Acquisition of 17 fumehoods and wet benches

Anders M. Jorgensen[a)], Michael W. Allerup[b)], Jan V. Eriksen[a)], Majken Becker[a)], Flemming Jensen[a)], Karen Birkelund[a)]

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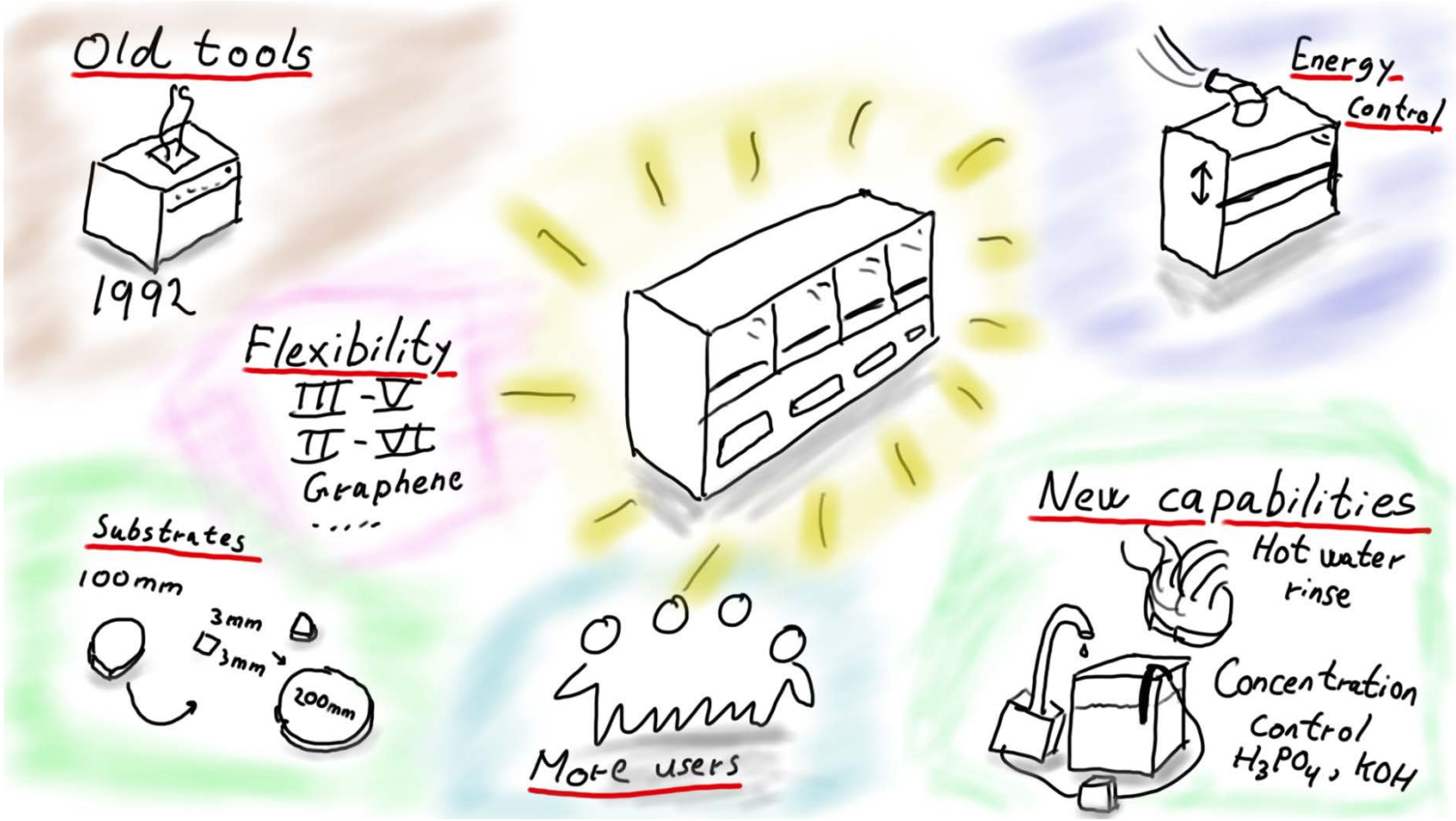
b) DTU AOR, Technical University of Denmark, Lundtoftevej 150, 2800 Kgs. Lyngby, Denmark

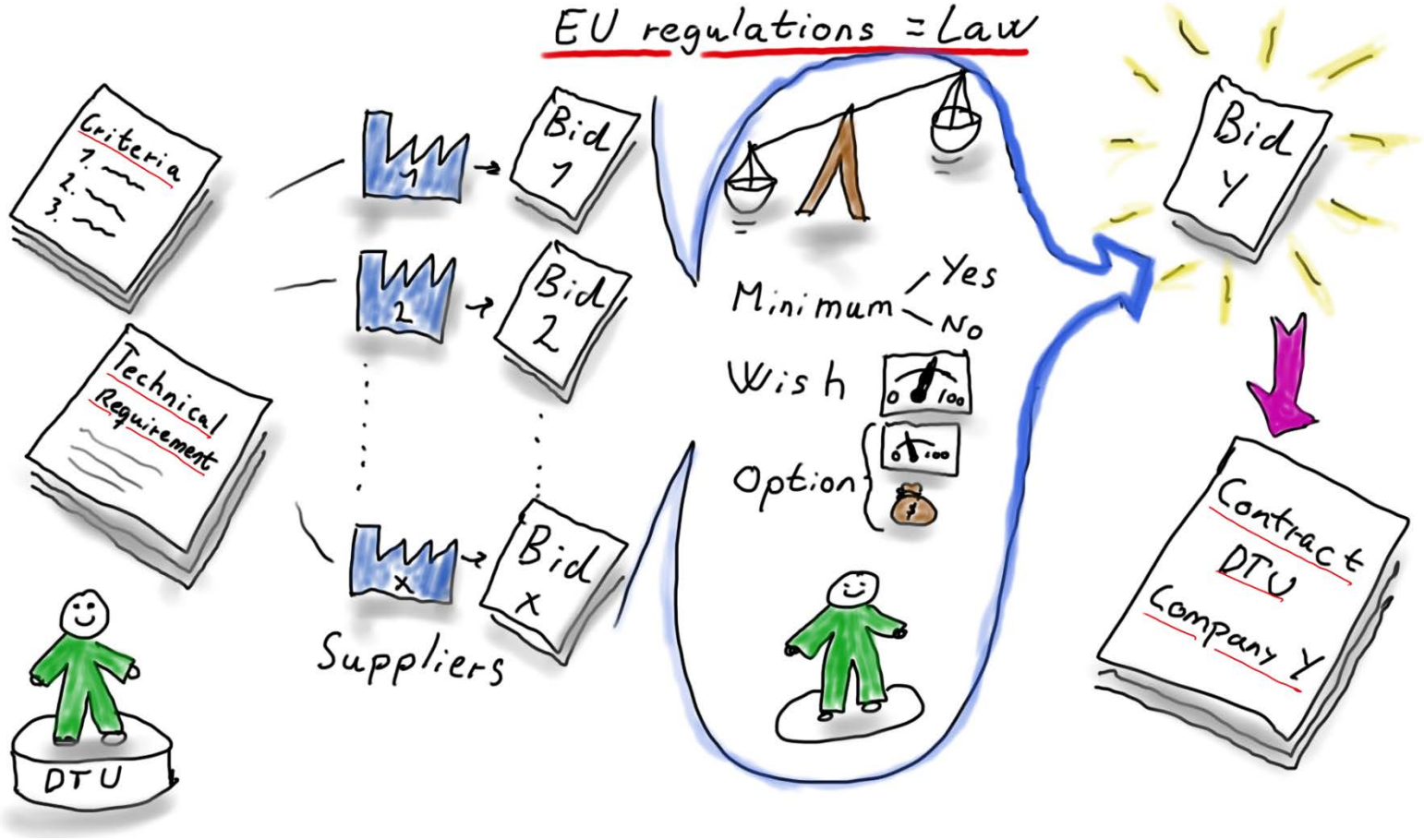
DTU Danchip/Cen

- Danish National Center for Micro- and Nanofabrication
- Center for Electron Nanoscopy
- Part of the Technical University of Denmark (DTU)
- 70 staff (Scientific and technical)
- Cleanroom ISO 9001 certified since 2009
- Environmental and Analytical TEMs, FIB, EBSD
- DUV Stepper
- 1350 m^2 (14 500 ft^2) cleanroom space (ISO 4, 5 & 6)
- 500 registered users
- 20 companies
- From basic research to small-scale production

