generation 3 target fabrication flow path.**

# 1. CREATING TARGET COMPONENT FABRICATION PACKAGES

## 1.1 TARGET COMPONENT FABRICATION PACKAGES

Target component fabrication packages comprise several documents that include the quality significant (QS) receipt inspection checklist, target receipt inspection report, dimensional inspection (DI) report (when required for a given component/assembly), certified material test reports (CMTRs), and cleaning report. The steps for compiling the information and documentation required for each report are outlined in this document. Figure 1 represents the fabrication flow path that should be followed when fabricating targets and their components at the High Flux Isotope Reactor.

### 1.1.1 QS Receipt Inspection Checklist

1. Navigate to SAP through the Key Links tab on the ORNL home page.

2. Open the Materials Management link on the menu on the left side of the page.

3. Open the Purchase Orders Display link under the Information group. This step will require you to log in with your three-character ID and UCAMS password.

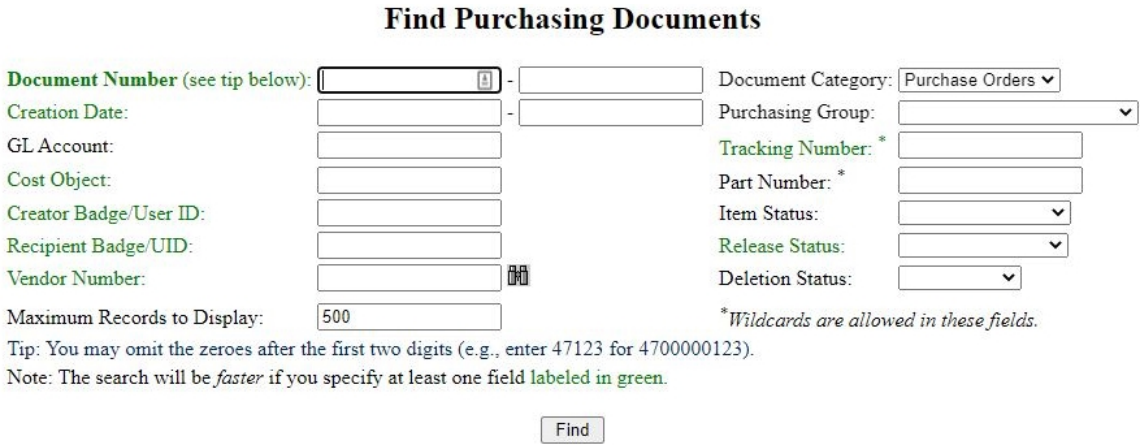



**Figure 3. Finding purchase order display.**

4. Enter the purchase order (PO) number in the document number field and click find (Figure 3).

    - General information will be provided first.

    - Take note of the vendor who machined the parts.

    - The drawing numbers with the revisions (REVs) used to make the parts will be listed with each part.

5. Identify all the line items that contain the parts.

    - Exclude the line items that do not contain parts such as delivery fees or DI reports.

6. Record on the QS receipt inspection checklist (Figure 4) the PO number, requisition number (Req No), quantity of parts ordered, and quantity of parts received (from the PO).

7. Fill out the receipt inspection checklist, a form encompassing information for all target components included on a given PO.

    - An example of the description is $^{238}$Pu target rod components.

    - The target rod components are QS. Make sure to check Yes.

**RECEIPT INSPECTION CHECKLIST**

**Purchase Order No.:** **Tracking No.:** N/A

**Req. Item No.:**

**Description:**

**Quantity Ordered:** **Quantity Received:**

**Quality Significant:** Yes ☒ No ☐ **100% Inspection:** Yes ☒ No ☐ **Sample No.:** N/A

| ATTRIBUTES | SAT | UNSAT | N/A | ATTRIBUTES | SAT | UNSAT | N/A |
|---|---|---|---|---|---|---|---|
| Shipping damage | ☒ | ☐ | ☐ | Protective cover/seals | ☒ | ☐ | ☐ |
| Physical damage | ☒ | ☐ | ☐ | Chemical properties | ☒ | ☐ | ☐ |
| Identification/marking | ☒ | ☐ | ☐ | Physical properties | ☒ | ☐ | ☐ |
| Workmanship | ☒ | ☐ | ☐ | Hardness | ☒ | ☐ | ☐ |
| Cleanliness | ☒ | ☐ | ☐ | Mfg. documentation | ☒ | ☐ | ☐ |
| Dimensions normal visual | ☒ | ☐ | ☐ | Test report | ☐ | ☐ | ☒ |
| Weld/weld preparation | ☐ | ☐ | ☒ | Calibration report | ☐ | ☐ | ☒ |
| Coatings/preservatives | ☒ | ☐ | ☐ | Suspect parts | ☒ | ☐ | |
| Desiccant | ☒ | ☐ | ☐ | Other | ☐ | ☐ | ☒ |

**Inspection equipment/calibration dates:** SEE ATTACHED DOCUMENTATION

**Nonconformance Report No.:** N/A **Hold Tag No.:** N/A

**Inspected in accordance with revision** ATTACHED **of** SEE ATTACHED

(Specification, Drawing, or Procedure)

**Inspection Results:** Accept ☒ Reject ☐

**Notes/Comments:**

**Goods Recipient/End User/Inspector:**

Signature and Date

**Figure 4. Sample QS receipt inspection checklist.**

- The target rod components are 100% inspected. Make sure to check Yes.

- The attributes should be checked off as satisfactory, unsatisfactory, or N/A.

8. Once the receipt inspection checklist has been completed, it must be signed.

9. Save the signed receipt inspection checklist as a PDF.

### 1.1.2 Target Component Receipt Inspection Report

1. Navigate to the Research Reactors Division (RRD) internal home page (https://home.rrd.ornl.gov/RRDhome.cfm).

2. Select RRD applications from the menu on the left side of the page.

3. Open WebMapics.

   - The list of applications is arranged alphabetically.

4. In the scope selection drop-down box, select issue tickets (Figure 5).

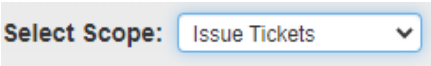



**Figure 5. Select issue tickets drop-down.**

5. In the pick field drop-down box, select WO # (Figure 6).

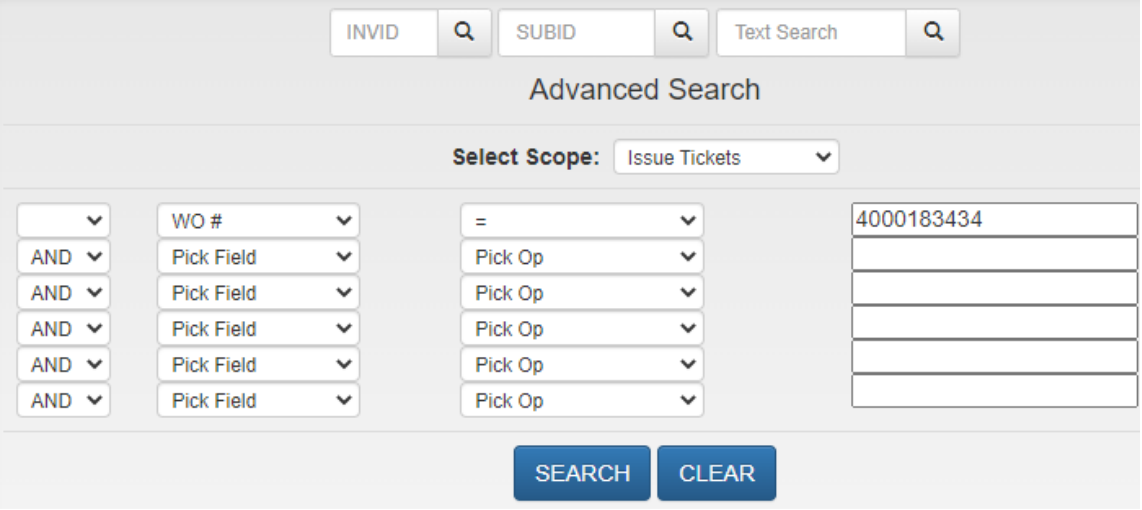



**Figure 6. Pick field drop-down box with WO # field.**

6. Enter the purchase order (PO) number for the target component and click search (Figure 6).

7. Select print tickets as 1 PDF (Figure 7).


**Figure 7. Print material issue ticket.**

- A material issue ticket in the format of a PDF will be created (Figure 8).

