

Report

Arrangement 5 - CVCS Mobile resin transfer cask Equipment Summary

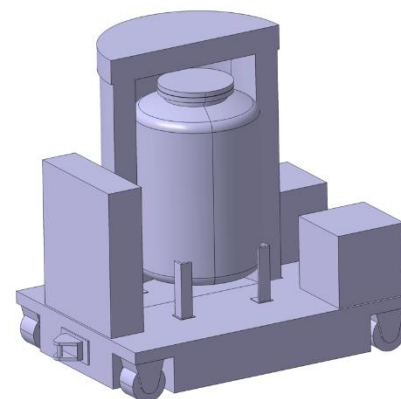
This document provides a summary of CVCS Mobile resin transfer cask

Approval Process			
	<i>Name</i>	<i>Action</i>	<i>Affiliation</i>
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<i>Approver</i>	Lioce D.	07 Apr 2023:approved	IO/DG/CNST/PLD/MID/TCWS
Document Security: Internal Use RO: Lioce Donato			
<i>Read Access</i>	LG: Arrangement 5 Cost Estimation, LG: USDA Arrangement 5, LG: Management, GG: IO DDGs (and Senior Advisors), AD: IO_Director-General, AD: External Management Advisory Board, AD: OBS - Project Control Office (PCO), AD: IDM_Controller, AD: OBS - Procurement & Contracts Division (PCD), AD: Auditors, p...		

<i>Change Log</i>			
Arrangement 5 - CVCS Mobile resin transfer cask Equipment Summary (8U78U2)			
<i>Version</i>	<i>Latest Status</i>	<i>Issue Date</i>	<i>Description of Change</i>
v0.0	In Work	10 Mar 2023	
v1.0	Signed	12 Mar 2023	The first version for review.
v2.0	Approved	28 Mar 2023	Updated according to comments.

OPERATIONAL NARRATIVE

Mobile resin transfer cask is a movable unit with shielded cask (tank), pump and associating accessories, which are used to load & unload resin of demineralizer in IBED and NBI CVCSs. Resin will be fluidized with water and transferred by liquid jet pump (ejector).



Disclaimer:

- Contents of this document have been assembled, reviewed and approved as for Information Only,
- May not be used for purchasing, fabrication or construction,
- May not be used as verified input to any document (may be used as unverified assumption).

COMPONENT INCLUDED

CVCS Mobile resin transfer cask shall include the following components. Note that this is not an exhaustive list and any additional components needed for the operation shall be included. Associating support and skid to be also provided. The scope is for a complete unit mounted on a mobile skid with all needed equipment and with shielding, ready to be used.

- Liquid jet pump (liquid/liquid ejector)
- Centrifugal pump to boost motive water
- Isolation valves and Cardan drive shafts, which enables manual valve operation from outside of the shielding
- Solids retention valve, actuated
- Cask (tank) with screen
- Shielding with connection to dynamic confinement

PHYSICAL ATTRIBUTES

<i>Commodity Type:</i>	Mobile unit
<i>Approx. Footprint:</i>	2.5 m x 2.3 m
<i>Approx. Height:</i>	2.3 m including shielding and support
<i>Approx. Weight:</i>	30 ton (with resin loaded)
<i>Approx. Resin Tank Volume:</i>	1.1 m ³
<i>Fluidizing Fluid:</i>	Demin. Water
<i>Material Notes:</i>	304L SS for wetted parts
<i>Maximum floor load</i>	8 ton/m ²
<i>Component configuration</i>	Mounted on mobile Skid, with shielding
<i>Design Life Time:</i>	300 loading/unloading operations

REFERENCE DOCUMENTS

Sizing calculation: ITER_D_Y5WG9D_v4.0

PID: N/A

ENVIRONMENTAL CONDITIONS

<i>Normal temperature</i>	5 – 35 °C
<i>Normal Humidity</i>	40 – 60 %
<i>Normal Pressure relative to atm:</i>	-0.14 kPa

CVCS – Mobile Resin Transfer Cask

DESIGN CODES AND SHIPPING

<i>French Law Pressure</i>	ESPN / 0 / N3
<i>Category / Nuclear Class:</i>	
<i>European Law:</i>	PED
<i>Fluid Type / Fluid group</i>	Liquid / Group 2
<i>Conformity Assessment Module:</i>	Cat 0
<i>Construction Codes:</i>	ASME VIII Div2
<i>Safety Class:</i>	SIC-1
<i>Quality Class:</i>	QC-1
<i>Seismic Class:</i>	SC1 (S)
<i>Fire:</i>	n/a
<i>Shipping Information:</i>	Oversea packing per ASME NQA-1 Level C, DAP at ITER site