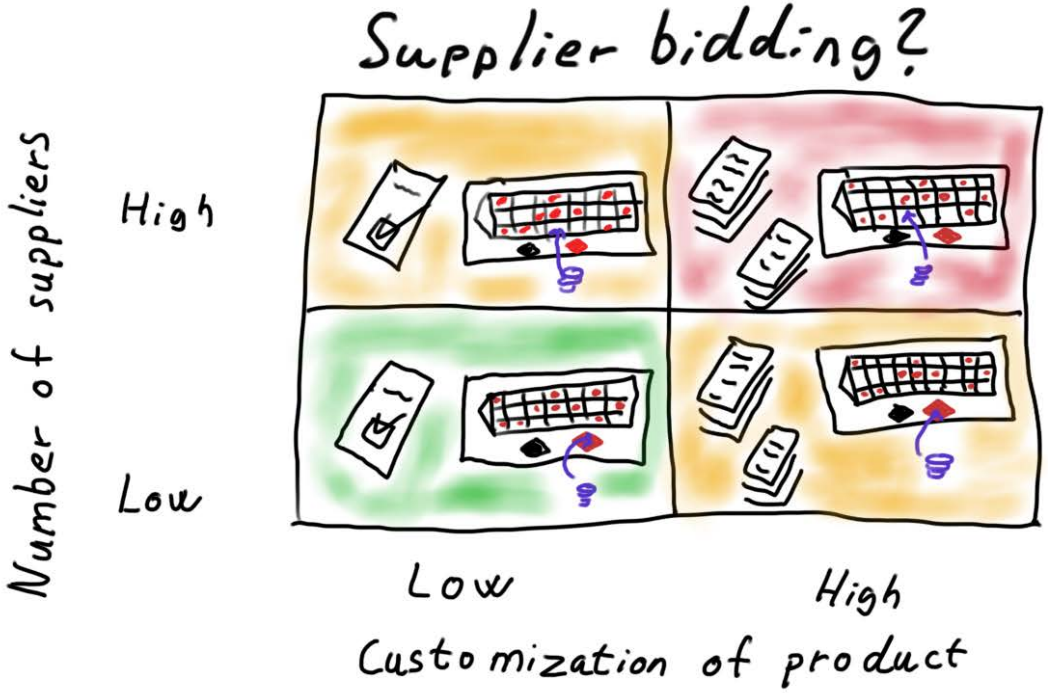
The actual acquisition - needs



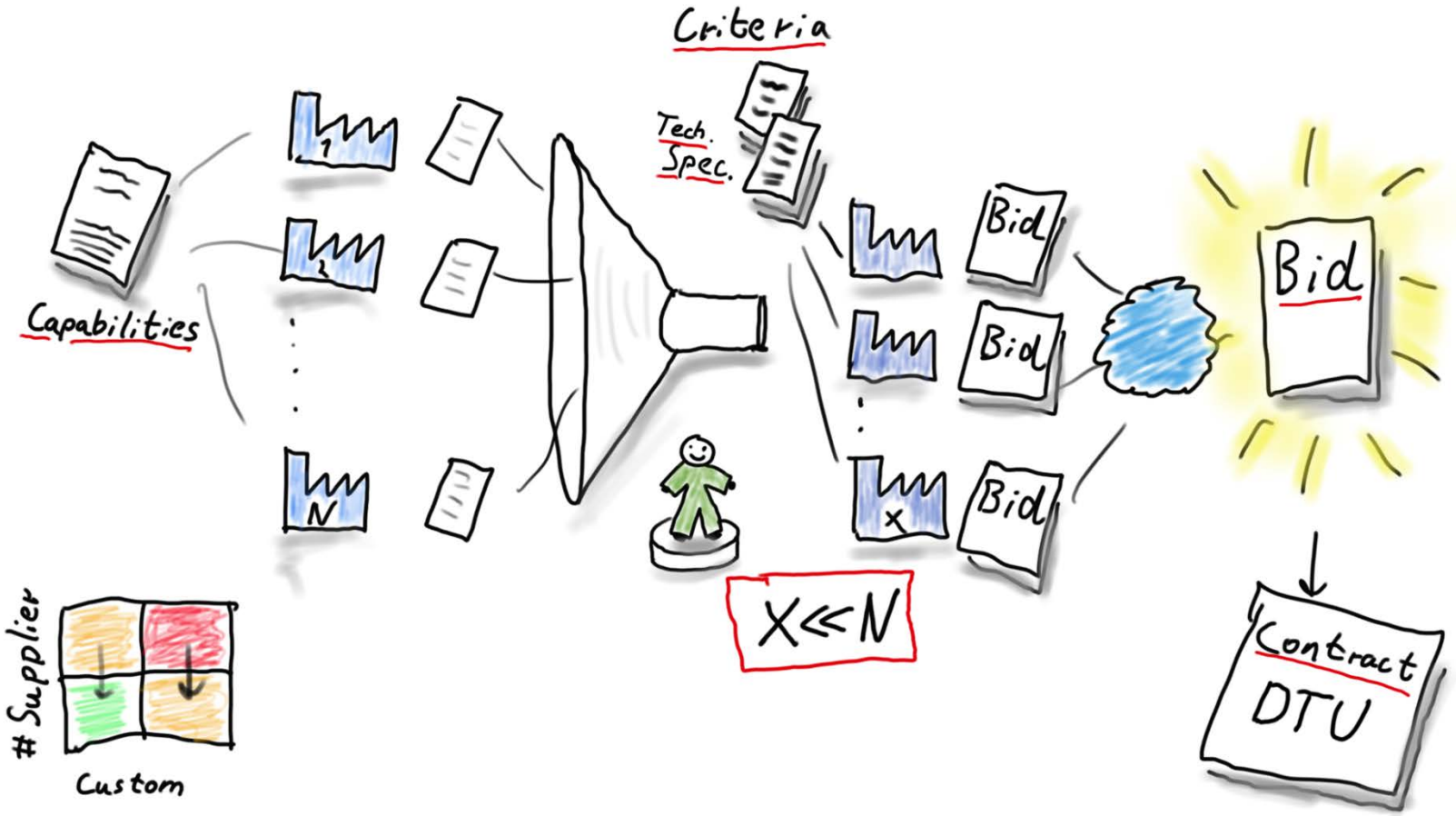
Transparent and equal treatment of suppliers - concept



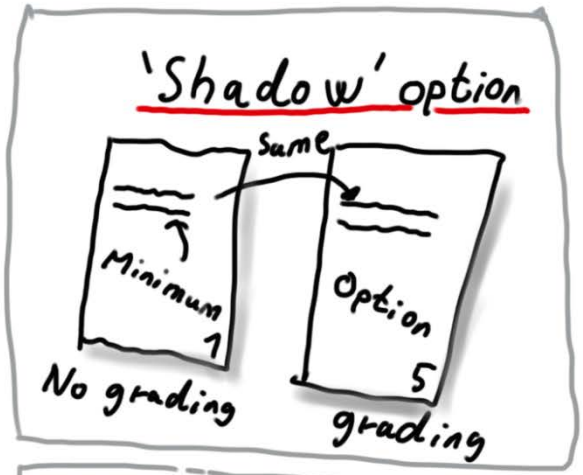
Transparent and equal treatment of suppliers - issues