**MATERIAL ISSUE**

| TicketID: 46159 | Issue Date: 10-19-2020 | Requester: Mcinturff, Donny | Group: Other | Work document: 4000183434 |
|---|---|---|---|---|
| End Use: PU-238 Target Fabrication | | | | |

| | InvID | SubID | Noun | Description | Bldg Loc. | Req. | Heat # | Stock End Use SR/Non | Notes | Qty | Units | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 22543 | 40551 | Tubing – Spacer Stock | Tubing, Seamless, Except Average Wall (EAW), Stainless, Type 304L, 1/4", O.D. 0.250" x I.D. 0.084" x 0.083" wall per ASTM A269/ ASME A213. | 7990 Yard | 8NC6775 | 554823 | QS<br>QS | | 50 | foot | |
| 2 | 20403 | 39289 | Bi-Metal Blank | Bi-Metal Blank, Assemblies per Interface Welding drawing IWAL/SS-15. Material is 304L Stainless Steel bar per ASTM A276 Cond. A/6061-T6 Aluminum bar per QQA200/8 | 7990 C17 | 8NC6756 | BYS/BYT | QS<br>QS | | 220 | each | |
| 3 | 20403 | 39767 | Bi-Metal Blank | Bi-Metal Blank, Assemblies per Interface Welding drawing IWAL/SS-15. Material is 304L Stainless Steel bar per ASTM A276 Cond. A/6061-T6 Aluminum bar per QQA200/8 | 7990 C17 | 8NC6813 | BZI/BZH | QS<br>QS | | 430 | each | Heat No: Aluminum BZI, SST BZH |
| 4 | 17111 | 39213 | Bar – Dummy Pellet Stock | Bar, Round, Dummy Pellet Stock, Aluminum, Type 6061-T6 per ASTM B211, 1/4" diameter -.2500 + .0000/-.0010, straightness .005 in/ft. Roundness-.0005, Surface Finish-32 Ra. 72" | 7990 C24 Top | 8NC6755 | 1610120086 | QS<br>QS | | 30 | foot | |
| 5 | 17111 | 39759 | Bar – Dummy Pellet Stock | Bar, Round, Dummy Pellet Stock, Aluminum, Type 6061-T6 per ASTM B211, 1/4" diameter -.2500 + .0000/-.0010, straightness .005 in/ft. Roundness-.0005, Surface Finish-32 Ra. 72" | 7990 C21 Top | 8NC6812 | 10071072 | QS<br>QS | | 18 | foot | The straightness spec has been changed from .001/in ft. to .005/in ft. on this order per Chris Jensen. |
| 6 | 13301 | 31547 | Bar – Weld Plug Stock | Bar, Round, Weld Plug Stock, Stainless, Type 304L, 1/2", per ASTM A479 | 7990 Yard | 8NC6128 | 40999 | QS<br>QS | | 48 | Foot | 2ft located in 7990 scrap rack. |
| 7 | 21083 | 30100 | Bar – Weld Coupler Stock | Bar, Round, Aluminum, Type 4047, 5/8", 5' pieces. There is no mill spec because the material is extruded. | 7990 D7 | B7A7229 | 310ED1 | QS<br>QS | | 85 | foot | |

**Figure 8. Sample material issue ticket.**

8. Fill out the target component receipt inspection report (Figure 9).

    a. The report ID is composed in the following format: *manufacturer initials–PO#–part initials*.

        i. An example of a report ID is WT-4000175849-BC.
            1. WT – Wartburg Tool & Die
            2. 4000175849 – PO#
            3. BC – Weld Coupler, Bottom

        ii. Target component part initials.
            1. The Finned Tube is FT.
            2. The Lower Transition is LT.
            3. The Upper Transition is UT.
            4. The Weld Coupler, Top is CT.
            5. The Weld Coupler, Bottom is BC.

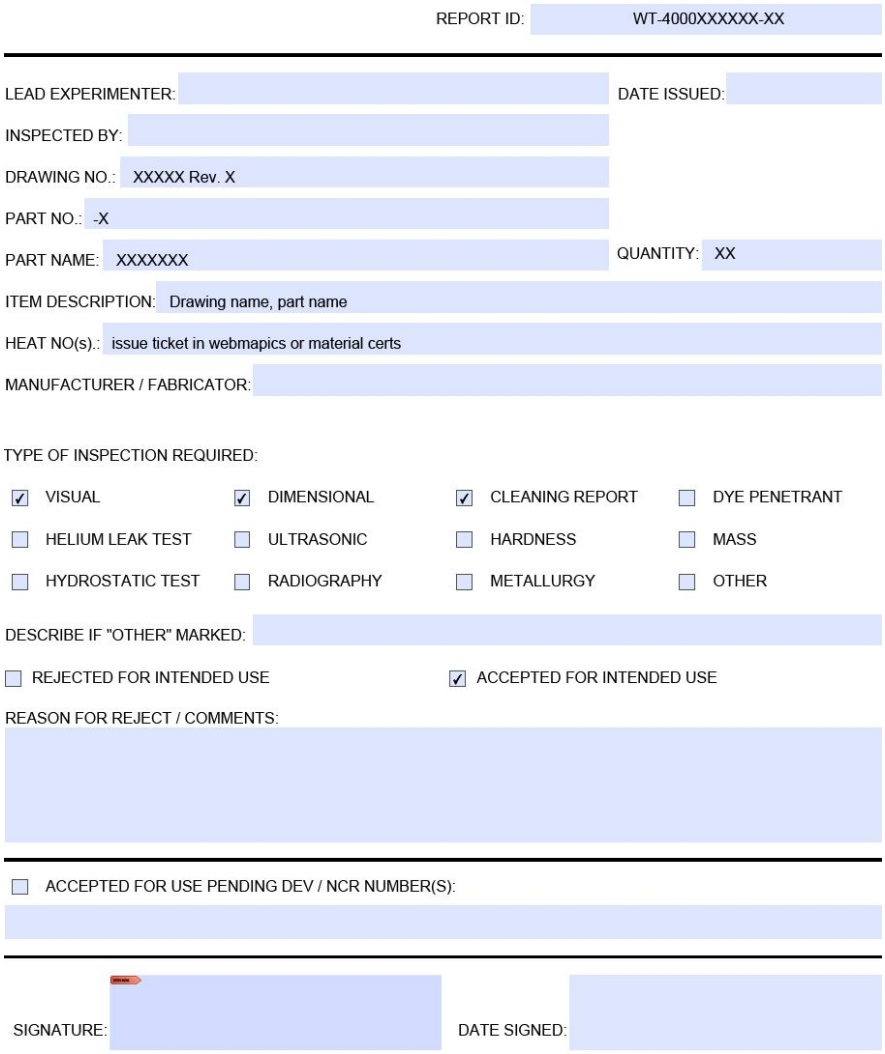



**Figure 9. Sample target receipt inspection report.**

- Enter the lead experimenter, date issued, and the name of the person who inspected the parts.

- Enter the drawing number and REV number used to fabricate the parts (from the PO).

  - Drawings with current REV numbers and part numbers are found in the RNSD drawing system

  - Enter one of the following drawing numbers in the drawing number search criteria and select search (Figure 10):

| HFIR Generation 2 Target Drawings | HFIR Generation 3/ATR Gen I Target Drawings |
|---|---|
| X3E020977A732 | HD-2021-007 |
| X3E020977A733 | HD-2021-008 |
| X3E020977A734 | HD-2021-009 |
| X3E020977A735 | HD-2021-029 |
| X3E020977A736 | HD-2021-030 |
| X3E020977A742 | HD-2021-031 |
| | HD-2021-032 |

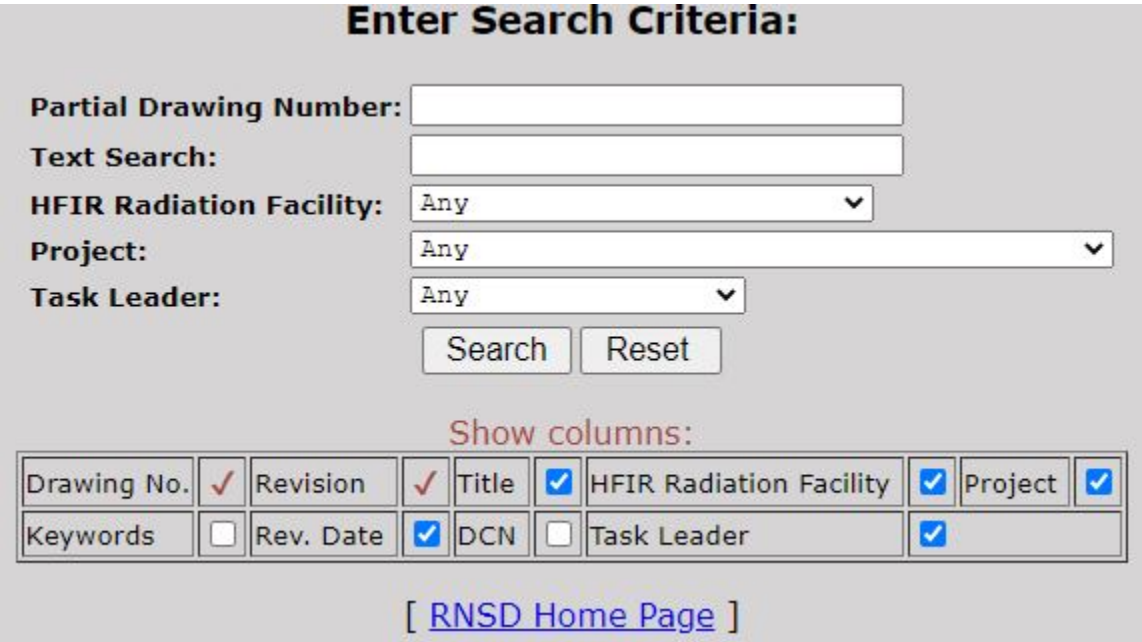



**Figure 10. Drawing search field.**

- Enter the quantity of the parts received (from the PO).
- Enter the item description (e.g., Generation 2 $^{238}$Pu cermet irradiation, weld coupler, top).
- The heat numbers are found in the material issue ticket (Figure 8), or they can be found in the CMTRs (Figure 27).
- Enter the manufacturer (from the PO).
- Select the type of inspection required (e.g., visual, dimensional, cleaning report).
- Identify any parts that were rejected and explain in the comment section the reason they were rejected.
- Add any additional comments as needed.

