

## Technical Specifications (In-Cash Procurement)

### **TS-63-34.00-001 - IOTS - 000001 : Technical Specifications B50s Grouting and related works**

This document provides requirements for grouting works and accompanied surface preparation and oil-resistant painting works to be performed on IO platform in B50s (B51/B52/A53) in order to complete the interface between PBS63 and each of PBS34.10 and PBS34.40.

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## 1 Purpose

This document provides requirements for grouting works and accompanied surface preparation that have to be performed on IO platform in Buildings 50s (B51/B52/A53) in order to complete the interface between PBS63 and each of PBS34.10 and PBS34.40.

In this document, the technical specifications of the scope are described for the purpose of a call for tender to select the Contractor.

## 2 Scope

The scope treated in this document is covering remained work shown on Fig.1 “General scope split regarding installation of plant in B50s”, Item 6. “Grout to underside of bed frame” and execution of preliminary surface preparation.

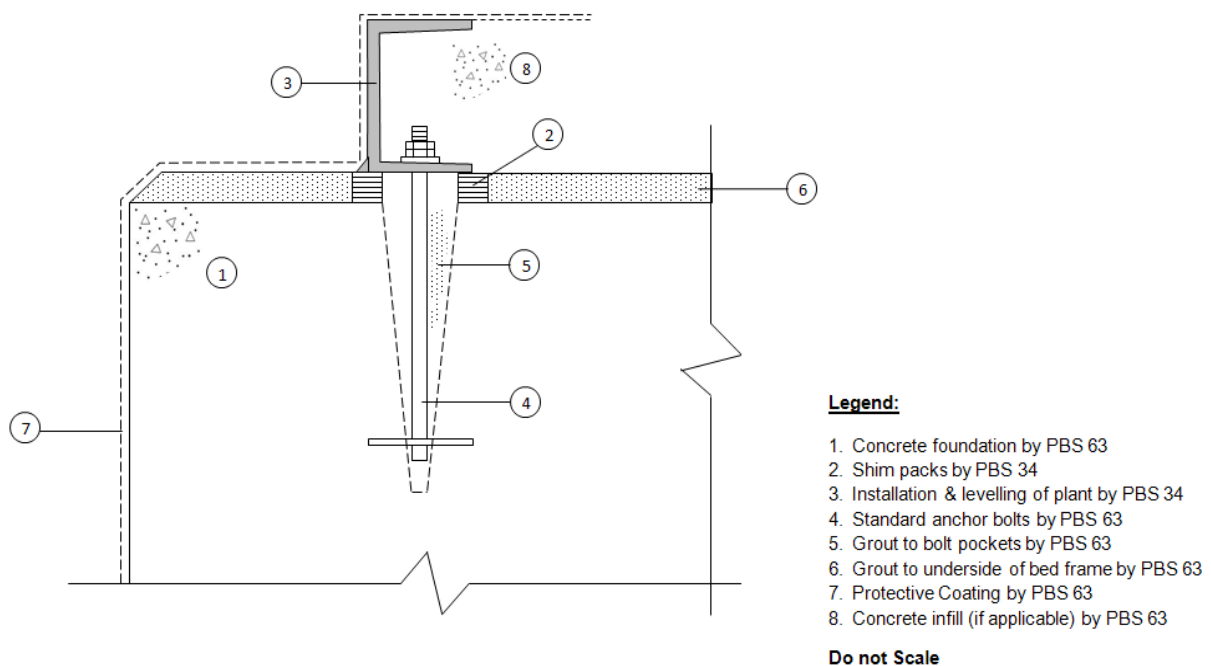


Fig. 1: General scope split regarding installation of plant in B50s

## 3 Definitions

The acronyms employed in this document are the following:

<b>IO</b>	ITER Organization
<b>PBS 34</b>	Cryogenic System
<b>PBS 34.1</b>	Cryogenic Nitrogen Systems
<b>PBS 34.4</b>	Cryogenic Helium Systems
<b>PBS 63</b>	Steel Frame Systems
<b>IDM</b>	ITER Document Management (system)
<b>CSP</b>	Concrete Surface Profile
<b>ICRI</b>	International Concrete Repair Institute
<b>SAF</b>	Subcontractors Acceptance Form
<b>MoS</b>	Method of Statement