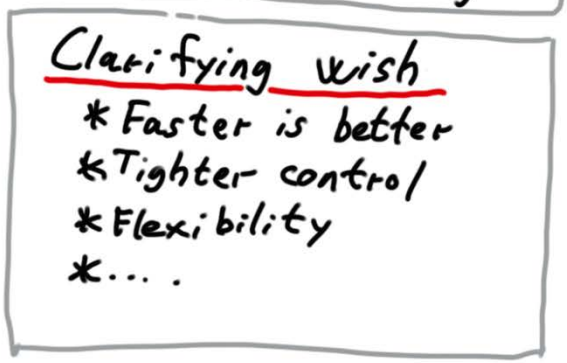


Restricted procurement procedure

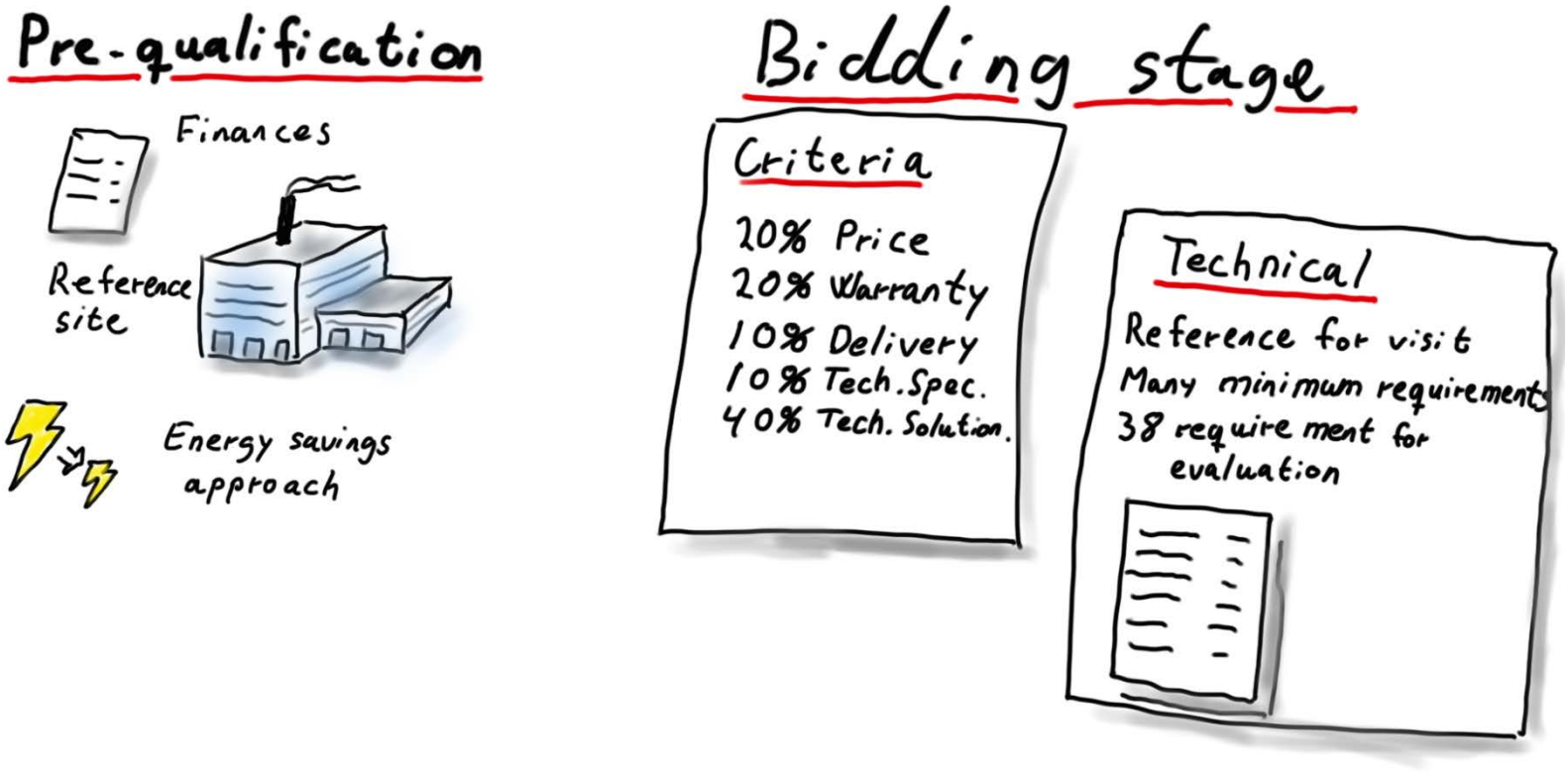


Quality evaluation through many evaluations

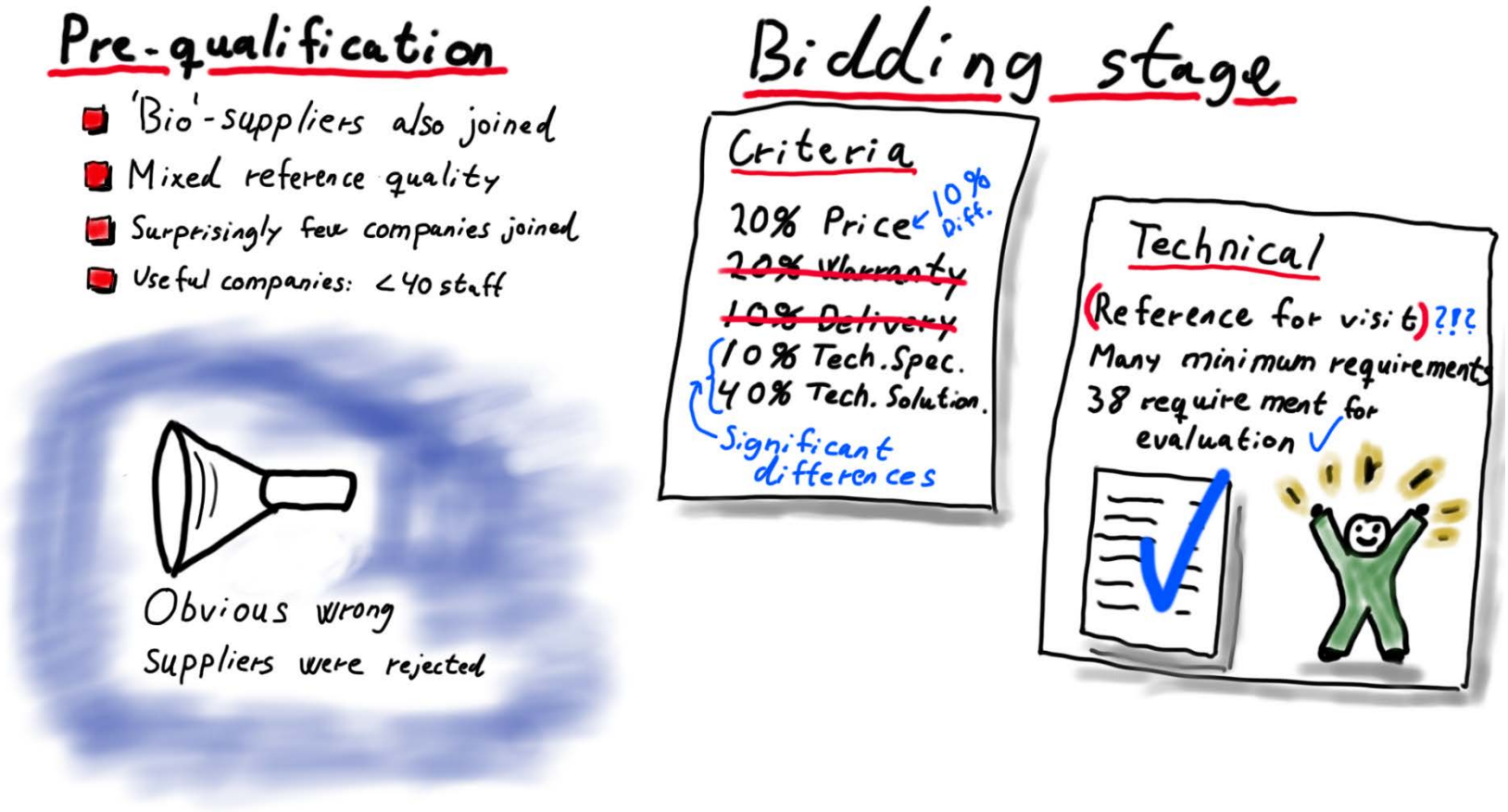




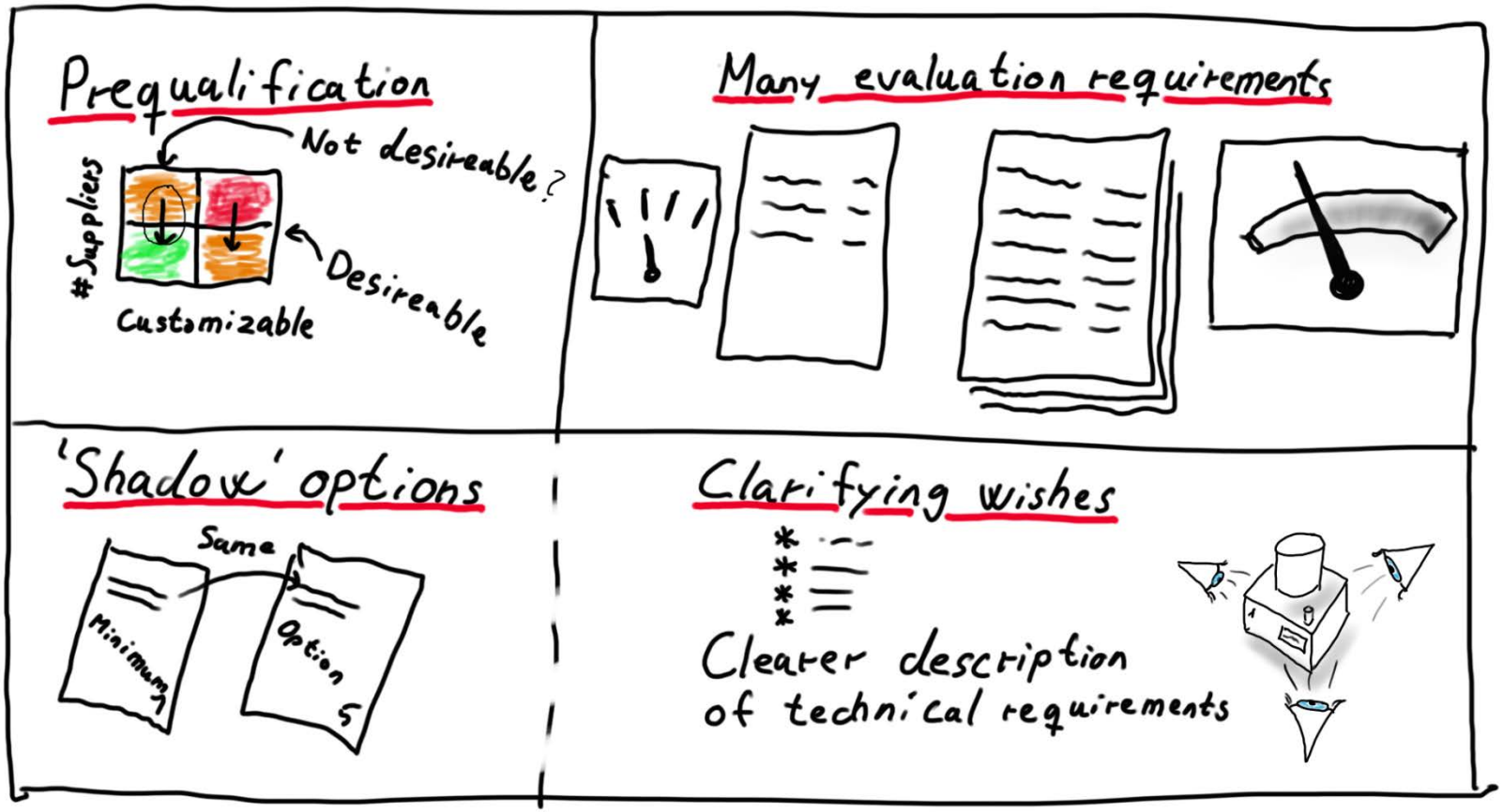
The actual acquisition - process



What actually happened



Conclusion


Prequalification
Not desireable?
#Suppliers
Desireable
Customizable
Many evaluation requirements
'Shadow' options
Same
Minimum
Option 5
Clarifying wishes
Clearer description
of technical requirements

Acquisition of 17 fumehoods and wet benches

Anders M. Jorgensen[a)], Michael W. Allerup [b)], Jan V. Eriksen [a)], Majken Becker [a)], Flemming Jensen [a)], Karen Birkelund [a)]

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Assuring a transparent and equal treatment of suppliers in the procurement process of technical equipment which rely on extended specifications from the Purchaser can be very time consuming for the purchaser and suppliers. Moreover, the risk is increased for the purchaser to get a solution which is suboptimal because purchaser and suppliers are not allowed to negotiate during the procurement procedure. In this abstract we describe a successful procurement procedure which includes a pre-qualification round in the tender and an extended list of technical parameters. The described procurement procedure was used for acquiring 17 fumehoods and wetbenches.

DTU Danchip is a core facility at the Technical University of Denmark (DTU). The facility covers 1300 m^2 (~14000 sq.ft.) of ISO class 4 and 5 cleanroom area for top-down micro- and nanofabrication. The facility accommodates users ranging from bachelor students to professors as well as researchers and scientists from commercial companies.

As a public organization all acquisitions must follow the EU regulations which secure a transparent procurement procedure and equal treatment of suppliers. DTU followed a restricted procurement procedure, which consists of a prequalification stage (supplier short-listing based on supplier's financial and technical capabilities) and a bidding stage.

In the prequalification suppliers had to provide information regarding financial figures, references within ventilated workplaces for this particular type of cleanrooms and description of energy saving solutions. Based on these requirements for supplier capabilities, a few suppliers were short-listed for giving bids. With the restricted procurement procedure, DTU secured only to receive offers from suppliers which had the right in-house competences and experience with delivering similar solutions. Moreover this meant that a limited number of bids had to evaluated, saving time and money in the evaluation stage. A disadvantage was that the procurement process got longer due to the short-listing stage.

In the bidding stage DTU had specified the needed technical requirements of the different fumehoods and wetbenches. Each requirement was given an attribute of being a minimum requirement, a wish or an option. A bid must fulfill all minimum requirements, can include fulfillment of wishes as part of the total price and can indicate an individual price for fulfilling each option. Each bid is evaluated against the fulfillment of wishes and options. The better the bid meets the wishes and options, the better the bid will be evaluated. This must be done individually, and without comparison to other bids.

The majority of the requirements were minimum requirements; and requirements which a vast group of suppliers could fulfill – at least on paper. Most suppliers of wetbenches and fumehoods make them according to customer specification and in that way the minimum requirements merely serves as part of the description of the task. Hence, it was essential for DTU to secure the technical quality of the bids and make sure the suppliers described and submitted the right documentation (eg. Drawings, diagrams, calculations of the solution) in their bids. Doing this made it easier to evaluate the quality of the different solutions. Moreover a large amount of options and wishes for a total of 38 was included. The large number of parameters was deemed necessary because the risk of miscommunication is quite large, as negotiation is not allowed during the procurement procedure, which means that if only a few parameters are taken into account, one error can have an excessive impact.

INSTRUCTIONS TO TENDERERS FOR SUBMISSION OF TENDER

Restricted procedure for the purchase/procurement of

11 cleanroom compatible fume hoods and 7 chemical benches

to

DTU Danchip

Technical University of Denmark

Version 1.0

Technical University of Denmark
Finance and accounting
Group Procurement

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Building 266
DK-2800 Kgs. Lyngby
Denmark

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www.dtu.dk

TABLE OF CONTENTS

1. DEFINITIONS

Contract	The legal document governing the legal relationship between DTU and the Contractor regarding the acquisition.
Contractor	The successful tenderer who enters into a contract with DTU
Contract Period	The period during which the Contract concluded between DTU and the Tenderer who subsequently contracts with DTU, is binding between the Parties.
DTU	The procuring entity as set out in Clause 3.
Parties	DTU and the Tenderer who subsequently contracts with DTU.
Tenderer	The natural or legal person who submits a tender in response to this restricted invitation to tender.
Tenderer's Price	The price offered by the Tenderer.

2. INTRODUCTION

These instructions to tenderers for submission of tender apply to DTU's invitation to tender for the purchase/provision of a 11 cleanroom compatible fume hoods and 7 chemical benches in accordance with Notice of Tender No 2015/S 118-213588 published at www.eu-supply.com and TED - Supplement to the Official Journal of the EU.