9. Once the target component receipt inspection report has been completed, it must be signed.

10. Save the file as a PDF.

### 1.1.3 Dimensional Inspection Report

After the parts have been manufactured, have arrived onsite, been received, and been inspected, the parts must go to ORNL Metrology and Measurement Services for DI.

1. Instruct the department to complete the DI of the parts.

    - Provide department with the part name, drawing number, REV number, and part number.

    - Discuss the time frame for retrieving the parts from the department.

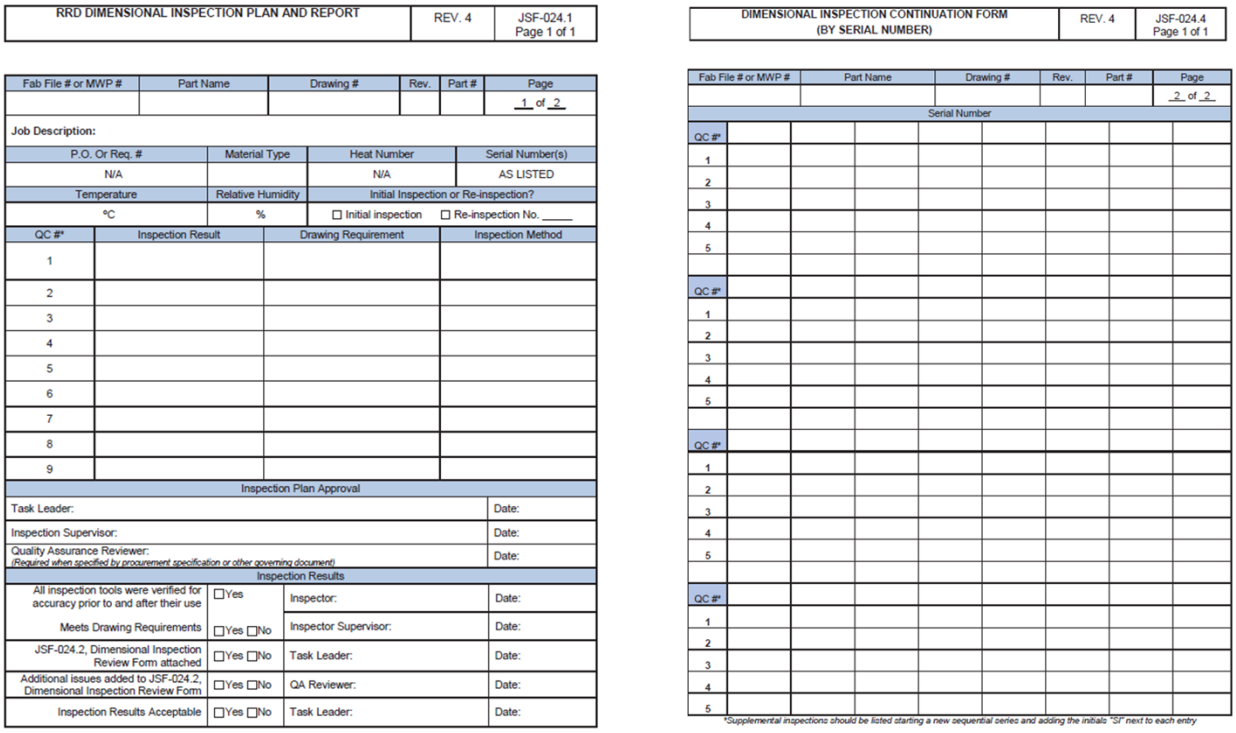
2. Once parts have completed DI, ORNL Metrology and Measurement Services will provide a DI plan and report (Figure 11).

    - The report will be signed by the inspector and the inspection supervisor.

    - The report will be reviewed to ensure the form has been properly filled out by the department.

        - Check the part name, drawing number, REV number, job description, material type, temperature, humidity, inspection type, inspection method, drawing requirement, inspection results, and serial numbers are accurate and have been recorded.

        - Identify any parts that do not meet requirements.



| RRD DIMENSIONAL INSPECTION PLAN AND REPORT | REV. 4 | JSF-024.1<br>Page 1 of 1 |
|---|---|---|

| Fab File # or MWP # | Part Name | Drawing # | Rev. | Part # | Page |
|---|---|---|---|---|---|
| | | | | | 1 of 2 |

**Job Description:**

| P.O. Or Req. # | Material Type | Heat Number | Serial Number(s) |
|---|---|---|---|
| N/A | | N/A | AS LISTED |
| **Temperature** | **Relative Humidity** | **Initial Inspection or Re-inspection?** | |
| °C | % | ☐ Initial inspection ☐ Re-inspection No. ____ | |

| QC #* | Inspection Result | Drawing Requirement | Inspection Method |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |

| Inspection Plan Approval | |
|---|---|
| Task Leader: | Date: |
| Inspection Supervisor: | Date: |
| Quality Assurance Reviewer:<br>*(Required when specified by procurement specification or other governing document)* | Date: |

| Inspection Results | | | |
|---|---|---|---|
| All inspection tools were verified for accuracy prior to and after their use | ☐Yes | Inspector: | Date: |
| Meets Drawing Requirements | ☐Yes ☐No | Inspector Supervisor: | Date: |
| JSF-024.2, Dimensional Inspection Review Form attached | ☐Yes ☐No | Task Leader: | Date: |
| Additional issues added to JSF-024.2, Dimensional Inspection Review Form | ☐Yes ☐No | QA Reviewer: | Date: |
| Inspection Results Acceptable | ☐Yes ☐No | Task Leader: | Date: |

| DIMENSIONAL INSPECTION CONTINUATION FORM<br>(BY SERIAL NUMBER) | REV. 4 | JSF-024.4<br>Page 1 of 1 |
|---|---|---|

| Fab File # or MWP # | Part Name | Drawing # | Rev. | Part # | Page |
|---|---|---|---|---|---|
| | | | | | 2 of 2 |

| | Serial Number | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| QC #* | | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| | | | | | | | | |
| QC #* | | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| | | | | | | | | |
| QC #* | | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| | | | | | | | | |
| QC #* | | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |

**Supplemental inspections should be listed starting a new sequential series and adding the initials "SI" next to each entry*

**Figure 11. Sample RRD DI plan and report.**

3. Save the DI form from ORNL Metrology and Measurement Services as a PDF file.

4. Prepare the form using Adobe Sign for the final signatures.

    - Go to the Adobe Sign home page and sign into your account (https://ornladobesign.na1.echosign.com/public/login).

    - Click on the request signatures button (Figure 12).

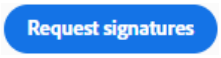



**Figure 12. Request signatures button.**

    - Drag and drop the saved PDF file to the files box (Figure 13).

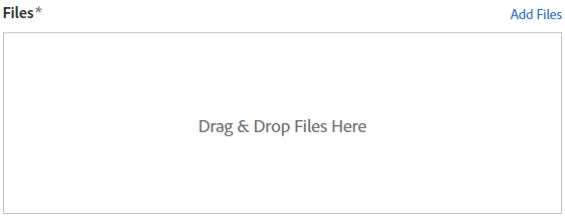



**Figure 13. Drag and drop files field.**

- Enter the task leader's name in the enter recipient email field, Box 1 (Figure 14). The add me link can be used.


**Figure 14. Recipient email box.**

- Enter the QA reviewer's name in the enter recipient email field, Box 2.
- Enter the task leader's name in the enter recipient email field, Box 3. The add me link can be used.
- On the right, in the options box, select set reminder to every business day.
- Click on next, and the document will be processed (Figure 15).

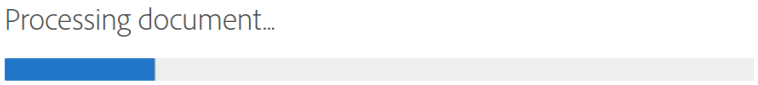



**Figure 15. Document processing notification.**

- Verify the recipient's box contains the person selected to correctly create the signature field (Figure 16).

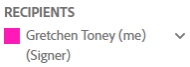



**Figure 16. Recipient's box.**

- Go to the signature fields box and click on signature to highlight it in white (Figure 17).


**Figure 17. Signature fields box.**

- Drag the signature field box to the appropriate place in the document and size the box as needed (Figure 18).

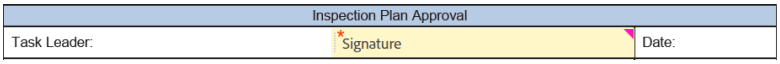



**Figure 18. Signature box.**

- Open the signer info fields box with the drop-down arrow (Figure 19).

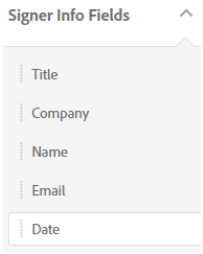



**Figure 19. Signature info fields box.**

- Go to the signer info fields box and click on date to highlight it in white (Figure 19).
- Drag the date field box to the appropriate place in the document and size the box as needed.
- Right-click on the date box created and then select edit (Figure 20).

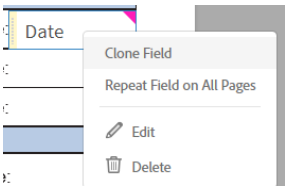



**Figure 20. Edit date box.**

- On date format, select from the drop-down box custom and enter a date format that will fit the form such as m/d/yy (Figure 21).