PARAMETERS

Parameter	Value
<i>Nominal Temperature (°C)</i>	35
<i>Design Temperature (°C)</i>	60
<i>Nominal Pressure (MPa)</i>	0.15
<i>Design Pressure (MPa)</i>	0.70
<i>Centrifugal Pump capacity (m³/h)</i>	11
<i>Centrifugal Pump head (m)</i>	50
<i>Target transfer resin rate (kg/h)</i>	3300
<i>Pump motor rating (kW)</i>	3.5

INTERFACE WITH DEMINERALIZER

I.D.	DN / Schedule	Service
N1	50 / 40S	Resin unloading
N2	50 / 40S	Water return to demineralizer
N3	200 / 20	Resin loading
N4	80 / 40S	Dynamic confinement header
N5	20 / 40S	Vent

PRELIMINARY SHIELDING CHARACTERISTICS

<i>Shielding Material:</i>	Stainless Steel
<i>Shielding thickness:</i>	40 mm
<i>Outside dimensions:</i>	H=2300 mm, L ₁ =2500 mm and L ₂ =1500mm
<i>Shielding weight:</i>	8300 kg
<i>Target Occupational dose rate</i>	≤ 20 μSv/h at 30 cm from the shielding
<i>Contained radiation level (GBq)</i>	404 (see Table 1 for detail)

Notes:

- Supplier to select suitable liquid/liquid ejector to achieve target transfer rate with the given pump head and water balance in the next page.
- Approximate footprint is based on 3d model approved configuration.
- Connection with demineralizer vessel shall be quick coupling inside glove box with dynamic confinement.
- Minimum documentation shall include: Quality plans, Manufacturing & inspection plans, Procedures, Calculation note (where design is involved), Working instructions, Special process qualifications (if applicable), Operator qualifications, As-built drawings, Contractor release note, Certificate of conformity, Material certification and inspection documents according to EN 10204 Type 3.1 (or equivalent) traceable to the component part and equipment.