3. THE CONTRACTING AUTHORITY

The procuring entity for this tender invitation is:

Technical University of Denmark
Anker Engelundsvej 1, Building 101A
DK-2800 Kongens Lyngby
Denmark
Cvr. Nr. 30 06 09 46

4. GENERAL INFORMATION ABOUT THE TENDER

4.1. SHORT DESCRIPTION OF THE CONTRACT

DTU Danchip wishes to acquire 11 Fumehoods and 7 Laminar flow wet benches for harsh chemicals, several chemical storage cabinets and tables. These units will be used in our ISO 14644-1 Class 4 and 5 cleanroom. The units should be built from flame retardant polypropylene.

The units will be used by many different users with diverse backgrounds, which means, that operator safety is an important aspect. Another important aspect is minimization of unnecessary exhaust due to the high cost of air treatment for the cleanroom environment.

It is expected that the total cost of the goods will fall in the range of 7 to 8.5 million Danish kroner.

Examination of the delivery site and installation site

The Tenderer is required to deliver the fumehoods and laminar flow wet benches for harsh chemicals into Danchips cleanroom at DTU. DTU therefore invites Tenderers to carry out a Site Survey of the delivery location. **The Site Survey takes place on the 21th October 2015 at 2 p.m. in building 346, Ørsteds Plads, 2800 Kgs. Lyngby, Denmark.** Tenderers must inform Procurement Adviser Michael Winther Allerup through www.eu-supply.com if they want to participate in the Site Survey, no later than the 17th of October. Only two persons from each Tenderer can participate in the Site Survey.

During the Site Survey Tenderer will not be able to ask questions to the tender documents. All questions regarding the tender documents must be asked through www.eu-supply.com, cf. point 7.

4.2 COMPLIANCE WITH EU PROCUREMENT RULES

This Procurement is subject to the EU Procurement rules regarding restricted procedure as regulated in Directive 2004/18/EC of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts.

This Directive is implemented in Danish law by Statutory Instrument no. 937 of 16 December 2004 on the procedures for the award of public works contracts, public supply contracts and public service contracts

This Procurement is therefore subject to EU Procurement rules. The Contracting Authority is therefore obliged to follow certain formalities and procedures regarding the award of the Contract.

The Contracting Authority wants thus to draw special attention to the following:,

- The Contracting Authority is entitled to and can be obliged to disregard an application if the application is in any way non compliant, that is, is not in compliance with the tender instructions or if the application contains significant uncertainties.

- The Contracting Authority will not accept that the Tenderer introduces changes to the Tender after the deadline for submission.

- It is the Tenderer's own responsibility to make sure that the Tender is compliant with these instructions to Tenderers.

5. GENERAL FORMAL REQUIREMENTS

When preparing the tender, close attention must be paid to the form and procedure specifications contained in these instructions to tenderers.

5.1. TENDERER'S CONTACT PERSON

Unless otherwise clearly and unambiguously stated by the Tenderer, DTU will direct any communication during the tender procedure to the person nominated by the Tenderer. The Tenderer may nominate an alternative contact person by informing DTU's contact person at any time.

5.2. DEADLINE FOR RECEIPT OF TENDER

The deadline for submission of tenders is 11 November 2015 at 12:00 CET.

5.3. LAYOUT

The tender must consist of the following documents:

Template 0 – Letter of quotation
Contract
Appendix 1 – Specification of requirements
Appendix 2 – Prices
Appendix 4 – Time Schedule

All documents must be submitted in word or pdf format. **The above documents must be delivered as one file** and supplementary material must be delivered as one file.

The Tenderer must answer and complete appendices, including appendix 1, Technical Specifications, and other appendices with fields marked "*To be completed by Tenderer*" or where otherwise indicated.

5.4. LANGUAGE

The language of the tender shall be English.

5.5. FEES

Tenderers will not be entitled to any fees for the preparation of the tender.

5.6. OWNERSHIP OF TENDERS RECEIVED

All documents submitted will be deemed to be the property of DTU.

5.7. VALIDITY PERIOD

The tender shall be binding for 3 months after the tender deadline has expired.

If the Tenderer is informed that her tender is accepted, DTU is entitled until expiry of the validity period to extend the validity period by up to 6 months upon written notice to the Tenderer's contact person.

5.8. OPENING OF TENDERS

Tenders will not be opened until after expiry of the deadline for submission. There is no access to attend the opening of the tenders or otherwise receive information about the content of other tenders.

5.9. NOTIFICATION OF THE RESULT

All participants in the tender process will be advised simultaneously and in writing of the result.

Notification to the winning Tenderer that the tender has been successful shall not necessarily mean awarding of the Contract. No contract or promise on this matter will apply until the Contract has been signed by all parties.

5.10. ALTERNATIVE TENDERS

Alternative tenders are not accepted.

5.11. RESERVATIONS

Reservations will not be accepted. Tenders that include reservations to the tender material will be considered non-compliant.

5.12. ADDITIONAL DOCUMENTATION

Other documentation than that listed under clause 5.3 may be included although such additional material will not necessarily be considered when evaluating tenders.

Such documentation shall be included in a separate file and shall be clearly marked as supplementary material.

5.13 INSPECTION OF THE REFERENCE REGARDING AUTOMATIC CLOSING OF SASH AND ENERGY SAVING

Tenderer is expected to state one reference site regarding automatic closing of sash and energy saving for inspection in appendix one.

From the deadline for submission of tenders to choice of supplier, DTU reserves the right to visit the by tenderer appointed reference regarding automatic closing of sash and energy saving.

When visiting the reference it shall be possible to examine the offered solution of automatic closing of sash and energy saving in operation.

The reference installation should preferably be within Europe. DTU reserves the right not to visit a reference.

DTU pays its own expenses in connection with the visit of the reference (travel and accommodation).

Tenderer must at DTUs request forward an inspection plan for the reference installation.

The inspection of the reference site will alone be a technical clarification and there will be no form of negotiation of tenderers offer.

6. TENDER

The tenderer must answer and complete Letter of Quotation *(Template 0)*, and appendices, including appendix 1, Specification of Requirements, and other appendices with fields marked "*To be completed by Tenderer*" or where otherwise indicated.

6.1. TERMINOLOGY USED IN THE SPECIFICATION OF REQUIREMENTS

DTU distinguishes between 4 categories:

MR	= Minimum requirement
MO	= Minimum options
W	= Wish
O	= Option

6.1.1. Minimum requirements (MR)

Requirements formulated as minimum requirements (MR) in the specification of requirements (appendix 1) or other appendices, should as a minimum be fulfilled by the Tenderer and be included in the tender.

If it is evident from the tender, that the minimum requirement (MR) is not met, or if it is not adequately explained how the minimum requirement will be met, the tender will be considered non-compliant.

Tenderer must, for each minimum requirement in appendix 1 explicitly specify whether the requirement is met by answering the minimum requirement "yes" or "no" and refer to the page of the offer, explaining how the minimum requirement is met. DTU considers non-response of the minimum requirements (MR) as if these are not met.

6.1.2. Minimum options (MO)

Requirements formulated as minimum option (MO) in the specification of requirements (appendix 1) or other appendices, should as a minimum be fulfilled by the Tenderer and be included in the offer.

If it is evident from the tender, that the minimum option (MO) is not met, or if it is not adequately explained how the minimum option will be met, the tender will be considered non-compliant.

Tenderer must price each minimum option in appendix 2 – prices.

Tenderer must, for each minimum option in appendix 1, or other appendices, explicitly specify whether the requirement is met by answering the minimum option "yes" or "no" and refer to the page of the offer, explaining how the minimum option is met.
DTU considers non-response of the minimum options (MO) as if these are not met.

6.1.3. Wishes (W)

Requirements formulated as a wish (W) in the specification of requirements (Appendix 1) can be fulfilled by the Tenderer.

Tenderer must for every wish in the specification of requirements (Appendix 1) or other appendices explicitly indicate how the wish is met by answering the wish "yes" or "no" and refer to the page of the offer, explaining how the wish is fulfilled. Where the contracting authority has described wishes with minimum quantity, specification, functionality, etc., the Tenderer may choose to offer the exact solution that matches the wish, alternatively a solution that exceeds the wish.

If a solution that exceeds the wish (W), the tender will score higher on the relevant sub-criterion for the award criterion ”economically most advantageous tender", cf. 7.2. If a wish is not met, the tender will score lower on the relevant sub-criterion for the award criterion;” the most economically advantageous tender".

DTU considers non-response of the wishes (W) as if these are not met.

6.1.4. Option (O)

Requirements formulated as an option (O) in the specification of requirements (Appendix 1) can be fulfilled by the Tenderer.

Tenderer must price each option in appendix 2 – prices.

Tenderer must, for each option in appendix 1, or other appendices, explicitly specify whether the option is met by answering the option "yes" or "no" and refer to the page of the offer, explaining how the option is met. Where the contracting authority has specified options as minimum quantity, specification, functionality, etc., the Tenderer may choose to offer exactly the solution that match the option, alternatively a solution that exceeds the option.

If the Tenderer offers a solution that over perform the option, the tender will score higher on the relevant sub-criterion for the award criteria "economically most advantageous tender ", cf.7.2. If an option is not met, the tender will score lower on the relevant sub-criterion for the award criterion;" the most economically advantageous tender".

DTU considers non-response of the options (O) as if these are not met.

7. TENDER EVALUATION

7.1. EVALUATION OF COMPLIANCE

DTU will verify that the tender complies with Contract Notice's conditions, i.e., that the tender fulfils the following requirements:

- The tender is accompanied by all required documentation
- The tender does not contain reservations
- The tender responds to all minimum requirements
- The tender responds to all minimum options

7.2. AWARD CRITERION

Tenders will be evaluated against the award criterion "the most economically advantageous tender".

Tenders received will be evaluated against a number of sub-criteria. All tenders will be awarded a number of points according to how well the specifications for each sub-criterion are fulfilled.

7.2.1. Sub-criteria

The most economically advantageous tender will be identified against the sub-criteria below, where the weighting of each is stated.

Sub-criteria	%age of weighting	Short description of sub-criteria
Technical Solution	**40 %**	Emphasis is on the proposed technical solution which ensures the best solution for DTU Danchip. During the evaluation special emphasis will be on an overall evaluation of the approaches to fulfilling the wishes, options and minimum options in Appendix 1.
Price	**20 %**	Total contract price cf. appendix 2 Prices on minimum options and options cf. appendix 2
Warranty	**20 %**	The offered warranty period cf. appendix 1, item 1.1.2
Technical specification	**10 %**	Fulfillment of technical specification in appendix 1, item 1.12, 1.15, 1.21, 1.26, 1.31
Delivery	**10 %**	The offered delivery schedule cf. appendix 4, milestone 3, 11, 19 and 27.

7.2.2. Point scale and award of points

The Contracting Authority will award points on all above sub-criteria on a scale from 0-100, where 0 is lowest and 100 highest. Details on how the Contract Authority will award points on each sub-criterion are described below.