<b>PRE</b>	Environmental Respect Plan (Plan de Respect de l'Environnement)
<b>ITP</b>	Inspection and Test Plan
<b>PPSPS</b>	Individual Health Protection and Safety Plan (Plan Particulier de Sécurité et de Protection de la Santé)
<b>ICPE</b>	Installations Classified for the Protection of the Environment (from French Regulation)

## 4 Duration

The expected duration for the completion of the Works is 3 months.

Both early and late shifts (from 06.30 until 22.00) are possible at the construction site if necessary for a better temperature control of grouting material in an appropriate range during the summer period. Power supply for the contractor's water cooler is also available.

The construction schedule and the method of grouting temperature management shall be included in the proposal by the Contractor.

## 5 Work Description

### 5.1 Scope of Works

All the reference drawings listed in Appendix A and Grouting information for LN2 compressors and 80K Loop compressors are extracted and uploaded in the archive [1]

The items listed below are included in the Contractor's scope of works:

- Surface cleaning and preparation work for grouting (Surface roughness has to be CSP3, according to ICRI 310-2R-2013 [2])
- Grouting works for the items listed in [Appendix A: "B50s Grouting list and specification"](#)
  - Roughening and cleaning of the grout supports (removal of dust, laitance, and grease)
  - Humidification of the concrete support and suction of excess water (Moisture < 4%, using Concrete moisture meter)
  - Tracing, positioning and fixing of the peripheral formwork at the right side of each plate
  - Preparation of injection points and peripheral vinyl protection (if necessary)
  - Mixing inside and application of mortar (if G1/G2 type grouting)
  - Grouting manufacturer's products datasheets, installation guidelines and safety measures shall be incorporated to the site working procedure.
  - As chemicals products are to be used, technical application recommendations from manufacturers should be followed (climatic conditions, mixing ratio, roughness profile...)
- Grouting material selection, procurement, preparation, and characteristic test according to Appendix B: "Grouting material general specification"
- Protection of the gutters (by formwork for G1/G2 grouting and by polyurethane foam if G3 epoxy grouting)
- After work treatments and reports
  - Stripping of formwork, covering, masking, and protection
  - Ragging and cleaning
  - Writing and transmission of reports

- Effluent recovery and treatment
- The materials, chemicals, and tools used for the work listed above
- On-site workshop / work area setup and recovery
  - Bringing equipment and materials
  - Setting up a container
  - Establishment of a marked buffer storage area
  - Installation of the mixing zone inside protected by a vinyl tent
  - Cleaning and folding at the end of the service
- Documentation for ITER Quality Assurance requirements
  - Access formalities, staff security receptions
  - Implementation of the PPSPS (French & English)
  - MoS and drafting of the procedure (French or English)
  - SAF, PRE and ITP[3] (English)
- Participation in the joint inspection visit

The following items are excluded from the Contractor's scope:

- Topographic surveys (concrete, slabs, etc...) and implementation
- Installation, wedging, adjustment any handling of the installed equipment other than concrete and steel structures
- Shim cutting before grouting
- Supply of electricity at ITER construction site

## 5.2 Grouting volume and preparation work

Grouting volume estimation is given in Appendix A, mainly for reference during the quotation phase. However, the contractor of the grouting work may optimize so that the total cost including the preparation works can be minimized with a reasonable duration of work. As example:

- The current volume estimation for skid frame grouting is only below the main structure, however if grouting formwork installation is too complicated, it is possible that grouting all over the surface minimizes the total cost.

For this reason, during the call for tender process will be organized a site review and discussion between ITER experts, plant supplier and potential Contractor to properly estimate the complexity and accessibility of the work to be done.

NOTE: Plant construction and installation is on-going and some pieces of equipment are not installed yet. This point has to be taken into account for the site investigation.

## 5.3 Standards

The selection of contractor's grouting material is subject to ITER approval and EN standards (or identical regional standards) shall be applied for the relevant grouting material, work, and test specification.