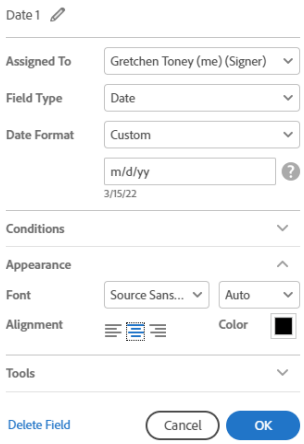



**Figure 21. Customize date format.**

- Open appearance and select center for the alignment (Figure 21).
- Click OK when complete.
- Go to the data fields box and click on check box to highlight it in white (Figure 22).

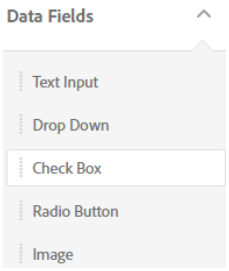



**Figure 22. Data fields box.**

- Drag the check box to the appropriate place in the document and size the box as needed (Figure 23).

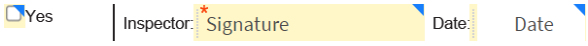



**Figure 23. Check box placement.**

- Verify that the color coding assigned to the designated signer in the recipient's box aligns with the signature, date, and check box.

- Return to the recipient's box and select the next person to sign the document using the drop-down arrow (Figure 24).


**Figure 24. Next recipient display.**

- Repeat the process of applying signature field boxes, date field boxes, and check boxes for each signer on the document until all the signers have been added.

- If you are the first signer, click the sign, then send button (Figure 25).

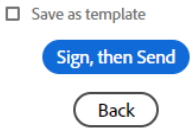



**Figure 25. First signer box.**

5. The form will be sent out to all signers.

6. Once the form has been completely signed, download, and save it as a PDF file.

### 1.1.4 Certified Material Test Report

1. Navigate to the RRD website (https://home.rrd.ornl.gov/RRDhome.cfm).

2. Open WebMapics.

3. In the scope selection drop-down box, ensure that inventory is selected.

4. Enter the SUBID found in the material issue ticket and select search (Figure 26).

| | | | | | |
|---|---|---|---|---|---|
| **SUBID:** | 16530 | **SR/NON** | SR1/SC | **Ded Pkg:** **PIT?** No | **Staged?** No |
| **Manf.** | Valbruna/DNES | **Vendor:** | DuBose National Energy Services | **Part no:** | |
| **Sub Qty:** | 1582 **Unit Price:** $0.80 | **Bldg:** | 7990 **Location:** Yard **Bin:** P2 **Chkd:** No | | |
| **Fabfile:** | | **Lab no.** | | **Heat no.** | 242732 |
| **Note:** | Excess items located on U2 rack in the 7990 yard. | | | | |
| **Req No:** | 8NC3948 (Crowe, Nathan) | **Po no.** | 8NC3948 | **Req Item no.** | 2 ($115.09 Each) |
| **Created By:** | | **Date:** | 06/09/2010 | **Inventoried:** | 09/12/2020 View |
| **Links:** Add | None | | | | |

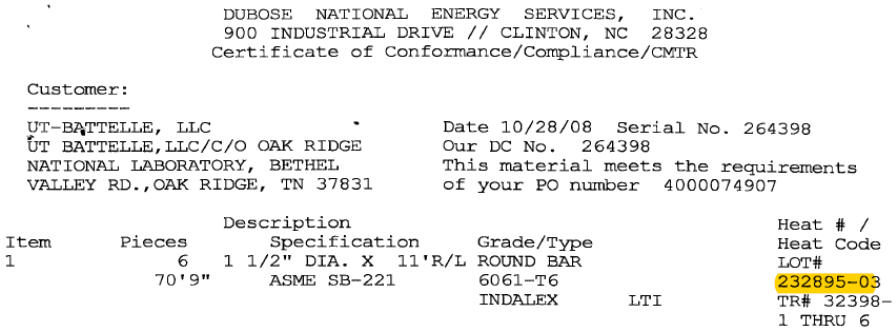
**Figure 26. Sample SUBID information.**

5. Find the SUBID and select the Req No highlighted in blue (Figure 26).


**Figure 27. Scanned in CMTR information.**

6. Click on the scanned image highlighted in blue under the Req No (Figure 27).

7. Search through the documents listed to find the CMTRs that correlate the heat numbers of the materials used to manufacture the part (Figure 28).



DUBOSE NATIONAL ENERGY SERVICES, INC.
900 INDUSTRIAL DRIVE // CLINTON, NC 28328
Certificate of Conformance/Compliance/CMTR

Customer:
---
UT-BATTELLE, LLC
UT BATTELLE,LLC/C/O OAK RIDGE
NATIONAL LABORATORY, BETHEL
VALLEY RD.,OAK RIDGE, TN 37831

Date 10/28/08 Serial No. 264398
Our DC No. 264398
This material meets the requirements
of your PO number 4000074907

| Item | Pieces | Description / Specification | Grade/Type | | Heat # / Heat Code / LOT# |
|---|---|---|---|---|---|
| 1 | 6 | 1 1/2" DIA. X 11'R/L | ROUND BAR | | 232895-03 |
| | 70'9" | ASME SB-221 | 6061-T6 | | TR# 32398-1 THRU 6 |
| | | | INDALEX | LTI | |

**Figure 28. Sample CMTR.**

- Use Ctrl-F to easily find the specific pages needed from the scanned documents.

8. Print the CMTR pages from the scanned documents and save them as PDF files.

### 1.1.5 Cleanliness Report for Materials and Components

1. Open a blank cleanliness report (RRD-JS-31 form; Figure 29).

2. Record the job number on the report.

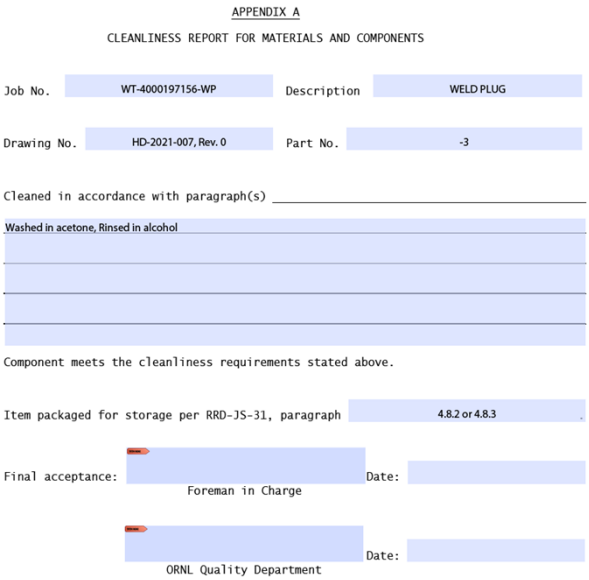
   - The job number is made up of the *manufacturer initials–PO#–part initials* (e.g., WT-4000183434-BC).

     ➢ The job number is equivalent to the report ID on the target receipt inspection report (refer to Section 1.1.2 and Figure 9).

3. Record the description, which is the part name.

4. Record the drawing number with REV number included.

5. Record the part number.



APPENDIX A

CLEANLINESS REPORT FOR MATERIALS AND COMPONENTS

Job No. WT-4000197156-WP Description WELD PLUG

Drawing No. HD-2021-007, Rev. 0 Part No. -3

Cleaned in accordance with paragraph(s) _____

Washed in acetone, Rinsed in alcohol

Component meets the cleanliness requirements stated above.

Item packaged for storage per RRD-JS-31, paragraph 4.8.2 or 4.8.3

Final acceptance: Foreman in Charge Date:

ORNL Quality Department Date:

**Figure 29. Sample cleanliness report.**

6. Describe the cleaning process as “Washed in acetone, Rinsed in alcohol.”

7. Record the item packaged for storage per RRD-JS-31, paragraph as “4.8.2 or 4.8.3.”

8. Email the form to the person signing as the “Foreman in Charge” under the final acceptance section.

9. Email the form to the person signing as the “ORNL Quality Department.”

10. Once the form has been completed, save the form as a PDF file.

### 1.1.6 Compile Target Component Fabrication Package

1. Organize the saved PDF files in the file folder according to the order listed below. Ensure a number is placed in front of the file (Figure 30).

    - First, the QS receipt inspection checklist.

    - Second, the target component receipt inspection report.

    - Third:

        - DI report, if required, or
        - If no DI report required, the CMTRs.

    - Fourth:

        - If DI report was required, the CMTRs, or

➢ If no DI report required, the cleaning report.

- Fifth:

➢ If DI report was required, the cleaning report.

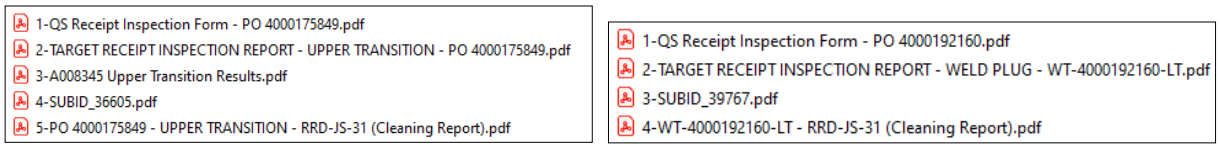



**Figure 30. Organized target component fabrication package files. (Left) DI report required; (right) DI report NOT required.**

2. Combine the files into one file.

- Highlight the files and right-click.