Technical Solution

Points will be awarded individually for each Offer on a scale of 0-100 based on an assessment of the fulfilment in the specification of requirements (number of "yes" and "no ") and the quality of the specification of requirements (more detailed description of how the requirements are fulfilled) assessed against the Contracting Authority's needs described in the requirement specification - Appendix 1. It is possible that no tenders gain maximum points, and it is possible that two or several tenders obtains the same score for a sub-criterion.

To ensure that the balance between "price" and "Technical Solution" is not disturbed, the assigned scores of "other sub-criteria" are converted so that the best offer gets 100 points and the other bids are awarded points relative to the best bid.

Price

The highest score is given to the lowest bid (100). The score of the other bids are calculated relative to the lowest bid. Ie. if the lowest bid is $ 1,000,000 and the next cheapest is $ 1,200,000, then score for the next cheapest offer is 80. Offers more than twice as expensive as the lowest bid, will be awarded 0 points.

Warranty

The highest score is given to the longest warranty (100). The score of the other bids are calculated relative to the longest warranty. Ie. if the longest warranty is 4 years (2 mandatory years plus 2 extra years) and the next longest warranty is 3 years, then score for the next longest warranty is 75. For example if the bid with the longest period offers 4 years warranty and another bid offers 3 years, the longest bid receives 100 point and the other bid receives 75 points (=3 years/4 years *100 point)

Technical specification
Points will be awarded individually for each Offer on a scale of 0-100 based on an assessment of the fulfilment in the specification of requirements (number of "yes" and "no ") and the quality of the specification of requirements (more detailed description of how the requirements are fulfilled) assessed against the Contracting Authority's needs described in the requirement specification - Appendix 1, item 1.12, 1.15, 1.21, 1.26, 1.31. It is possible that no tenders gain maximum points, and it is possible that two or several tenders obtains the same score for a sub-criterion.

To ensure that the balance between "price" and "technical specification" is not disturbed, the assigned scores of "technical specification" are converted so that the best offer gets 100 points and the other bids are awarded points relative to the best bid.

Delivery time
Points will be awarded individually for each Offer according to the following table and based upon the dates tenderer has specified for milestone 3, 11, 19 and 27 in appendix 4 – Time Schedule:

Points related to Lot #1

Delivery week after contract signature	<19	19	20	21	22	23	24	25	>25
Points for Lot #1	25	30	35	30	25	20	10	5	0

Points related to Lot #2

Delivery week after delivery of Lot#1	<4	4	5	6	7	8	9	10	10<
Points for Lot #2	10	13	16	19	22	25	20	15	5

Points related to Lot #3

Delivery week after delivery of Lot#2	<4	4	5	6	7	8	9	10	10<
Points for Lot #3	10	13	16	19	22	25	20	15	5

Points related to Lot #4

Delivery week after delivery of Lot#3	<4	4	5	6	7	8	9	10	10<
Points for Lot #4	5	7	9	11	13	15	10	5	0

For example a bid which promises to deliver Lot#1 in week 19, Lot #2 in week 28, Lot #3 in week 33 and lot #4 in week 42 (all weeks numbered as full weeks following the week when the contract is signed) will receive 76 points as detailed below.

	Delivery week	Difference compared to previous lot	Points
Lot #1	19		30
Lot #2	28	9	20
Lot #3	33	5	16
Lot #4	42	9	10
Total points awarded			**76**

8. QUESTIONS TO THE TENDER DOCUMENTS

8.1. QUESTIONS AND ANSWERS

Questions must be asked through www.eu-supply.com

All questions must start with clear reference to the section of the tender documentation to which they refer. Questions must be sent no later than 03.11.2015.

All questions and answers will be visible to all tenderers in anonymous form and will always be accessible at the eu-supply website.

8.2. ADDITIONAL INFORMATION TO THE TENDER DOCUMENTATION

If relevant, additional information to the tender documentation will be forwarded to the potential tenderers up to 6 days before the deadline for submission of tenders.

8.3. CHANGES TO THE TENDER DOCUMENTATION

In the event of changes to the original tender documentation, the changed documents will be made available at the eu-supply website.

9. TIMETABLE FOR THE TENDER PROCESS

The following timetable shows the most important milestones in the tender process.

Table 1: Timetable for the tender process

Date	Milestone
06.10.2015	Access to tender documents at www.eu-supply.com
21.10.2015	Site Survey at DTU
03.11.2015	Final deadline for submission of written questions to tender documents.
05.11.2015	Response to written questions from all tenderers to be sent
11.11.2015	Final deadline for submission of tenders.
20.11.2015	Contract award. *Dates are estimated.*
Primo December	Contract signing. *Dates are estimated*

10. LIST OF TENDER DOCUMENTS

The following table includes a list of all tender documents. The list includes a definition for each document of whether:

- It is to be included in the tender
- It is to be completed by the Tenderer

Document	Title	Contents	To be included in tender	To be completed by Tenderer
This document	Instructions to Tenderers for submission of Tender	Contains the Instructions to tenderers	No	No
Template 0	Letter of Quotation	Contains information about the tenderer and the submitted tender	Yes	Yes
Contract	Contract	Contains Standard Contract	Yes	No
Appendix 1	Technical specifications	The technical specifications of the procured product/service	Yes	Yes
Appendix 2	Quoted prices	The total price quoted for the product/service	Yes	Yes
Appendix 3	Test	Description for test procedures	Yes	No
Appendix 4	Time schedule	Time schedule	Yes	Yes

APPENDIX 1 - SPECIFICATION OF REQUIREMENTS

INSTRUCTIONS AND TERMINOLOGY

The Tenderer must answer and elaborate the present specification of requirements as well as other appendixes where indicated that the Tenderer must complete a space or similar.

Requirements have been classified in 4 categories designated as follows:

MR = Minimum requirement (lacking compliance entails that the offer is non conditional)
MO = Minimum option (lacking compliance entails that the offer is non conditional)
W = Wish (can be fulfilled and appear as a competitive parameter in the comparison of offers)
O = Option (can be fulfilled and appear as a competitive parameter in the comparison of offers)

For minimum options (MO) and options (O) applies, that Tenderer must fix a price for each minimum option unambiguous in appendix 2 – prices. The price must entail expenses for all elements that are necessary for the minimum options applicability for the Contracting Authority.

The Contracting Authority considers lacking response to one or more MR, MO, W or O as if these are not met.

Tenderer **must** elaborate and qualify the response to a MR, MO, O or W. Tenderer can in the elaboration and qualification place references to tenderers offer or additional appendixes / documentation if Tenderer judges this to be of relevance / necessary. **POINTS WILL BE AWARDED BASED ON THESE ELABORATIONS AND REFERENCES TO ADDITIONAL APPENDIXES / DOCUMENTATION**. It is therefore important that Tenders are thorough in their elaboration of compliance to specification requirements

Tender concerning 11 cleanroom compatible fumehoods and 6 chemical benches

Item	Requirement ID	Description	Type of requirement	Fulfilment of requirement To be completed by the Tenderer		Suggested means of demonstrating compliance with the requirement	Reference to where in the bid the information can be found regarding compliance with the requirement
				Yes	No		
Contract requirement	1.1	Tenderer accepts the enclosed contract proposal without reservations	MR				
	1.1.2	Tenderer must specify any additional number of years of full and complete warranty included in the Tenderers offer. Please notice that the minimum requirement is a two year full and complete warranty cf. point 26.1 in the contract.	W				
Spare part identification requirement	1.2	The tenderer accepts that as part of the final delivery, a list of spare parts as well as technical drawings will be provided before Site Acceptance Test (SAT) can be approved. The spare parts list must include the part numbers of the original equipment manufacturer.	MR				
General requirements/ Both Fumehoods and wet benches	1.3	Benches are to be installed in Clean room ISO 14644-1 class 4 and 5, materials and workmanship must be appropiate for this environment. Made completely in white PPs (flame retardant polypropylene) all welding should be of good quality, neat and tight. Construction must consist of a top part and bottom part for transport through doors (2000 mm x 1000 mm HxW). Installed height is approximately 2950 mm, assembly height in cleanroom max. 3000 mm.	MR				
	1.4	The work surface (tabletop) must be made of perforated plate or plates, in PPs/PP nature or in stainless steel if solvents are to be used.	MR				
	1.5	Under the tabletop there should be a water and chemical tight basin connected to drain. This basin serves to pick up spills, hold installed process modules and allow exhaust air to pass through the perforated tabletop.	MR				
	1.6	Valve lifetime is important and expected to depend on the amount of chemical/fluid exposure they are subjected to. The less exposed, the outside of the valves are to chemiclas/fluids, the better	W			Description of basin solution including where valves are expected to be placed	To be specified by Tenderer
	1.7	The bottom part of the hood (underneath the basin) must be equipped with a leak detector (water/wet chemical). The detector must give a signal to light up a indicator lamp in the front panel and shut down DIW to the bench	MR				
	1.8	Front window/sash in safety glass.	MR				
	1.9	Ease of overview of work area. Structures on the sash, like bulky handle, or non-transparent regions should be minimized	W			Description of safetyglass sash including drawing. Nontransparent regions are particularly interesting	To be specified by Tenderer
	1.10	DIW installation in IR welded PVDF or quality fitted PFA tubes for ultra high purity DIW. All DIW installations must be with recirculation flow (DIW in/out connections on bench) Danchip facilities provides a small differential pressure between in and out connections. N2 in PFA or Stainless steel 316 All other media in PE, PP, PVDF, PFA or SS.	MR				
	1.11	Sash must be controlled by single-press push buttons. Alarms for not maintained exhaust flow has to be installed (both in normal operation and energy saving mode)	MR				
	1.12	Manual operation (by operator hand) of sash should be able to override motor control of sash (with and without electrical power supplied to bench)	W			Description of operation including reaction speed of system	To be specified by Tenderer
	1.13	Extra exhaust in the front part (closest to the operator) of the perforated table top for improved particle control and safety	MO			Description of solution including expected airflow	To be specified by Tenderer
	1.14	To prevent accidents, there must be a safety device that prevents automatic closing of the sash if something obstructs the sash path.	MR				
	1.15	The device preventing automatic closing of the sash in case of obstruction should be as safe as possible	W			What method will be used to detect this situation and what are the consequences of false signals (both false positives and false negatives)?	To be specified by Tenderer
	1.16	Daily used functions like start and stop of process must be with “hard” push buttons, not touch screen only.	MR				