## 5.4 Other remarks

- Expansion joints will not be required for the grouting work, as each grouting surface area is not such extensive

## 6 Responsibilities

The Contractor's responsibility to identify the relevant ICPE headings (rubriques) for environmental protection mandated by French regulations, then to inform them IO.

## 7 List of Deliverables and Due Dates

The contractor should provide minimum required documents listed in the Table 1. Format of the reports is a subject of the discussion with IO.

**Table 1. Deliverables**

<b>Nº</b>	<b>Description</b>	<b>Due Data</b>
1	Safety Requirements (PPSPS) + The Work schedule breakdown for each piece of equipment*	Within 3 week after contract signed
2	ITER Environmental Plan (PRE)	Within 3 week after contract signed
3	Grouting Technical Procedure**	Within 2 week after contract signed
4	Method of Statement	Within 3 week after contract signed
5	Chemical product acceptance form for applying Grouting Materials + Material Safety Data Sheet	Within 3 week after contract signed
6	Work Permit at the IO site	Within 2 weeks after contract signed
7	3 Weeks Look ahead Plan	Within 3 weeks after contract signed
8	Inspection and Test Plan	Within 2 weeks after contract signed
9	Intermediate Report after completion of each area (B51/B52/A53)	≤ 2 week after completion
10	Final Test Report	≤ 2 week after completion of the last grouting

\* The work schedule breakdown for each piece of equipment to be used to undertake the grouting by the Contractor to secure the availability and coactivity of each zone of IO construction site.

\*\* In addition, the method of grouting temperature management shall be included in the proposal by the Contractor (by water cooler, early or late shift work, etc.)

## 8 Acceptance Criteria

The acceptance criteria and during the works should be included as a minimum, the following:

- The test method and criteria to pass the test shall be described in the Contractor's method of statement and Technical Procedure
- Visual inspection at the completion of the work for each piece of equipment
- Compressive strength shall be measured according to the selected grouting product specification.

## 9 Specific Requirements and Conditions

### 9.1 Language

Since the official language of the ITER Organization is English, all written communication and deliverables shall be in English.

## 9.2 Site data

The Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Works. To the same extent, the Contractor shall be deemed to have inspected and examined the site, its surroundings, the above data and other available information, and to have been satisfied as to all relevant matters.

## 9.3 Safety

The Contractor shall comply with the following procedures and all proceedings arising therefrom:

- Alert procedure [4]
- ITER Internal Regulations [5]
- General measures for the safety coordination of the ITER Organization common area [6]

The area of the Works falls under decree 94 - 1159. A safety plan (PPSPS) shall be established by the Contractor prior to the start of the Works, using the ITER template [7].

In the case where the Works involve the use of chemical products, the Contractor shall comply with the Chemical product management procedure [8] and fill in the Chemical product acceptance form [9].

## 9.4 Environmental protection

The Contractor shall comply with environmental protection requirements and procedures applicable at the ITER Site:

- ITER Organization Environmental Management System [10];
- Environmental requirements, [11].

An environmental respect plan shall be provided by the Contractor in 3 weeks prior to the start of the Works, using the ITER template [12].

Debris and waste of all type shall be removed as work progresses.

The Contractor shall be responsible for cleaning, repairing and restoring facilities which are dirtied or damaged to their original condition, and shall remove their debris and rubbish to site available rubbish tips.

## 9.5 Access to the site / Worksite installation

Access to the ITER Site is subject to the ITER Site Access Procedure [13].

The Contractor shall be responsible for supplying and installing fencing protecting the worksite which shall be maintained for the duration of the works and removed after completion of the Works. The Contractor shall also display signs prohibiting entry onto the worksite.

## 9.6 Work authorisation

Prior to the start of any Works on the ITER Site, a Work Authorisation must be obtained in accordance with the Work Authorisation Procedure [14].

## 10 Work Monitoring / Meeting Schedule

A general meeting will be organized as a weekly inspection on Site in order to monitor the work progress. Additionally, after every formwork preparation, IO should be invited for the inspection, and only after the formwork inspection grouting operation can be started.