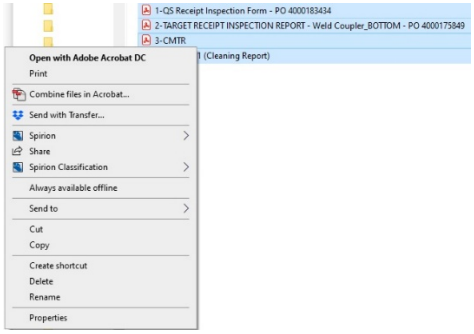



**Figure 31. Select combine files in Acrobat.**

- Select combine files in Acrobat (Figure 31).

➢ If an error on the file appears (Figure 32), it will not allow the files to be merged, and the file needs to be saved properly.


**Figure 32. Error on the files display.**

➢ Open the file and save as a PDF.

➢ Redo the steps to combine the files in Acrobat (Figure 33).

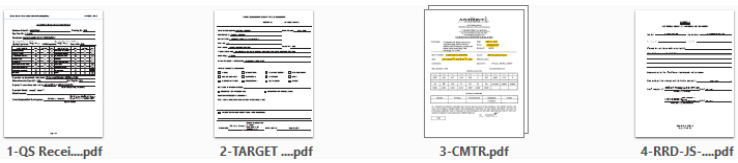



**Figure 33. File error fixed display.**

- Select combine button (Figure 34).

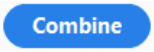



**Figure 34. Combine files button.**

3. Add a header to the combined document.

    - Select header & footer at the top of the document.
    - Select add.
    - Select add new.
    - In the right header text box, enter the following: "IR# *manufacturer initials-PO#-part initials*" (e.g., IR# *WT-4000183434-BC*) (Figure 35).

        ➢The IR# is equivalent to both the job number on the cleaning report and the report ID on the target receipt inspection report (refer to Section 1.1.2 and Figure 9).

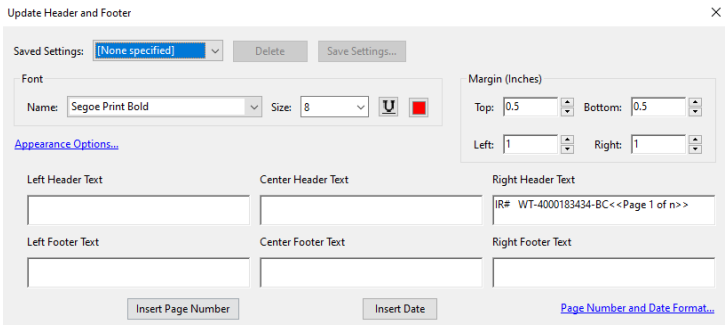



**Figure 35. Update header and footer box.**

➢Use red font.

➢Select insert page number using the format page 1 of n (Figure 35).

4. Save the file as a PDF.

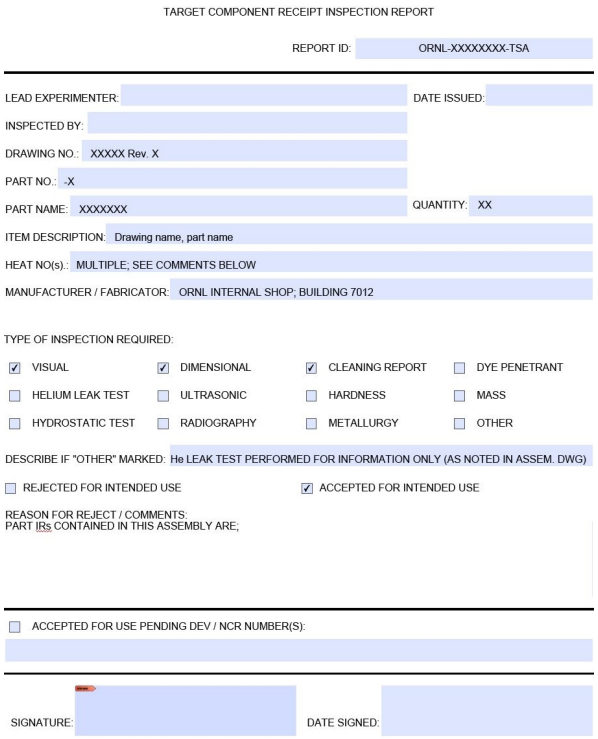
# 2. CREATING TARGET SUBASSEMBLY FABRICATION PACKAGES

## 2.1 TARGET SUBASSEMBLY FABRICATION PACKAGES

The target subassembly fabrication packages comprise several documents that include the target component receipt inspection report, the completed target component fabrication packages, Weld 1 and Weld 2 reports, helium leak test report pre-hydro, the DI report for the target rod post machined weldment, and the cleaning report.

### 2.1.1 Target Component Receipt Inspection Report

1. Fill out the target component receipt inspection report for the target subassembly (Figure 36).


TARGET COMPONENT RECEIPT INSPECTION REPORT

REPORT ID: ORNL-XXXXXXXX-TSA

LEAD EXPERIMENTER: DATE ISSUED:

INSPECTED BY:

DRAWING NO.: XXXXX Rev. X

PART NO.: -X

PART NAME: XXXXXXX QUANTITY: XX

ITEM DESCRIPTION: Drawing name, part name

HEAT NO(s).: MULTIPLE; SEE COMMENTS BELOW

MANUFACTURER / FABRICATOR: ORNL INTERNAL SHOP; BUILDING 7012

TYPE OF INSPECTION REQUIRED:

☑ VISUAL ☑ DIMENSIONAL ☑ CLEANING REPORT ☐ DYE PENETRANT

☐ HELIUM LEAK TEST ☐ ULTRASONIC ☐ HARDNESS ☐ MASS

☐ HYDROSTATIC TEST ☐ RADIOGRAPHY ☐ METALLURGY ☐ OTHER

DESCRIBE IF "OTHER" MARKED: He LEAK TEST PERFORMED FOR INFORMATION ONLY (AS NOTED IN ASSEM. DWG)

☐ REJECTED FOR INTENDED USE ☑ ACCEPTED FOR INTENDED USE

REASON FOR REJECT / COMMENTS:
PART IRs CONTAINED IN THIS ASSEMBLY ARE;

☐ ACCEPTED FOR USE PENDING DEV / NCR NUMBER(S):

SIGNATURE: DATE SIGNED:

**Figure 36. Sample target component receipt inspection report.**

- The report ID is made up of the *manufacturer initials–Year month–part initials*.
  - An example of a report ID is ORNL-2020SEPT-TSA.
  - The target subassembly part initials are TSA.

- Enter the lead experimenter, the date issued, and the name of the person who inspected the parts.

- Enter the drawing number with the REV number used for making the parts (refer to Figure 10 to complete a drawing search).

    - Drawings with current REV numbers and part numbers are found in RNSD drawing system (https://home.rrd.ornl.gov/cfpro/rnsd/hems/drawings/dsearch.cfm).

- Enter the quantity of parts.

- Enter the item description (e.g., Generation 2 $^{238}$Pu cermet irradiation, target rod weldment).

- Enter "Multiple, see comments below" for the heat numbers section.

    - In the comments section, list the report IDs where the heat numbers are found (e.g., part IRs contained in this assembly are WT-4000175849-UT).

- Enter the manufacturer, which is the ORNL internal shop, Building 7012.

- Select the type of inspection required (e.g., visual, dimensional, cleaning report).

- Identify any parts that were rejected and give the reason the part(s) were rejected in the comment section.

- Add any additional comments as needed.

2. Once the target component receipt inspection report has been completed, it must be signed.
3. Save the file as a PDF.

### 2.1.2 Completed target component fabrication packages

The target component fabrication reports were completed and compiled for each target component in Section 1.1.6. The completed target component fabrication package files will be used to create the target subassembly fabrication package.

### 2.1.3 Weld Reports

1. Weld reports are completed by the weld inspector who was present for the welding of the target subassemblies.

2. Review the weld reports for Weld 1 and Weld 2.

3. Ensure all the information has been filled out accurately for each weld of each subassembly (a sample weld report is displayed in Figure 37).

REPORT NUMBER: 1 **E-BEAM WELD #1 VISUAL INSPECTION REPORT** WELD REPORT DATE: 7-21-2020

2ND GENERATION Pu-238 CERMET IRRADIATION

DWG TITLE: Target Rod Pre/Post Machined Weldment JOINT TYPE: SINGLE WELDED LOCATION: BUILDING 4508

DWG NUM: X3E020977A732 Rev. 2 INSP. SPEC.: NDE 21 Rev. 3 WELD SPEC.: EB23.23-5(PP) Rev. 0 C/N 02

BASE MATERIAL(S): CHARGE CODE: Z2TFB221

| | LOWER TRANSITION | WELD COUPLER, BTM | FINNED TUBE | | LOWER TRANSITION | WELD COUPLER, BTM | FINNED TUBE | | LOWER TRANSITION | WELD COUPLER, BTM | FINNED TUBE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE: | 6061 Al | 4047 Al | 6061 Al | HEAT #: | P0.750280 | 310ED1 | 22739-1-2 | SPEC.: | ASTM B221 | AMS 4185 | ASTM B221 |
| IR #: | WT-4000177619-MLT | WT-4000175849-BC | WT-4000175849-FT | MFG: | KAISER ALUMINUM | JL ANTHONY | PROFILE PRECISION | # PCS./ASSY.: | 1 EACH | 1 EACH | 1 EACH |

WELD PARAMETERS:

| | DATE OF WELD | TARGET ID | VOLTS (kV) | BEAM CURR. (mA) | LENS CURR. (mA) | FILAMENT CURR. (A) | CLEANER - ACETONE | CLEANER - ALCOHOL | JOINT PREP | FIT UP | WELDER | WELDER EXP. | FINAL INSP. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 06/29/2020 | FL-645 | 100 | 2.8 | 584 | 24 | ✓ | ✓ | SAT | SAT | 3V | 09/03/2020 | SAT |

**Figure 37. Sample weld report.**

4. Ensure the final acceptance section is signed by a qualified staff member (Figure 38).

INSPECTOR(S) SIGNATURE(S): Mark A Denton Digitally signed by Mark A Denton Date: 2020.08.26 08:31:55 -04'00'

FINAL ACCEPTANCE: Chris L. Jensen Digitally signed by Chris L. Jensen Date: 2020.09.30 10:09:07 -04'00'

**Figure 38. Sample signature section of weld report.**

5. Save the report as a PDF.

### 2.1.4 Helium Leak Check Report

1. Navigate to the Non-Destructive Examination (NDE) SharePoint site (https://ornl.sharepoint.com/sites/iosd/qms/NDE/default.aspx).