	1.17	The push buttons should be easy to use even when wearing double gloves	MR				
	1.18	Signal light (red/yellow/green) mechanically integrated in each bench/hood. The electrical connections are led to the service side of the cabinet for future use	MR				
	1.19	DIW guns are desired to be "embedded" in the surface, that is fixed in such a way that the gun has a specific location when not in use. The easier it is to grab the gun and return in the better. Please see Appendix 1.1 for a possible approach. - This wish applies to all DIW guns.	W			Description of solution including a sketch	To be specified by Tenderer
	1.20	Nitrogen guns are desired to be "embedded" in the surface, that is fixed in such a way that the gun has a specific location when not in use. The easier it is to grab the gun and return in the better. Please see Appendix 1.1 for a possible approach. - This wish applies to all N2 guns.	W			Description of solution including a sketch	To be specified by Tenderer
	1.21	When space is available in the lower part of a bench or hood there should be room for storage, preferably with drawers.	W			Description of drawers, principle sketch and especially a description of the materials used for the sliding part of the drawer	To be specified by Tenderer
General requirements/ Fumehoods only	1.22	All exhaust coming through the sash opening and exhaust system should be dimensioned for a surface velocity of 0.5 m/s through sash opening in normal working position (500 mm) Building exhaust system is running at approximately 300-400 Pa. When sash is closed the exhaust flow should be reduced to maintain 0.5 m/s through opening. Approximately 80% of exhaust should go through perforated table top and 20% should go through adjustable openings in the top part to prevent contamination buildup in upper part.	MR				
	1.23	A range of adjustment between the air volume passing through the table top and the adjustable openings is desireable.	W			Description of solution including a sketch	To be specified by Tenderer
	1.24	All fumehoods must be equipped with energy saving functions, automatic lowering of sash and reduced exhaust flow when no activity (PIR timer controlled). When sash is closed air velocity should be approximately 0.5m/s.	MR				
	1.25	The faster the change to energy saving mode the better.	W			Description of solution including expected status change speeds and drawing of the principles	To be specified by Tenderer
	1.26	Reference documenting experience with automatic closing of sash and energy saving as described in 1.24. From the deadline for submission of tenders to choice of supplier, DTU reserves the right to visit the by tenderer appointed reference, cf. Instructions to Tenderers point 5.13.	W			Drawing(s), photos, measurements from site with this solution. Name, email, phone number to representative of this reference	To be specified by Tenderer
General requirements/ Wet benches only	1.27	Wet bencehs equipped with HEPA filter with speed controlled fan. Exhaust system dimensioned to extract the air from the HEPA filter + 20% from room air through sash opening. Down flow in bench should be approximately 0.5m/s when sash is open. When sash is closed values must be reduced to save energy. All the above ratios must be adjustable in order to secure room safety and energy savings.	MR				
	1.28	Alarms for not maintained exhaust flow has to be installed (both in normal operation and energy saving mode)	MR				
	1.29	All benches should be equipped with energy saving functions, automatic lowering of sash and reduced exhaust/HEPA flow when no activity (PIR timer controlled). Energy saving when sash is closed must reduce exhausted flow but still maintain room safety and particle free work area.	MR				
	1.30	The faster the change to energy saving mode the better.	W			Description of solution including expected status change speeds and drawing of the principles	To be specified by Tenderer
	1.31	Reference documenting experience with automatic closing of sash and energy saving as described in 1.29. From the deadline for submission of tenders to choice of supplier, DTU reserves the right to visit the by tenderer appointed reference, cf. Instructions to Tenderers point 5.13.	W			Drawing(s), photos, measurements from site with this solution. Name, email, phone number to representative of this reference	To be specified by Tenderer
	1.32	Built in automatic fire extinguisher, budget price per unit.	O			Description of solution including drawing, triggers and risk assesment of automatic fire extinguishing	To be specified by Tenderer

Lot 1 - Fumehood for Acid and bases	2.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	2.2	Sink (400 mm x 500 mm x 200 mm WxLxD) placed to the left in the fume hood. There must be room for DIW gun and aspirator to the left of the sink Drain in sink in the corner to the left and furthest from the sash opening	MR				
	2.3	Quick dump rinse bath in PVDF/PFA with drain and timer for 6” wafers.	MR				
	2.4	Flexibility with regards to control of quick dump rinse is desireable. Desireable controls include possibility of dumping the volume without refilling and adjusting the spray velocity.	O			Description of solution including a sketch and materials choice	To be specified by Tenderer
	2.5	Lid on quick dump rinse in plane with tabletop	MR				
	2.6	DIW gun placed to the **left** of the sink	MR				
	2.7	N2 gun placed to the **right** in the hood	MR				
	2.8	Aspirator placed in the **left** side of the hood behind the DI water gun. The aspirator will be using city water and should be controlled with a timer.	MR				
	2.9	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	2.10	2 Schuko power plugs (230 V) in the front panel with splash protection lid and a residual-current circuit breaker	MR				
Lot 1 - Fumehood for Acid and bases (Identical to number 2)	3.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	3.2	Sink (400 mm x 500 mm x 200 mm WxLxD) placed to the left in the fume hood. There must be room for DIW gun and aspirator to the left of the sink Drain in sink in the corner to the left and furthest from the sash opening	MR				
	3.3	Quick dump rinse bath in PVDF/PFA with drain and timer for 6” wafers.	MR				
	3.4	Flexibility with regards to control of quick dump rinse is desireable. Desireable controls include possibility of dumping the volume without refilling and adjusting the spray velocity.	O				
	3.5	Lid on quick dump rinse in plane with tabletop	MR				
	3.6	DIW gun placed to the **left** of the sink	MR				
	3.7	N2 gun placed to the **right** in the hood	MR				
	3.8	Aspirator placed in the **left** side of the hood behind the DI water gun. The aspirator will be using city water and should be controlled with a timer.	MR				
	3.9	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	3.10	2 Schuko power plugs (230 V) in the front panel with splash protection lid and a residual-current circuit breaker	MR				
Lot 1 - Fumehood for Solvents	4.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	4.2	Grounded stainless steel table top	MR				
	4.3	Sink in stainless steel (400 mm x 500 mm x 200 mm WxLxD) placed to the left in the fume hood. Drain in sink in the corner to the left and furthest from the sash opening	MR				
	4.4	Quick dump rinse bath in PVDF/PFA with drain and timer for 6” wafers.	MR				
	4.5	Lid on quick dump rinse in plane with tabletop	MR				
	4.6	DIW gun placed to the **left** of the sink	MR				
	4.7	N2 gun placed to the **right** in the hood	MR				
	4.8	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	4.9	Integrated space for 2x 4L waste bottles in the **right** side of hood, furthest from the sash opening	MR				
	4.10	Covers for the holes for the waste bottles, in case the bottles are not used. The covers must be in the same plane as the tabletop	MR				
	4.11	2 Schuko power plugs (230 V) in the front panel with splash protection lid and a residual-current circuit breaker	MR				
Lot 1 - Fumehood for Solvents (idetical to number 4)	5.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	5.2	Grounded stainless steel table top	MR				
	5.3	Sink in stainless steel (400 mm x 500 mm x 200 mm WxLxD) placed to the left in the fume hood. Drain in sink in the corner to the left and furthest from the sash opening	MR				
	5.4	Quick dump rinse bath in PVDF/PFA with drain and timer for 6” wafers.	MR				
	5.5	Lid on quick dump rinse in plane with tabletop	MR				
	5.6	DIW gun placed to the **left** of the sink	MR				
	5.7	N2 gun placed to the **right** in the hood	MR				
	5.8	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				

	5.9	Integrated space for 2x 4L waste bottles in the **right** side of hood, furthest from the sash opening	MR				
	5.10	Covers for the holes for the waste bottles, in case the bottles are not used. The covers must be in the same plane as the tabletop	MR				
	5.11	2 Schuko power plugs (230 V) in the front panel with splash protection lid and a residual-current circuit breaker	MR				
Lot 1 - Fumehood for working with Graphene	6.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	6.2	Sink (400 mm x 500 mm x 200 mm WxLxD) placed to the left in the fume hood. There must be room for DIW gun and aspirator to the left of the sink Drain in sink in the corner to the left and furthest from the sash opening	MR				
	6.3	Quick dump rinse bath in PVDF/PFA with drain and timer for 6” wafers.	MR				
	6.4	Lid on quick dump rinse in plane with tabletop	MR				
	6.5	DIW gun placed to the **left** of the sink	MR				
	6.6	N2 gun placed to the **right** in the hood	MR				
	6.7	Integrated space for 2x 4L waste bottles in the **right** side of hood furthest from the sash opening	MR				
	6.8	Covers for the holes for the waste bottles, in case the bottles are not used. The covers must be in the same plane as the tabletop	MR				
	6.9	Aspirator placed in the **left** side of the hood behind the DI water gun. The aspirator will be using city water and should be controlled with a timer.	MR				
	6.10	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	6.11	2 Schuko power plugs (230 V) in the front panel with splash protection lid and a residual-current circuit breaker	MR				
Lot 1 - Fumehood for nickel and KOH etching of plated wafers and cleaning of nickel plated tools	7.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	7.2	Sink (400 mm x 500 mm x 200 mm WxLxD) placed to the left in the fume hood. There must be room for DIW gun and aspirator to the left of the sink Drain in sink in the corner to the left and furthest from the sash opening	MR				
	7.3	The sink must be able to support a load of at least 60 kg	MR				
	7.4	Switch to toggle between normal drain and drain collecting Ni from the sink (two drains out)	MR				
	7.5	Alarm input for full external waste tank. The signal must trigger closing of the drain valve and light up an indicator light on the front panel	MR				
	7.6	One tank for 6” wafers in PTFE with heating for KOH etching. Overflow including recirculation. The tank should be located far from the sash opening and to the right of the fumehood.	MR				
	7.7	Circulation flowrate:10-15 l/min of KOH	MR				
	7.8	Timer on KOH circulation and heating which automatic switches off during night.	MR				
	7.9	Low noise circulation pump. Magnetic levitation rotor (eg. Iwaki). Pump house in ceramic, EPDM o-rings. On/Off control button on frontpanel.	MR				
	7.10	An easy to repair (while still being safe), system is preferred.	W			Description of circulation solution. Including placement of component and materials	To be specified by Tenderer
	7.11	KOH tank is filled manually and emptied by panel switch. There must be aprogrammable interlock with the temperature sensor to avoid draining hot chemicals	MR				
	7.12	KOH tank empties to drain, diluted with city water controlled by timer	MR				
	7.13	Temperature control of KOH: 40-90 °C ± 1 °C	MR				
	7.14	Tighter temperature control (than ± 1 °C) is preferred on KOH tanks	W			Please describe the solution and estimate temperature control in the tank volume	To be specified by Tenderer
	7.15	Overheating control on KOH tank	MR				
	7.16	Low level sensor in KOH tank	MR				
	7.17	Automatic switch off heating element and circulation pump if level is too low or temperature is too high in KOH tank	MR				
	7.18	Cooling in lid of KOH tank with facility cooling water ~20°C. Switch off when tank temperature is below 40°C	MR				
	7.19	Easy operator readable temperature display	MR				
	7.20	Quick dump rinse bath in PVDF/PFA with drain and timer for 6” wafers.	MR				
	7.21	Lid on quick dump rinse in plane with tabletop	MR				
	7.22	DIW gun placed to the **left** of the sink	MR				
	7.23	N2 gun placed to the **right** in the hood	MR				