## 11 Payments Breakdown:

1. Documents preparation + procurement of the materials. 15%
2. Completion of the LN2 Plant Area 53 grouting with related issued documentation (Reports, Test Results,) 25%
3. Completion of the LN2 Plant B51 grouting with related documentation (Reports, Test Results,) 25%
4. Completion of the LHe Plant grouting with related documentation (Reports, Test Results) + Final Report of the completed grouting works on LN2+LHe Plant (B51/B52/A53) 35%

## 12 Reference and Applicable Documents

- [1] Grouting Drawing Package including LN2 and 80 K Loop Compressors Grouting [Zip Archive](#)
- [2] 10.2R-2013 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair Guide
- [3] Inspection and Test Plan template [ITER\\_D\\_TTPQL2](#)
- [4] Emergency Response Alert procedure [ITER\\_D\\_7LB8NY](#)
- [5] Internal Regulations [ITER\\_D\\_27WDZW](#)
- [6] General measures for the safety coordination of the ITER Organization common area [ITER\\_D\\_FF72HN](#)
- [7] Individual Health Protection and Safety Plan (PPSPS) ITER template [ITER\\_D\\_K7C6SZ](#)
- [8] The Chemical product management procedure [ITER\\_D\\_TF5GP8](#)
- [9] The Chemical product acceptance form [ITER\\_D\\_T6ZLR3](#)
- [10] ITER Organization Environmental Management System: Environmental Management Plan [ITER\\_D\\_97W4PN](#)
- [11] Environmental requirements, [ITER\\_D\\_97WRFP](#)
- [12] Environmental Respect Plan ITER Template [ITER\\_D\\_9FUP5C](#)
- [13] ITER Site Access Procedure [ITER\\_D\\_S3893D](#), [ITER\\_D\\_WRWQRG](#)
- [14] Work Authorisation Procedure [ITER\\_D\\_UBET39](#)



## **Appendix A: B50s Grouting list and specification**

(from the next page)