2. Click on the NDE service request icon (Figure 39).


**Figure 39. NDE service request icon.**

3. Fill out the necessary information in the work overview on the service request (Figure 40).

- Enter the description with corresponding number to inspect.
  - ➢ For example, HELIUM LEAK TEST PERFORMED FOR INFORMATION ONLY (AS NOTED IN ASSEMBLY DRAWING) OF ### TARGET SUB-ASSEMBLIES.

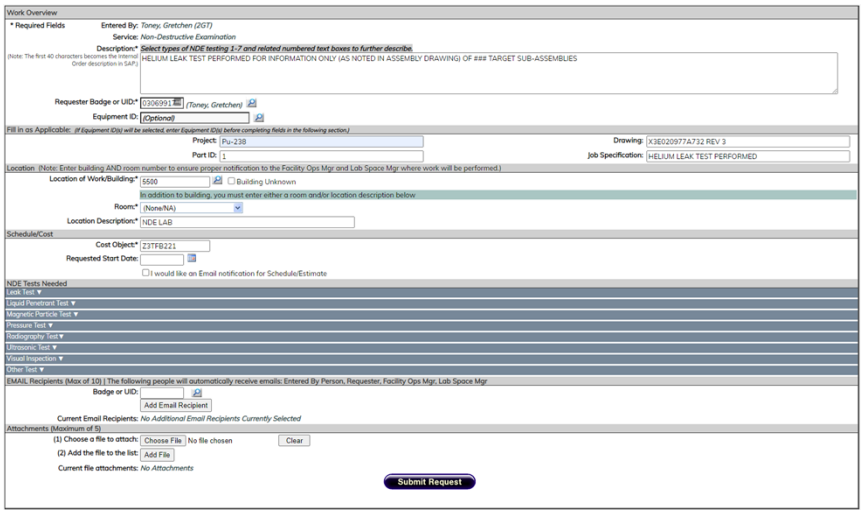
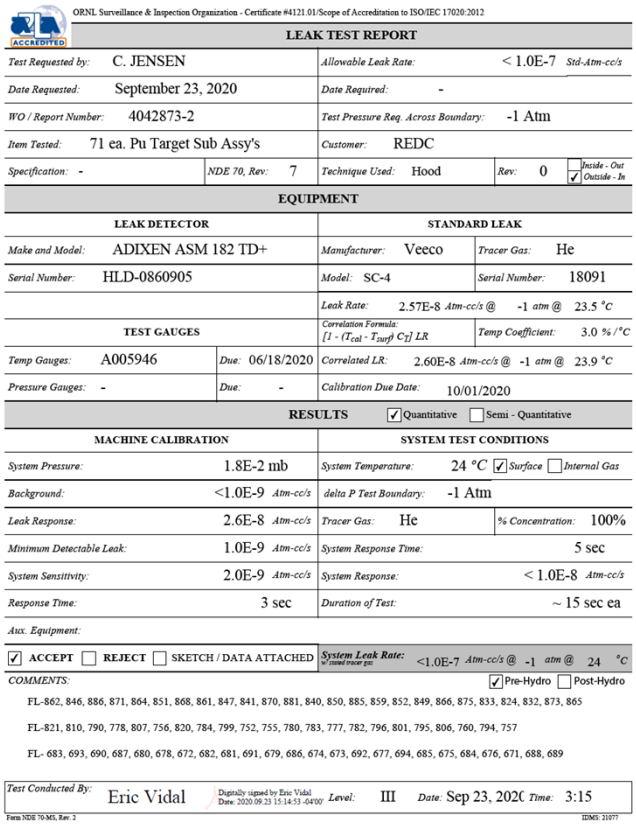



**Figure 40. Sample NDE service request online form.**

- Enter the requestor's badge number.
- Enter the project (e.g., PU238).
- Enter the part ID (e.g., -1).
- Enter the drawing and REV number (e.g., X3E020977A732 REV 3).
- Enter the job specification.
    - For example, HELIUM LEAK TEST TARGET SUB-ASSEMBLIES.
- Enter the location of the building (e.g., 5500).
- Enter the location description (e.g., NDE LAB).
- Enter the cost object.

4. Select submit the request.
5. After the target sub-assemblies have been helium leak checked by NDE. The NDE department will send a leak test report (Figure 41).



ORNL Surveillance & Inspection Organization - Certificate #4121.01/Scope of Accreditation to ISO/IEC 17020:2012

**LEAK TEST REPORT**

| | | | |
|---|---|---|---|
| *Test Requested by:* | C. JENSEN | *Allowable Leak Rate:* | < 1.0E-7 *Std-Atm-cc/s* |
| *Date Requested:* | September 23, 2020 | *Date Required:* | - |
| *WO / Report Number:* | 4042873-2 | *Test Pressure Req. Across Boundary:* | -1 Atm |
| *Item Tested:* | 71 ea. Pu Target Sub Assy's | *Customer:* | REDC |
| *Specification:* | - *NDE 70, Rev:* 7 | *Technique Used:* | Hood *Rev:* 0 ☐ Inside - Out ☑ Outside - In |

**EQUIPMENT**

| LEAK DETECTOR | | STANDARD LEAK | |
|---|---|---|---|
| *Make and Model:* | ADIXEN ASM 182 TD+ | *Manufacturer:* Veeco | *Tracer Gas:* He |
| *Serial Number:* | HLD-0860905 | *Model:* SC-4 | *Serial Number:* 18091 |
| | | *Leak Rate:* 2.57E-8 *Atm-cc/s @* -1 *atm @* 23.5 *°C* | |
| **TEST GAUGES** | | *Correlation Formula:* $[1 - (T_{cal} - T_{surf}) C_T] LR$ | *Temp Coefficient:* 3.0 *% / °C* |
| *Temp Gauges:* | A005946 *Due:* 06/18/2020 | *Correlated LR:* 2.60E-8 *Atm-cc/s @* -1 *atm @* 23.9 *°C* | |
| *Pressure Gauges:* | - *Due:* - | *Calibration Due Date:* | 10/01/2020 |

**RESULTS** ☑ Quantitative ☐ Semi - Quantitative

| MACHINE CALIBRATION | | SYSTEM TEST CONDITIONS | |
|---|---|---|---|
| *System Pressure:* | 1.8E-2 mb | *System Temperature:* | 24 *°C* ☑ *Surface* ☐ *Internal Gas* |
| *Background:* | <1.0E-9 *Atm-cc/s* | *delta P Test Boundary:* | -1 Atm |
| *Leak Response:* | 2.6E-8 *Atm-cc/s* | *Tracer Gas:* He | *% Concentration:* 100% |
| *Minimum Detectable Leak:* | 1.0E-9 *Atm-cc/s* | *System Response Time:* | 5 sec |
| *System Sensitivity:* | 2.0E-9 *Atm-cc/s* | *System Response:* | < 1.0E-8 *Atm-cc/s* |
| *Response Time:* | 3 sec | *Duration of Test:* | ~ 15 sec ea |
| *Aux. Equipment:* | | | |

☑ ACCEPT ☐ REJECT ☐ SKETCH / DATA ATTACHED — *System Leak Rate:* w/ tunnel tracer gas: <1.0E-7 *Atm-cc/s @* -1 *atm @* 24 *°C*

*COMMENTS:* ☑ Pre-Hydro ☐ Post-Hydro

FL-862, 846, 886, 871, 864, 851, 868, 861, 847, 841, 870, 881, 840, 850, 885, 859, 852, 849, 866, 875, 833, 824, 832, 873, 865

FL-821, 810, 790, 778, 807, 756, 820, 784, 799, 752, 755, 780, 783, 777, 782, 796, 801, 795, 806, 760, 794, 757

FL- 683, 693, 690, 687, 680, 678, 672, 682, 681, 691, 679, 686, 674, 673, 692, 677, 694, 685, 675, 684, 676, 671, 688, 689

*Test Conducted By:* Eric Vidal Digitally signed by Eric Vidal Date: 2020.09.23 15:14:53 -04'00' *Level:* III *Date:* Sep 23, 202( *Time:* 3:15

Form NDE 70-MS, Rev. 3 IDMS: 21077

**Figure 41. Sample NDE leak test report.**

6. Review the leak test report for accuracy.

7. Save the file as PDF.

### 2.1.5 Dimensional Inspection Report

After the target subassembly has been welded and helium leak tested (for information only), the target subassemblies must go to ORNL Metrology and Measurement Services for DI.