	7.24	Aspirator placed in the **left** side of the hood behind the DI water gun. The aspirator will be using city water and should be controlled with a timer.	MR				
	7.25	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	7.26	2 Schuko power plugs (230 V) in the front panel with splash protection lid and a residual-current circuit breaker	MR				
Lot 1 - Fumehood for III-V materials (acids and bases)	8.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	8.2	Sink (400 mm x 400 mm x 200 mm WxLxD) placed to the **centre** of the fume hood. Drain in sink in the corner to the left and furthest from the sash opening	MR				
	8.3	Water tap with DIW placed at the back-end of the sink	MR				
	8.4	Water tap controlled by foot pedal	MR				
	8.5	DIW gun placed to the **left** of the sink	MR				
	8.6	N2 gun placed to the **right** in the hood	MR				
	8.7	Aspirator placed next to the water tap, using city water and should be controlled with a timer.	MR				
	8.8	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	8.9	Rack for beakers on the wall inside hood, placed on the **left** side	MR				
	8.10	2 Schuko power plugs (230 V) in the front panel with splash protection lid and a residual-current circuit breaker	MR				
Lot 1 - Fumehood for III-V materials (solvents)	9.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	9.2	Grounded stainless steel table top	MR				
	9.3	Sink (400 mm x 400 mm x 200 mm WxLxD) placed to the **centre** of the fume hood. Drain in sink in the corner to the left and furthest from the sash opening	MR				
	9.4	Water tap with DI water placed at the back-end of the sink	MR				
	9.5	Water tap controlled by foot pedal	MR				
	9.6	DIW gun placed to the **left** of the sink	MR				
	9.7	N2 gun placed to the **right** in the hood	MR				
	9.8	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	9.9	Rack for beakers on the wall inside hood, placed on the **left** side	MR				
	9.10	Integrated space for 2x 4L waste bottles in the **right** side of hood furthest from the sash opening	MR				
	9.11	Covers for the holes for the waste bottles, in case the bottles are not used. The covers must be in the same plane as the tabletop	MR				
	9.12	2 Schuko power plugs (230 V) in the front panel with splash protection lid and a residual-current circuit breaker	MR				

Lot 2 - Wet Bench for KOH	10.1	Outer dimension 1890 mm x 850 mm x 2950 mm (WxDxH). The width is the expected width, if another width results in a better solution, this can be changed.	MR			Please specify the recommended width of the bench	To be specified by Tenderer
	10.2	One 6” tank for BHF in PVDF, filled manually, and with drain controlled by switch on front panel	MR				
	10.3	Two PTFE tanks for 6” wafers for etching in heated KOH with overflow including recirculation	MR				
	10.4	A good degree of etchant mixing during recirculation is preferred.	W			Description of tank solution as well as overflow and other elements relevant for mixing	To be specified by Tenderer
	10.5	Tanks are filled manually and emptied by panel switch. Drained with timed city water. There must be aprogrammable interlock with the temperature sensor to avoid draining hot chemicals.	MR				
	10.6	Cooling in lid of KOH tanks with facility cooling water ~20°C. Switch off when tank temperature is below 40°C	MR				
	10.7	Elevator for the KOH tanks	O			Description of solution with a sketch and component choice	To be specified by Tenderer
	10.8	Circulation of tanks, flowrate:10-15 l/min	MR				
	10.9	Flowrate of the circulation speed controlled from the frontpanel	O			Please indicate the approximate range	To be specified by Tenderer
	10.10	Built-in instrument for measuring the density of the etching fluid	O			Description of solution with a sketch and component choice.	To be specified by Tenderer
	10.11	Automatic adjustment of water content in KOH tanks to maintain a given density of the etchant	O			Description of solution with a sketch and component choice.	To be specified by Tenderer
	10.12	Timer on KOH circulation and heating which automatic switches off during night.	MR				
	10.13	Low noise circulation pump. Magnetic levitation rotor (eg. Iwaki). Pump house in ceramic, EPDM o-rings. On/Off control button on frontpanel.	MR				
	10.14	An easy to repair (while still being safe), system is preffered.	W			Description of circulation solution. Including placement of component and materials	To be specified by Tenderer
	10.15	Temperature control on KOH tanks 40-90 °C ± 1 °C (Each tank controlled individually)	MR				
	10.16	Tighter temperature control (than ± 1 °C) is preferred on KOH tanks	W			Please describe the solution and estimate temperature control in the tank volume	To be specified by Tenderer
	10.17	Overheating control on KOH tanks	MR				
	10.18	Level sensors in KOH tanks	MR				
	10.19	Automatic switch off of heating element and circulation pump if level is too low or temperature is too high in a KOH tank, each tank should be monitored individually so that one can continue to work even if the other is overheating or at low level.	MR				
	10.20	All three tanks (2*KOH and HF) must have drain controlled by switches on the front panel	MR				
	10.21	Two individual two-stage cascade rinsing baths in PVDF/PFA with drain, timer and resistivity controlled on the front panel for each bath. The baths should be placed close to the KOH tanks	MR				
	10.22	Cascade rinsing bath with possibility of filling and heating water to 80°C, and subsequently flow with cold water.	MO			Description of solution. Including material and component choice	To be specified by Tenderer
	10.23	DIW gun placed to the **right** in the hood	MR				
	10.24	N2 gun placed to the **left** in the hood	MR				
	10.25	Aspirator placed in the **middle** of the bench, far from the sash opening. The aspirator will be using city water and should be controlled with a timer.	MR				
	10.26	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
Lot 2 - Wet Bench for High temperature phosphoric acid etch	11.1	Dimension 800 mm x 850 mm x 2950 mm (WxDxH). The width is the expected width, if another width results in a better solution, this can be changed.	MR			Please specify the recommended width of the bench	To be specified by Tenderer
	11.2	One tank in quartz for 6" wafers for heated phosphoric acid treatment	MR				
	11.3	Temperature control adjustable in the range 40-160 °C ± 1 °C	MR				
	11.4	Temperature control adjustable in the range 40-180 °C ± 1 °C is desireable	O				
	11.5	Tank is filled manually and emptied by panel switch.	MR				
	11.6	Tank empties to drain with timed city water. There must be a programmable interlock with the temperature sensor to avoid draining hot chemicals	MR				

	11.7	Cooling in lid of phosphoric acid etch tank with facility cooling water ~20°C. Switch off when tank temperature is below 40°C	MR				
	11.8	Protection against bumping (rapid bubble formation from water vaporizing) during processing	O			Description of solution.	To be specified by Tenderer
	11.9	Automatic adjustment of water content in tank	MO			Description of solution. Including material and component choice	To be specified by Tenderer
	11.10	Overheating control on tank	MR				
	11.11	A tight control of the overheating is preferred	W			Description of solution possibly including operational precision of sensors and expected temperature variations within the tank volume	To be specified by Tenderer
	11.12	Level sensors in tank	MR				
	11.13	Timer on heating, with automatic switch-off of the power during night	MR				
	11.14	Cascade rinsing bath with possibility of filling and heating water to 80°C, and subsequently flow with cold water.	MR				
	11.15	The heater for the water rinsing must be compatible with DI water	MR				
	11.16	Timer and drain on water bath controlled from the front panel	MR				
	11.17	Filtering of the phosphoric acid etchant to remove particles. It is perfectly acceptable for the filtering to only be possible on cool etchant (<30 degrees).	O			Description of solution. Including material and component choice	To be specified by Tenderer
	11.18	DIW gun placed to the **right** in the hood	MR				
	11.19	N2 gun placed to the **left** in the hood	MR				
	11.20	Aspirator placed on the left hand side of the bench, centered between sash opening and rear. The aspirator will be using city water and should be controlled with a timer.	MR				
	11.21	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
Lot 2 - Wet Bench for Acid etch I	12.1	Dimension 1200 mm x 850 mm x 2950 mm (WxDxH). The width is the expected width, if another width results in a better solution, this can be changed.	MR			Please specify the recommended width of the bench	To be specified by Tenderer
	12.2	Two PVDF tanks for 6" wafers. One for BHF (left hand side) and one for diluted HF/HNO3 etching (right hand side)	MR				
	12.3	Tanks empty to drain with timed city water	MR				
	12.4	Tanks are filled manually and emptied by panel switch.	MR				
	12.5	Elevator in BHF tank activated by switch on front panel (left bath)	O			Description of solution. Including material and component choice	To be specified by Tenderer
	12.6	Two individual two-stage cascade rinsing baths in PVDF/PFA with drain, timer and resistivity controlled on the front panel for each bath	MR				
	12.7	DIW gun placed to the **right** in the hood	MR				
	12.8	N2 gun placed to the **left** in the hood	MR				
	12.9	Aspirator placed centered in the bench, far from the sash opening. The aspirator will be using city water and ahould be controlled with a timer.	MR				
	12.10	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				