for PBS 34.10																
PBS	Tag	Equipment	L*W(Length*Width)/mm	Units	H(Height)/mm	Note for grouting dimensions	Space/m3	Correction ratio	Volume/m3	Contractor	Area	IDM Reference dwg (1)	IDM Reference dwg (2)	Material	Grouting surface finish	Remarks on grouting work
34.1L.C1		80k loop CS1	2390*5650	1	60	dimension by drawing and checked on site, Height measured on site	0.810	1.030	0.835	LN2	51	R46EUE	RGMZBG	G2		As per the manufacturer's document (R2RCBH)
34.1L.C2		80K loop CS2	2390*5650	1	65	dimension by drawing and checked on site, Height measured on site	0.878	1.030	0.904	LN2	51	R46EUE	RGMZBG	G2		As per the manufacturer's document (R2RCBH)
34.1L.C2		80k loop comp cooler	1000*500*2	1	100	dimension by drawing and checked on site, Height measured on site	0.100	1.030	0.103	LN2	51	R46EUE	RGMZBG	G2		
34.1L.B1		80K CB1	0.176 m <sup>2</sup> *8	1	40	dimension by 3d model,height measured on site	0.056	1.040	0.059	LN2	53	RGYF8S / RCYJ5F	RB7ZZK	G2		
34.1L.B2		80K CB2	0.176 m <sup>2</sup> *8	1	40	dimension by 3d model,height measured on site	0.056	1.040	0.059	LN2	53	RGYF8S / RCYJ5F	RB7ZZK	G2		
34.1N.C1	PC-1100	LN2 CS 1(compressor frame)	4120*300*2	1	60	dimension by 3d model, Height measured on site	0.148	1.030	0.153	LN2	51	QX2J7V	RGN55J	G2		As per the manufacturer's document (R2QGZ3)
34.1N.C2	PC-1100	LN2 CS2(compressor frame)	4120*300*2	1	60	dimension by 3d model, Height measured on site	0.148	1.030	0.153	LN2	51	QX2J7V	RGN55J	G2		As per the manufacturer's document (R2QGZ3)
34.1N.C1	GM-1100	LN2 compressor 1 (motor)	2300*3150	1	83	dimension by drawing and checked on site, Height measured on site	0.601	1.030	0.619	LN2	51	R8SXUJ	RGN55J	G2		
34.1N.C2	GM-1100	LN2 compressor 2(motor)	2300*3150	1	83	dimension by drawing and checked on site, Height measured on site	0.601	1.030	0.619	LN2	51	R8SXUJ	RGN55J	G2		
34.1N.C1	TA-1100	LN2 compressor 1 (oil tank)	2000*1000*2	1	60	dimension by 3d model, Height measured on site	0.240	1.030	0.247	LN2	51	QX2J7V	RGN55J	G2		
34.1N.C2	TA-1100	LN2 compressor 2(oil tank)	2000*1000*2	1	60	dimension by 3d model, Height measured on site	0.240	1.030	0.247	LN2	51	QX2J7V	RGN55J	G2		
34.1N.B1	HX-5100	N2 turbine Booster cooler 1	1000*500*2	1	100	dimension by drawing and checked on site, Height measured on site	0.100	1.030	0.103	LN2	53	RLN7RL	RBS2N5	G2		
34.1N.B2	HX-5100	N2 turbine Booster cooler 2	1000*500*2	1	100	dimension by drawing and checked on site, Height measured on site	0.100	1.030	0.103	LN2	53	RLN7RL	RBS2N5	G2		
34.1N.B1		N2 CB1	0.176 m <sup>2</sup> *8	1	40	dimension by 3d model,height measured on site	0.056	1.040	0.059	LN2	53	RGMDHA / RELPTN	RBS2N5	G2		
34.1N.B2		N2 CB2	0.176 m <sup>2</sup> *8	1	40	dimension by 3d model,height measured on site	0.056	1.040	0.059	LN2	53	RGMDHA / RELPTN	RBS2N5	G2		
34.10.00	AH-1000	Liquid disposal Vaporizer	1.811m <sup>2</sup>	1	30	dimension by 3d model,height measured on site	0.031	1.040	0.032	LN2	53	UM28VG	RBS2N5	G2		
34.10.00	PB-1000	Vaporizer Fan	0.12m <sup>2</sup>	1	30	dimension by 3d model,height measured on site	0.004	1.030	0.004	LN2	53	VAEAP4	RBS2N5	G2		
34.1S.HG	TA-2100 to 2500	Pure GHe storage	18.38 m <sup>2</sup>	5	50	dimension by 3d model,height measured on site	4.595	1.030	4.733	LN2	53	RLPSRT	REP2NM	G2		
34.1S.HI	TA-2100	Impure GHe storage	18.38 m <sup>2</sup>	1	50	dimension by 3d model,height measured on site	0.919	1.030	0.947	LN2	53	RLONDS	REP2NM	G2		
34.1S.NG	TA-4100	GN2 storage	6.643 m <sup>2</sup>	1	38	dimension by 3d model,height measured on site	0.252	1.030	0.260	LN2	53	RLSW8P	REP2NM	G2		
34.1S.NL	TA-5100	LN2 Storage	28.26 m <sup>2</sup>	1	50	dimension by 3d model,height measured on site	1.413	1.030	1.455	LN2	53	R9UK8X	RH2DPB	G2		
34.1S.NL	HA-5100	Pressure Building Coil		1		Grouting may be done with LN2 Storage (volume included above)				LN2	53	RTSRST	RH2DPB	G2, if applied		No need for itself, but Grouting may be done with LN2 Storage
34.1S.NL	AH-5600 / 5700	LN2 Storage Vaporizer	250mm*250mm*8	1	40	dimension by 3d model,height measured on site	0.020	1.040	0.021	LN2	53	REL2KX	RH2DPB	G2		
34.1S.NL	SK-0003	LN2 Storage Warm Skid	2.359 m <sup>2</sup>	1	35	dimension by drawing and checked on site, Height measured on site	0.083	1.040	0.086	LN2	53	SMW5F4	RH2DPB	G2		
34.1S.NL	SK-0001	Casing pump	350mm*350mm*8	1	40	dimension by 3d model,height measured on site	0.039	1.040	0.041	LN2	53	S2N6U8	RH2DPB	G2		
34.1G.D0	SK-2000	Air Purifier	0.14m <sup>2</sup> *10	1	40	dimension by 3d model,height measured on site	0.056	1.030	0.058	LN2	53	RLIKGV	REF393	G2		
34.1G.B0	KA-2200	Air Separation Column	0.14 m <sup>2</sup> *3	1	40	dimension by 3d model,height measured on site	0.017	1.040	0.017	LN2	53	QXXW3F	REF393	G2		
34.1P.B0		HE purification	2 m <sup>2</sup>	1	35	dimension by 3d model,height measured on site	0.070	1.040	0.073	LN2	53	RMZ8V5		G2		
34.1P.B0	AH-7300	Liquid disposal Vaporizer	0.54m <sup>2</sup>	1	30	dimension by 3d model,height measured on site	0.007	1.040	0.007	LN2	53	UMBWUL (Page 88)		G2		
34.1P.B0	PB-7300	Vaporizer Fan	0.08m <sup>2</sup>	1	30	dimension by 3d model,height measured on site	0.002	1.030	0.002	LN2	53	VAEC6C		G2		
34.1W.AH	AH-6100 / 6200	ATM. HE heater	350*250*8	1	40	dimension by 3d model,height measured on site	0.028	1.040	0.029	LN2	53	RN3X8Q		G2		
34.1W.E0	AH-3100 / 3200	6-100k Heaters	0.15 m <sup>2</sup> *4	2	50	dimension by 3d model,height measured on site	0.060	1.040	0.062	LN2	53	RMDHCS		G2		
34.1S.HL	TA-3100	LHe Storage	4600*800*2	1	40	dimension by 3d model,height measured on site	0.589	1.040	0.612	LN2	53	QZXZDN	TMEBES / TMEBBK	G2		
34.1S.HB		LHE Tank loading bay	0.14m <sup>2</sup> *6	1	35	dimension by 3d model,height measured on site	0.515	1.040	0.536	LN2	53	VBWKF5		G1		
34.1S.Q0	TA-6100	Quench tank 1	4600*800*2	1	100	dimension by 3d model,height measured on site	0.736	1.040	0.765	LN2	53	QWU8YU / QWBMTG	RHPPUZ	G2		
34.1S.Q0	TA-6200	Quench tank 2	4600*800*2	1	100	dimension by 3d model,height measured on site	0.736	1.040	0.765	LN2	53	QWU8YU / QWBMTG	RHPPUZ	G2		
34.1S.Q8		Quench tanks cold box	1650*650*2	1	100	dimension by drawing and checked on site, Height measured on site	0.215	1.040	0.223	LN2	53	QXN7NW		G2		