CVCS – Mobile Resin Transfer Cask

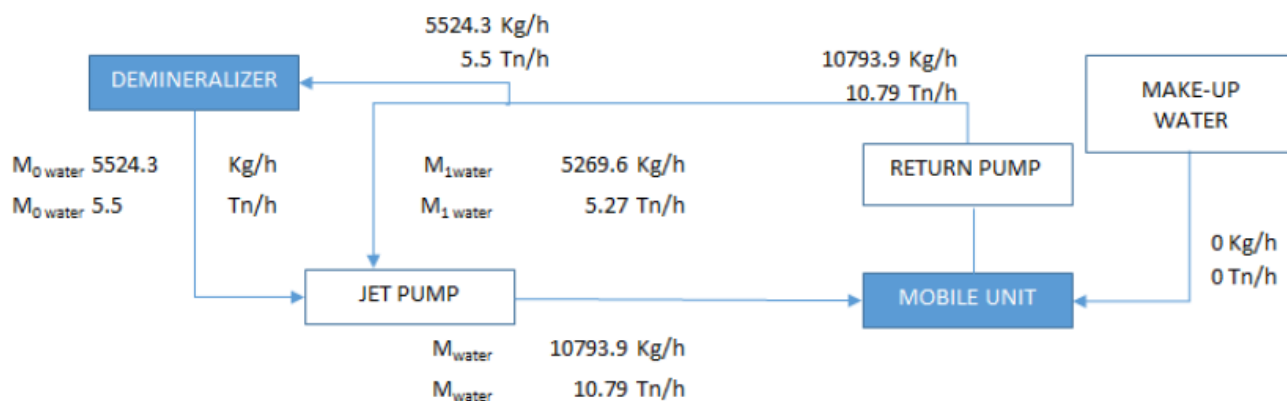


Figure 1 Water balance during Resin unloading operation

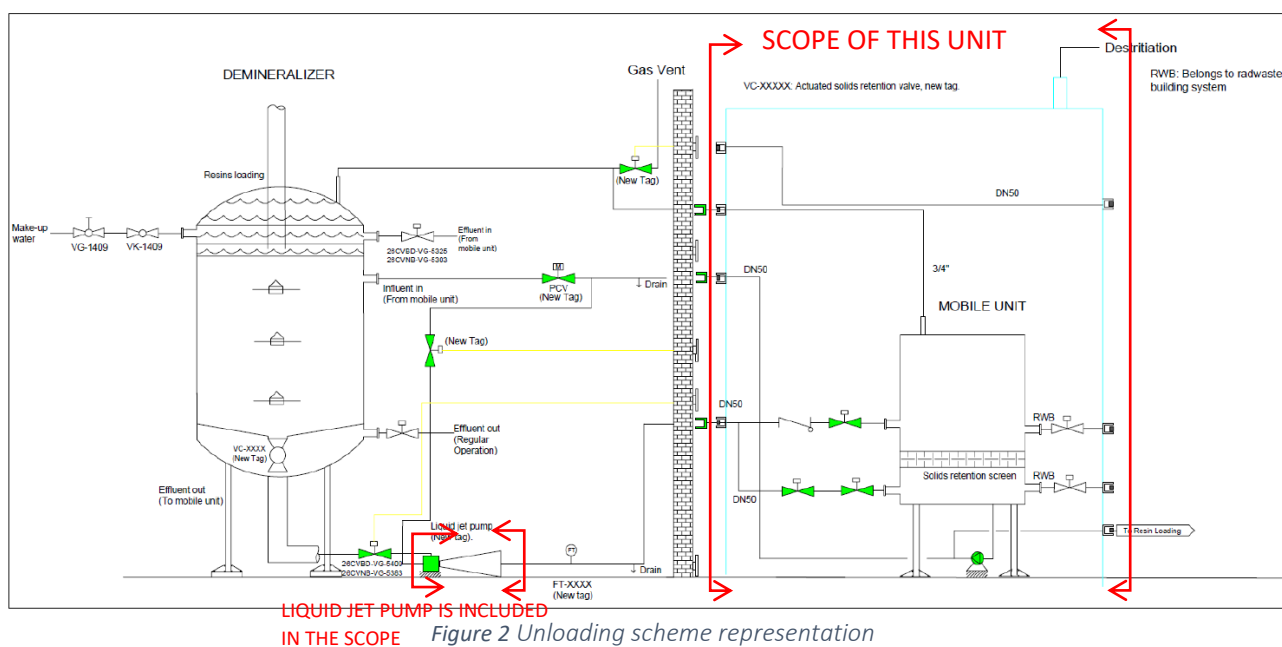


Figure 2 Unloading scheme representation

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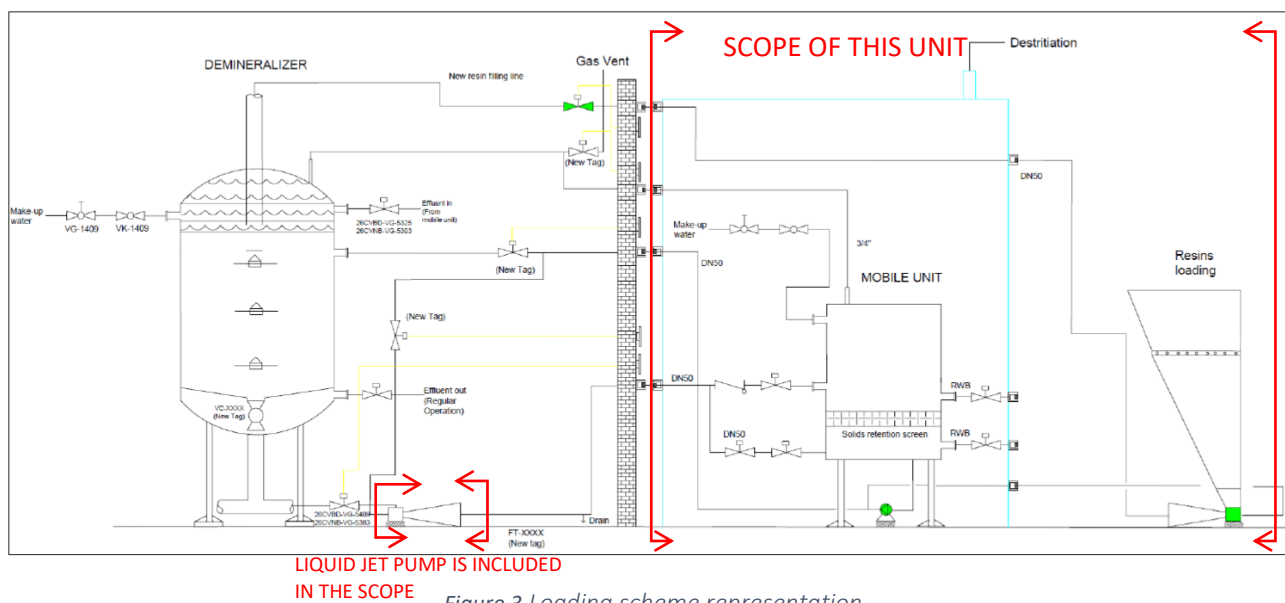


Figure 3 Loading scheme representation

Table 1 Activity of spent resin

	Activity (Bq)
Cr-51	5.09E+08
Mn-54	1.68E+10
Mn-56	3.64E+07
Fe-55	3.08E+11
Co-57	1.41E+10
Co-58	2.20E+09
Co-60	5.98E+10
Ni-57	3.56E+06
Cu64	2.64E+09
Total spectrum	4.04E+11