1. Instruct the department to complete the DI of the parts.

    - Provide the department with the part name, drawing number, REV number, and part number.

    - Discuss the time frame for retrieving the subassemblies from the department.

2. Once the target subassemblies have completed DI, ORNL Metrology and Measurement Services will provide a DI plan and report (refer to Section 1.1.3 and Figure 11).

    - The report will be signed by the inspector and the inspection supervisor.

- The report will be reviewed to ensure the form has been properly filled out by the department.

    - Check the part name, drawing number, REV number, job description, material type, temperature, humidity, inspection type, inspection method, drawing requirement, inspection results, and serial numbers are accurate and have been recorded.

    - Identify any parts that do not meet requirements.

3. Save the DI form from ORNL Metrology and Measurement Services as a PDF file.

4. Prepare the form using Adobe Sign for the final signatures.

    - Go to the Adobe Sign home page and sign into your account (https://ornladobesign.na1.echosign.com/public/login).

    - Click on the request signatures button (refer to Figure 12).

    - Drag and drop the saved PDF file to the files box (refer to Figure 13).

    - Enter the task leader's name to the enter recipient email field, Box 1 (refer to Figure 14). The add me link can be used.

    - Enter the QA reviewer's name in the enter recipient email field, Box 2.

    - Enter the task leader's name to the enter recipient email field, Box 3. The add me button can be used.

    - On the right, in the options box, select set reminder to every business day.

    - Click on next, and document will be processed (refer to Figure 15).

    - Verify the recipient's box contains the person selected to correctly create the signature field (refer to Figure 16).

    - Go to the signature fields box and click on signature to highlight it in white (refer to Figure 17).

    - Drag the signature field box to the appropriate place in the document and size the box as needed (refer to Figure 18).

    - Open the signer info fields box with the drop-down arrow (refer to Figure 19).

    - Go to the signer info fields box and click on date to highlight it in white (refer to Figure 19).

- Drag the date field box to the appropriate place in the document and size the box as needed.

- Right-click on the date box created and then select edit (refer to Figure 20).

- On date format, select custom from the drop-down box and enter a date format that will fit the form such as m/d/yy (refer to Figure 21).

- Open appearance and select center for the alignment (refer to Figure 21).

- Click OK when complete.

- Go to the data fields box and click on check box to highlight it in white (refer to Figure 22).

- Drag the check box to the appropriate place in the document and size the box accordingly (refer to Figure 23).

- Verify that the color coding assigned to the designated signer in the recipient's box aligns with the signature, date, and check box.

- Return to the recipient's box and select the next person to sign the document using the drop-down arrow (refer to Figure 24).

- Repeat the process of applying signature field boxes, date field boxes, and check boxes for each signer on the document until all the necessary signers have been added.

- If you are the first signer, then select sign, then send (refer to Figure 25).

5. The form will be sent out to all the necessary signers.

6. Once the form has been completely signed, download and save it as a PDF file.

### 2.1.6 Cleanliness Report for Materials and Components

1. Open a blank cleanliness report (RRD-JS-31 form; Figure 42).

2. Record the job number on the report.

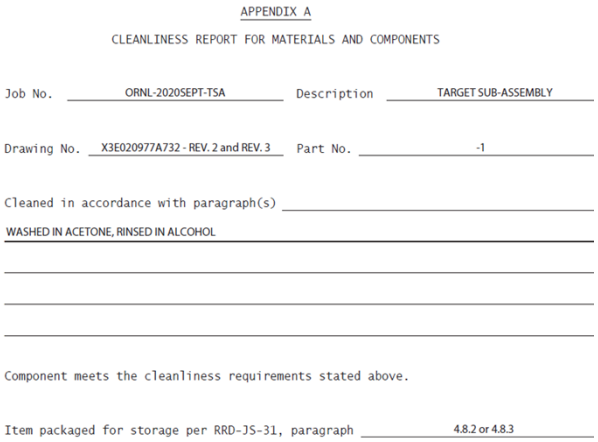
    - The job number is made up of the *manufacturer initials–year month–part initials* (e.g., ORNL-2020SEPT-TSA).

        ➢ The job number is equivalent to the report ID on the target receipt inspection report (refer to Section 2.1.1 and Figure 36).

3. Record the description which is the part name.

4. Record the drawing number with REV number included.

5. Record the part number.



APPENDIX A

CLEANLINESS REPORT FOR MATERIALS AND COMPONENTS

Job No. ORNL-2020SEPT-TSA Description TARGET SUB-ASSEMBLY

Drawing No. X3E020977A732 - REV. 2 and REV. 3 Part No. -1

Cleaned in accordance with paragraph(s)

WASHED IN ACETONE, RINSED IN ALCOHOL

Component meets the cleanliness requirements stated above.

Item packaged for storage per RRD-JS-31, paragraph 4.8.2 or 4.8.3

**Figure 42. Sample TSA cleanliness report (RRD-JS-31).**

6. Describe the cleaning process as “Washed in acetone, Rinsed in alcohol.”

7. Record the item packaged for storage per RRD-JS-31, paragraph as “4.8.2 or 4.8.3.”

8. Email the form to the person signing as the “Foreman in Charge” under final acceptance.

9. Email the form to the person signing as the “ORNL Quality Department.”

10. Once the form has been completed save the form as a PDF file.

### 2.1.7 Compile Target Subassembly Fabrication Package

1. Organize the saved PDF files in the file folder according to the order listed below. Ensure a number is placed in front of the file (Figure 43).

    - First, the target component receipt inspection report.
    - Second, the QS receipt inspection checklist.
    - Third, the target components fabrication packages.
    - Fourth, the weld reports.
    - Fifth, the helium leak test reports.
    - Sixth, the target subassembly DI report.

- Seventh, the cleaning report (RRD-JS-31).

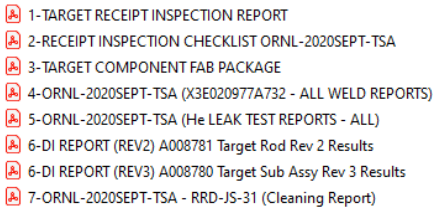



**Figure 43. Organized TSA fabrication package files.**

2. Combine the files into one file.

    - Highlight the files and right-click.
    - Select combine files in Acrobat (refer to Figure 31).
        - ➢ If an error on the file appears (refer to Figure 32), it will not allow the files to be merged, and the file needs to be saved properly.
        - ➢ Open the file and select print to PDF.
        - ➢ Redo the steps to combine the files in Acrobat (refer to Figure 33).
    - Select combine (refer to Figure 34).

3. Add a header to the combined document.

    - Select header & footer at the top of the document.
    - Select add.
    - Select add new.
    - In the left header text box, enter the following "*Fab File: manufacturer initials–Year month –part initials*" for example, Fab File: ORNL-2020SEPT-TSA (Figure 44).

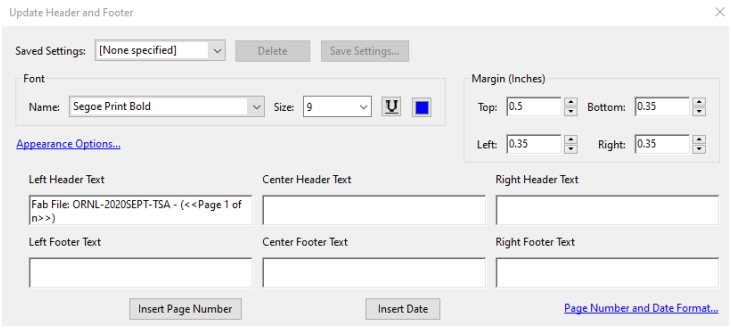



**Figure 44. Sample header text box for fabrication file.**

➢Use blue font.

➢Select insert a page number and use the format page 1 of n (Figure 44).

4. Save the file as a PDF.

# 3. CREATING SPIDER (TARGET HOLDER) FABRICATION PACKAGES

## 3.1 SPIDER (TARGET HOLDER) FABRICATION PACKAGES

The spider (or target holder) fabrication packages comprise several documents that include the receipt inspection checklist, receipt inspection report, target rod holder DI report, target rod holder component CMTRs, and cleaning report.

### 3.1.1 QS Receipt Inspection Checklist

1. Navigate to SAP through the Key Links tab on the ORNL home page.

2. Open the Materials Management link.

3. Open the Purchase Orders Display link under the Information group. This step will require you to log in with your three-character ID and UCAMS password.

4. Enter the PO number in the document number field and click find (refer to Figure 3).

    - General information will be provided first.

    - Take note of the vendor who has machined the parts.

    - The drawing numbers with the REVs used to make the parts will be listed with each part.

5. Identify all the line items that contain the parts.

- Exclude the line items that do not contain parts such as delivery fees and DI reports.

6. Record on the QS receipt inspection checklist the PO number, the Req No, the quantity of parts ordered, and the quantity of parts received (from the PO).

7. Fill out the receipt inspection checklist, a form encompassing information for all the spider (or target rod holder) components.

    - An example of the description is $^{238}$Pu Target Rod Holder (Spider) Components.

    - The target rod components are QS. Make sure to check Yes.

    - The target rod components are 100% inspected. Make sure to check Yes.

    - The attributes should be checked off as either satisfactory, unsatisfactory, or N/A.