platform supports																
PBS	Tag	Equipment	L*W(Length*Width)/mm	Units	H(Height)/mm	Note for grouting dimensions	Space/m3	Correction ratio	Volume/m3	Contractor	Area	IDM Reference dwg (1)	IDM Reference dwg (2)	Material	Grouting surface finish	Remarks on grouting work
34.1S.H0	SK-0001 / 0002	gas helium tank area	400*400	14	40	counting and measure on site	0.090	1.040	0.093	LN2	53	SGT9SQ	REP2NM	G1		Supported with shims
		gas nitrogen tank	350*250	4	40	counting and measure on site	0.014	1.040	0.015	LN2	53		PS38UW	G1		Supported with shims
		nitrogen cold box area	350*250	22	40	counting and measure on site	0.077	1.040	0.080	LN2	53		PS38UW	G1		Supported with shims
		CW PIPE SUPPORTS	350*250	20	40	counting and measure on site	0.070	1.040	0.073	LN2	53		PS38UW	G1		Supported with shims
		generator area	350*350	20	40	counting and measure on site	0.098	1.040	0.102	LN2	53		PS38UW	G1		Supported with shims
		Liquid nitrogen tank area	350*350	15	40	counting and measure on site	0.074	1.040	0.076	LN2	53		PS38UW	G1		Supported with shims
		80k CBs area	400*350	12	40	counting and measure on site	0.067	1.040	0.070	LN2	53		PS38UW	G1		Supported with shims
		LN2 CSs area	350*350	60	40	counting and measure on site	0.294	1.040	0.306	LN2	51		PS38UW	G1		Supported with shims
		80k loop CSs area	350*300	26	40	counting and measure on site	0.109	1.040	0.114	LN2	51		PS38UW	G1		Supported with shims