8. Once the receipt inspection checklist has been completed, it must be signed.

9. Save the file as a PDF.

### 3.1.2 Dimensional Inspection Report

After the target rod holder (or spider) component parts have been fabricated, the individual parts including the bottom cup, pintel head, spider body, and top cup must go to metrology for DI according to the drawings. After the target rod holder assembly has been fabricated which is comprised of the bottom cup, spider body, and dowel pin then it must go to ORNL Metrology and Measurement Services for DI.

1. Instruct the department to complete the DI of the parts.

    - Provide the department with the part name, drawing number, REV number, and part number.

    - Discuss the time frame for retrieving the spider component parts or spider from inspection.

2. Once the spider component parts have completed DI, ORNL Metrology and Measurement Services will provide a DI plan and report (refer to Figure 11).

    - The report will be signed by the inspector and the inspection supervisor.

    - The report will be reviewed to ensure the form has been properly filled out by the department.

        - Check the part name, drawing number, REV number, job description, material type, temperature, humidity, inspection type, inspection method, drawing requirement, inspection results, and serial numbers are accurate and have been recorded.

➢ Identify any parts that do not meet the requirements.

3. Save the DI form from ORNL Metrology and Measurement Services as a PDF file.

4. Prepare each DI form using Adobe Sign for the final signatures.

    - Go to the Adobe Sign home page and sign into your account (https://ornladobesign.na1.echosign.com/public/login).
    - Click on the request signatures button (refer to Figure 12).
    - Drag and drop the saved PDF file to the files box (refer to Figure 13).
    - Enter the task leader's name in the enter recipient email box one (refer to Figure 14). The add me button can be used.
    - Enter the QA reviewer's name in the enter recipient email field, Box 2.
    - Enter the task leader's name in the enter recipient email box three. The add me button can be used.
    - On the right in the options box, select set reminder to every business day.
    - Click on next and document will be processed (refer to Figure 15).
    - Verify the recipient's box contains the person selected to correctly create the signature fields (refer to Figure 16).
    - Go to the signature fields box and click on signature to highlight it in white (refer to Figure 17).
    - Drag the signature field box to the appropriate place in the document and size the box as needed (refer to Figure 18).
    - Open the signer info fields box with the drop-down arrow (refer to Figure 19).
    - Go to the signer info fields box and click on date to highlight it in white (refer to Figure 19).
    - Drag the date field box to the appropriate place in the document and size the box as needed.
    - Right-click on the date box created and then select edit (refer to Figure 20).

- On date format, select from the drop-down box custom and enter a date format that will fit the form such as m/d/yy (refer to Figure 21).

- Open appearance and select center for the alignment (refer to Figure 21).

- Click OK when complete.

- Go to the data fields box and click on check box to highlight it in white (refer to Figure 22).

- Drag the check box to the appropriate place in the document and size the box accordingly (refer to Figure 23).

- Verify that the color coding assigned to the designated signer in the recipient's box aligns with the signature, date, and check box.

- Return to the recipient's box and select the next person to sign the document using the drop-down arrow (refer to Figure 24).

- Repeat the process of applying signature field boxes, date field boxes, and check boxes for each signer on the document until all the necessary signers have been added.

- If you are the first signer, then select sign, then send (refer to Figure 25).

5. The form will be sent out to all the necessary signers.

6. After each form has been signed, download, and save it as a PDF file.

### 3.1.3 Target Component Receipt Inspection Report

1. Fill out the target component receipt inspection report for each spider component (refer to Figure 9).

    - The report ID is made up of the *manufacturer initials–PO#–part initials*.

        ➢ An example of a report ID is WT-4000175849-SBC.

        ➢ Spider component part initials are:
            - The bottom cup is SBC.
            - The top cup is STC.
            - The pintel head is SPH.
            - The spider body is SB.

    - Enter the lead experimenter, the date issued, and the name of the person who inspected the parts.

- Enter the drawing number with the REV used for making the parts (refer to Section 1.1.2 and Figure 10 to complete a drawing search).
    - Drawings with current REV numbers and part numbers are found in RNSD drawing system (https://home.rrd.ornl.gov/cfpro/rnsd/hems/drawings/dsearch.cfm).
- Enter the quantity of parts.
- Enter the item description (e.g., 304L SST).
- The heat numbers are found in the CMTRs (refer to Figure 27).
- Enter the manufacturer.
- Select the type of inspection required (e.g., visual, dimensional, cleaning report).
- Identify any parts that were rejected and give the reason the part(s) were rejected in the comment section.
- Add any additional comments as needed.

2. Once the target component receipt inspection report has been completed, it must be signed.
3. Save the file as a PDF.

### 3.1.4 Certified Material Test Report

1. Navigate to the RRD home website (https://home.rrd.ornl.gov/RRDhome.cfm).
2. Open WebMapics.
3. In the scope selection drop-down box, ensure that inventory is selected.
4. Enter the SUBID found in the material issue ticket and select search.
5. Find the SUBID and select the Req No highlighted in blue (refer to Figure 26).
6. Click on the scanned image highlighted in blue under the Req No (refer to Figure 27).
7. Search through the documents listed to find the CMTRs that correlate the heat numbers of the materials used to manufacture the part (refer to Figure 28).
    - Use Ctrl-F to find the specific pages needed from the scanned documents.

8. Print the CMTR pages from the scanned documents to PDF and save them.

### 3.1.5 Cleanliness Report for Materials and Components

1. Open a blank cleanliness report (RRD-JS-31 form; refer to Figure 42).

2. Record the job number on the report.

    - The job number is made up of the *manufacturer initials–PO#–part initials* (e.g., WT-4000183434-SB).

        ➢ The job number is equivalent to the report ID on the target receipt inspection report (refer to Section 3.1.3 and figure 9).

3. Record the description (i.e., part name).

4. Record the drawing number with REV number.

5. Record the part number.

6. Describe the cleaning process as "Washed in acetone, Rinsed in alcohol."

7. Record the item packaged for storage per RRD-JS-31, paragraph as "4.8.2 or 4.8.3."

8. Email the form to the person signing as the "Foreman in Charge" under final acceptance section.

9. Email the form to the person signing as the "ORNL Quality Department."

10. Once the form has been completed save the form as a PDF file.

### 3.1.6 Compile Target Rod Holder (Spider) Fabrication Package

1. Organize the saved PDF files in the file folder according to the order listed below. Ensure a number is placed in front of the files (Figure 45).

    - First, the QS receipt inspection checklist.
    - Second, the target rod holder DI report.
    - Third, the receipt inspection report for the bottom cup.
    - Fourth, the DI report for the bottom cup.
    - Fifth, the CMTR for the bottom cup.
    - Sixth, the cleaning report for the bottom cup.

- Seventh, the receipt inspection report for the pintel head.
- Eighth, the DI report for the pintel head.
- Nineth, the CMTR for the pintel head.
- Tenth, the cleaning report for the pintel head.
- Eleventh, the receipt inspection report for the spider body.
- Twelfth, the DI report for the spider body.
- Thirteenth, the CMTR for the spider body.
- Fourteenth, the cleaning report for the spider body.
- Fifteenth, the receipt inspection report for the top cup.
- Sixteenth, the DI report for the top cup.
- Seventeenth, the CMTR for the top cup.
- Eighteenth, the cleaning report for the top cup.

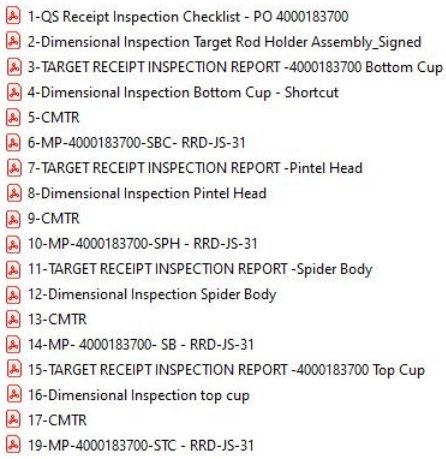



**Figure 45. Organized spider fabrication package files.**

2. Combine the files into one file.
    - Highlight the files and right-click.
    - Select combine files in Acrobat (refer to Figure 31).

- If an error on the file appears (refer to Figure 32), it will not allow the files to be merged, and the file needs to be saved properly.
- Open the file and select print to PDF.
- Redo the steps to combine the files in Acrobat (refer to Figure 33).

- Select combine (refer to Figure 34).

3. Add a header to the combined document.

- Select header & footer at the top of the document.
- Select add.
- Select add new.
- In the right header text box, enter the following: "PO# *PO number*" (e.g., PO# 4000175783) (Figure 46).

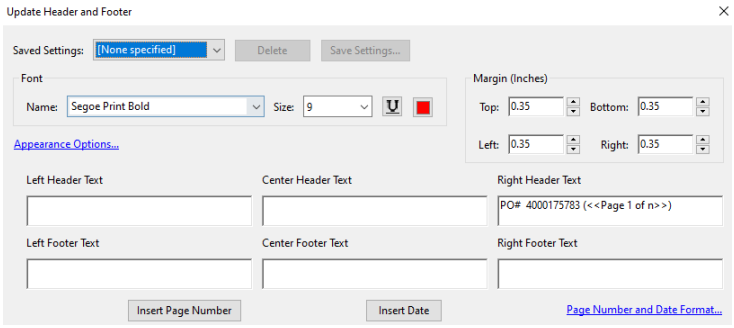



**Figure 46. Sample header text box for PO#.**

- Use red font.
- Insert page number use format page 1 of n.

4. Save the file as a PDF.