G1	=	Portland cement grout
G2	=	Cement based non-shrink grout
G3	=	Epoxy (color to be specified)

for PBS 34.40														
Main skids	Equipment	L*W(Length*Width)/mm	Units	H(Height)/mm	Note for grouting dimensions	Space (volume)/m3	Correction ratio	Volume/m3	Contractor	Area	IDM Reference dwg	Material	Grouting surface finish	Remarks on grouting work
14	34.4H.C1-CS	3000*5850	1	24	dimension by drawing and checked on site, Height measured on site	0.438	1.03	0.452	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
13	34.4H.C1-CS	3000*5850	1	31	dimension by drawing and checked on site, Height measured on site	0.566	1.03	0.583	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
12	34.4H.C1-CS	3000*5850	1	30	dimension by drawing and checked on site, Height measured on site	0.548	1.03	0.564	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
11	34.4H.C1-CS	3000*5850	1	30	dimension by drawing and checked on site, Height measured on site	0.548	1.03	0.564	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
11	34.4H.C2-CS	3000*5850	1	45	dimension by drawing and checked on site, Height measured on site	0.822	1.03	0.847	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
12	34.4H.C2-CS	3000*5850	1	40	dimension by drawing and checked on site, Height measured on site	0.731	1.03	0.753	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
13	34.4H.C2-CS	3000*5850	1	28	dimension by drawing and checked on site, Height measured on site	0.512	1.03	0.527	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
14	34.4H.C2-CS	3000*5850	1	31	dimension by drawing and checked on site, Height measured on site	0.566	1.03	0.583	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
14	34.4H.C3-CS	3000*5850	1	36	dimension by drawing and checked on site, Height measured on site	0.658	1.03	0.677	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
13	34.4H.C3-CS	3000*5850	1	40	dimension by drawing and checked on site, Height measured on site	0.731	1.03	0.753	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
12	34.4H.C3-CS	3000*5850	1	35	dimension by drawing and checked on site, Height measured on site	0.639	1.03	0.659	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
11	34.4H.C3-CS	3000*5850	1	27	dimension by drawing and checked on site, Height measured on site	0.493	1.03	0.508	LHE	51	MC72RA	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
41	34.4H.C1-CS	3000*5850	1	28	dimension by drawing and checked on site, Height measured on site	0.512	1.03	0.527	LHE	51	MCBBDP	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
42	34.4H.C1-CS	3000*5850	1	31	dimension by drawing and checked on site, Height measured on site	0.566	1.03	0.583	LHE	51	MCBBDP	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
42	34.4H.C2-CS	3000*5850	1	34	dimension by drawing and checked on site, Height measured on site	0.621	1.03	0.640	LHE	51	MCBBDP	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
41	34.4H.C2-CS	3000*5850	1	29	dimension by drawing and checked on site, Height measured on site	0.530	1.03	0.546	LHE	51	MCBBDP	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
41	34.4H.C3-CS	3000*5850	1	30	dimension by drawing and checked on site, Height measured on site	0.548	1.03	0.564	LHE	51	MCBBDP	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
42	34.4H.C3-CS	3000*5850	1	34	dimension by drawing and checked on site, Height measured on site	0.621	1.03	0.640	LHE	51	MCBBDP	G2, G3, or G2 + G3	Oil Resistant G2, or G3 (RAL specified by IO) or Oil Resistant sealing /coating/painting	Gutter for effluent to be protected, if necessary
20	34.4H.C1-ORS	11.04m <sup>2</sup>	1	30	Per ALAT suggestion, no need grouting for middle ribs, only grouting the outer structure	0.342	1.04	0.356	LHE	51	MU39UQ	G2	Oil Resistant G2 or Oil Resistant sealing /coating/painting for inner grouting surface	Gutter for effluent to be protected, if necessary
20	34.4H.C2-ORS	11.04m <sup>2</sup>	1	30	Per ALAT suggestion, no need grouting for middle ribs, only grouting the outer structure	0.342	1.04	0.356	LHE	51	MU39UQ	G2	Oil Resistant G2 or Oil Resistant sealing /coating/painting for inner grouting surface	Gutter for effluent to be protected, if necessary
20	34.4H.C3-ORS	11.04m <sup>2</sup>	1	30	Per ALAT suggestion, no need grouting for middle ribs, only grouting the outer structure	0.342	1.04	0.356	LHE	51	MU39UQ	G2	Oil Resistant G2 or Oil Resistant sealing /coating/painting for inner grouting surface	Gutter for effluent to be protected, if necessary
50	34.4H.C1-ORS	11.04m <sup>2</sup>	1	30	Per ALAT suggestion, no need grouting for middle ribs, only grouting the outer structure	0.342	1.04	0.356	LHE	51	MU9HJB	G2	Oil Resistant G2 or Oil Resistant sealing /coating/painting for inner grouting surface	Gutter for effluent to be protected, if necessary
50	34.4H.C2-ORS	11.04m <sup>2</sup>	1	30	Per ALAT suggestion, no need grouting for middle ribs, only grouting the outer structure	0.342	1.04	0.356	LHE	51	MU9HJB	G2	Oil Resistant G2 or Oil Resistant sealing /coating/painting for inner grouting surface	Gutter for effluent to be protected, if necessary
50	34.4H.C3-ORS	11.04m <sup>2</sup>	1	30	Per ALAT suggestion, no need grouting for middle ribs, only grouting the outer structure	0.342	1.04	0.356	LHE	51	MU9HJB	G2	Oil Resistant G2 or Oil Resistant sealing /coating/painting for inner grouting surface	Gutter for effluent to be protected, if necessary
70	34.4H.C1-ORS	8.613m <sup>2</sup>	1	25	dimension by drawing and checked on site, Height measured on site	0.017	1	0.017	LHE	51	QN3LHS	G2		
70	34.4H.C2-ORS	8.613m <sup>2</sup>	1	25	dimension by drawing and checked on site, Height measured on site	0.017	1	0.017	LHE	51	QN3LHS	G2		
70	34.4H.C3-ORS	8.613m <sup>2</sup>	1	25	dimension by drawing and checked on site, Height measured on site	0.017	1	0.017	LHE	51	QN3LHS	G2		

G1	=	Portland cement grout
G2	=	Cement based non-shrink grout
G3	=	Epoxy (color to be specified)

## Appendix B: Grouting material general specification

- a) G1 (Portland Cement grout)
  - Volume Expansion: shrinks up to -1.2%
  - Minimum Compressive Strength (nominal):
    - 22 MPa at 7<sup>th</sup> day
    - 30 MPa at 28<sup>th</sup> day
- b) G2 (Cement Based Non-Shrink Grout)
  - Volume Expansion: more than +0.5%
  - Minimum Compressive Strength (nominal):
    - 50 MPa after 1<sup>st</sup> day
    - 90 MPa after 28<sup>th</sup> day
  - Recommended commercial products by the plant subcontractor:
    - Five Star High Strength Grout
    - PAGEL V1/10, V1/50, V1/160 (choice depending on the grouting thickness)
    - BETEC 110, 140, 180 (choice depending on the grouting thickness)
- c) G3 (Epoxy Based Non-Shrink Grout)
  - Volume Expansion: +0.1% to +0.5%
  - Minimum Compressive Strength (nominal):
    - 55-75 MPa at 7<sup>th</sup> day
    - 75-105 MPa at 28<sup>th</sup> day
  - Recommended commercial products by the plant subcontractor:
    - Five Star SP Epoxy Grout
    - Sikadur-42 Grout