Lot 3 - Wet Bench for Acid etch II	13.1	Dimension 1200 mm x 850 mm x 2950 mm (WxDxH). The width is the expected width, if another width results in a better solution, this can be changed.	MR			Please specify the recommended width of the bench	To be specified by Tenderer
	13.2	Two PVDF tanks for 6" wafers. One for diluted Phosphoric acid (left hand side) and one for a future acidic etchant etching (right hand side)	MR				
	13.3	Tanks empty to drain with timed city water. There must be aprogrammable interlock with the temperature sensor to avoid draining hot chemicals.	MR				
	13.4	Tanks are filled manually and emptied by panel switch.	MR				
	13.5	Temperature control adjustable in the range 20-90 °C ± 1 °C for both tanks	MR				
	13.6	Elevator in phosphoric acid tank activated by switch on front panel (left tank)	O			Description of solution. Including material and component choice	To be specified by Tenderer
	13.7	Elevator in the other acid tank activated by switch on front panel (right tank)	O				
	13.8	Individual two-stage cascade rinsing baths in PVDF/PFA with drain, timer and resistivity controlled on the front panel for each bath (two cascade rinsing baths in total for the bench)	MR				
	13.9	Timer on heating, with automatic switch-off of the power during night	MR				
	13.10	DIW gun placed to the **right** in the hood	MR				
	13.11	N2 gun placed to the **left** in the hood	MR				
	13.12	Aspirator placed centered in the bench, far from the sash opening. The aspirator will be using city water and should be controlled with a timer.	MR				
	13.13	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
Lot 3 - Wet Bench for Wafer and Mask Cleaning	14.1	Dimension 1600 mm x 850 mm x 2950 mm (WxDxH). The width is the expected width, if another width results in a better solution, this can be changed.	MR			Please specify the recommended width of the bench	To be specified by Tenderer
	14.2	One quartz tank for 7" masks (left side) for heated sulphuric acid cleaning	MR				
	14.3	One quartz tank for 6" wafers (right side) for heated sulphuric acid cleaning	MR				
	14.4	Tanks empty to drain with timed city water. There must be aprogrammable interlock with the temperature sensor to avoid draining hot chemicals.	MR				
	14.5	Tanks are filled manually and emptied by panel switch	MR				
	14.6	Temperature control adjustable in the range 20-120 °C ± 1 °C for both baths	MR				
	14.7	Tighter temperature control (than ± 1 °C) is preferred	W			Please describe the solution and estimate temperature control in the tank volumes	To be specified by Tenderer
	14.8	Two individual two-stage cascade rinsing baths in PVDF/PFA with drain, timer and resistivity controlled on the front panel for each bath (two cascade rinsing baths in total for the bench)	MR				
	14.9	Timed control of heating, with automatic switch-off of the power during night	MR				
	14.10	DIW gun placed to the **right** of the bench	MR				
	14.11	N2 gun placed to the **left** in the bench	MR				
	14.12	Aspirator placed in the middle of the bench, far from the sash opening. The aspirator will be using city water and should be controlled with a timer.	MR				
	14.13	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
Lot 3 - Wet Bench for lift-off	15.1	Dimension 1200 mm x 850 mm x 2950 mm (WxDxH). The width is the expected width, if another width results in a better solution, this can be changed.	MR			Please specify the recommended width of the bench	To be specified by Tenderer
	15.2	Grounded perforated stainless steel table top	MR				
	15.3	Two stainless steel tanks for 6" wafers for solvent treatment. Initially planned for use with N-Methyl-2-pyrrolidone (CAS: 872-50-4) and Isopropanol (CAS: 67-63-0)	MR				
	15.4	Tanks empty to drain	MR				
	15.5	Tanks are filled manually and emptied by panel switch	MR				
	15.6	Temperature control adjustable in the range 20-70 °C ± 1 °C for both tanks	MR				
	15.7	Ultrasonic transducers must be fitted to the bottom of both process tanks	MR				
	15.8	The tanks should preferably be equipped with a device (such as a basket) to make sure that the carrier is not resting directly on the bottom of the tank	W			Description of solution Drawing	To be specified by Tenderer
	15.9	Ultrasonic pressure on wafers must be compatible with lift-off processing	MR				

	15.10	Characterization of the ultrasonic generated pressue or impact of the ultrasonication is desired. The closer the approach gets to measuring real physical quantities the better.	W			Description of planned measurements and/or results of previous measurements	To be specified by Tenderer
	15.11	Overheating control on each tank	MR				
	15.12	A tight control of the overheating is preferred	W			Description of solution possibly including operational precision of sensors and expected temperature variations within the tank volumes	To be specified by Tenderer
	15.13	Level sensor on each tank	MR				
	15.14	A two-stage cascade rinsing baths in PVDF/PFA with drain, timer and resistivity controlled on the front panel	MR				
	15.15	Timed control of heating, with automatic switch-off of the power during night	MR				
	15.16	DIW gun placed to the **right** of the bench	MR				
	15.17	N2 gun placed to the **left** in the bench	MR				
	15.18	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
Lot 3 - Wet Bench for resist stripping	16.1	Dimension 1200 mm x 850 mm x 2950 mm (WxDxH). The width is the expected width, if another width results in a better solution, this can be changed.	MR			Please specify the recommended width of the bench	To be specified by Tenderer
	16.2	Grounded perforated stainless steel table top	MR				
	16.3	Two stainless steel tanks for 6" wafers for solvent treatment. Initially planned for use with Acetone (CAS: 67-64-1)	MR				
	16.4	Tanks empty to drain	MR				
	16.5	Tanks are filled manually and emptied by panel switch	MR				
	16.6	Temperature control adjustable in the range 20-70 °C ± 1 °C for both tanks	MR				
	16.7	Ultrasonic transducers must be fitted to the bottom of both process tanks	MR				
	16.8	The tanks should preferably be equipped with a device (such as a basket) to make sure that the carrier is not resting directly on the bottom of the tank	W			Description of solution Drawing	To be specified by Tenderer
	16.9	Ultrasonic pressure on wafers must be compatible with lift-off processing	MR				
	16.10	Characterization of the ultrasonic generated pressue or impact of the ultrasonication is desired. The closer the approach gets to measuring real physical quantities the better	W			Description of planned measurements and/or results of previous measurements	To be specified by Tenderer
	16.11	Overheating control on each tank	MR				
	16.12	A tight control of the overheating is preferred	W			Description of solution possibly including operational precision of sensors and expected temperature variations within the tank volumes	To be specified by Tenderer
	16.13	Level sensor on each tank	MR				
	16.14	A two-stage cascade rinsing baths in PVDF/PFA with drain, timer and resistivity controlled on the front panel	MR				
	16.15	Timed control of heating, with automatic switch-off of the power during night	MR				
	16.16	DIW gun placed to the **right** of the bench	MR				
	16.17	N2 gun placed to the **left** in the bench	MR				
	16.18	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				

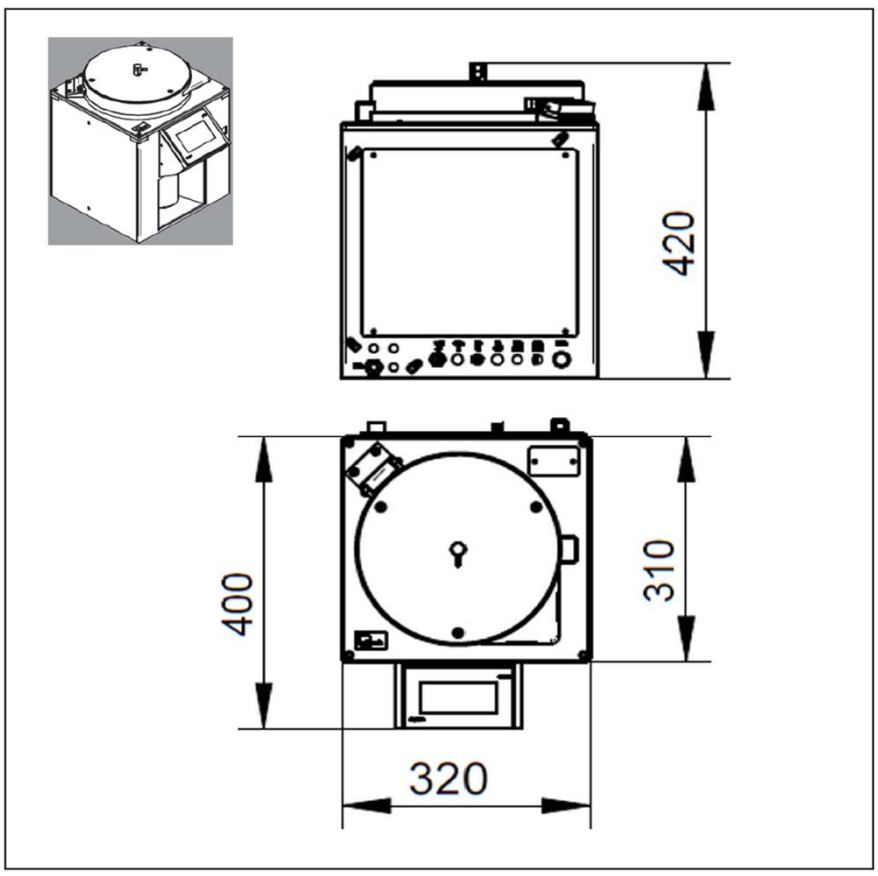
Lot 4 - Fumehood with integrated spin-coater I	17.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	17.2	Grounded perforated stainless steel tabletop	MR				
	17.3	Cutout to the left in the tabletop to allow for a spin-coater (“LabSpin6 TT” from Süss MicroTec). The size of the cut-out must be 340 mm x 340 mm. The cutout should be placed as close to the sash as possible (with the front edge at most 340 mm from the sash), while still allowing min. 80 mm access at full depth in front of spin coater and min. 150 mm access at 100 mm below tabletop surface. A sketch of the required solution is shown in Appendix 1.2.	MR				
	17.4	There must be a levelling platform 180 mm below tabletop surface (max. depth). Access to the platform should be possible from both sides with the spin coater in place, in order to perform levelling.	MR				
	17.5	The platform/stage/table with the spin-coater should be adjustable to allow for levelling of the spin-coater	MR				
	17.6	The more precise and userfriendly the levelling can be performed the better	W			Description of the possible adjustments and how to perform them	To be specified by Tenderer
	17.7	Access duct through the basin back wall (the service side) to allow for compressed air, house vacuum and power for the spin coater.	MR				
	17.8	A section of the tabletop in front of the cut out for the spin coater, should be removable in order to access the front of the spin coater to remove a waste container. This section of the tabletop should have a width of 340 mm, and a minimum length of 170 mm. This section should be in plane with the remaining tabletop when in place.	MR				
	17.9	A perforated stainless steel cover for the cutout region in case the integrated spin-coater is removed. This cover should also replace the removable section in front of the cutout. The cover should be in plane with the remaining tabletop	MR				
	17.10	N2 gun placed to the **right** in the hood	MR				
	17.11	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	17.12	2 Schuko power plugs (230 V) in the front panel to the **right** with splash protection lid and a residual-current circuit breaker	MR				
Lot 4 - Fumehood with integrated spin-coater II (Identical to 17)	18.1	Outer dimensions 1500 mm x 850 mm x 2950 mm (WxDxH)	MR				
	18.2	Grounded perforated stainless steel tabletop	MR				
	18.3	Cutout to the left in the tabletop to allow for a spin-coater (“LabSpin6 TT” from Süss MicroTec). The size of the cut-out must be 340 mm x 340 mm. The cutout should be placed as close to the sash as possible (with the front edge at most 340 mm from the sash), while still allowing min. 80 mm access at full depth in front of spin coater and min. 150 mm access at 100 mm below tabletop surface. A sketch of the required solution is shown in appendix 1.2.	MR				
	18.4	There must be a levelling platform 180 mm below tabletop surface (max. depth). Access to the platform should be possible from both sides with the spin coater in place, in order to perform levelling.	MR				
	18.5	The platform/stage/table with the spin-coater should be adjustable to allow for levelling of the spin-coater	MR				
	18.6	The more precise and userfriendly the levelling can be performed the better	W			Description of the possible adjustments and how to perform them	To be specified by Tenderer
	18.7	Access duct through the basin back wall (the service side) to allow for compressed air, house vacuum and power for the spin coater.	MR				
	18.8	A section of the tabletop in front of the cut out for the spin coater, should be removable in order to access the front of the spin coater to remove a waste container. This section of the tabletop should have a width of 340 mm, and a minimum length of 170 mm. This section should be in plane with the remaining tabletop when in place.	MR				
	18.9	A perforated stainless steel cover for the cutout region in case the integrated spin-coater is removed. This cover should also replace the removable section in front of the cutout. The cover should be in plane with the remaining tabletop	MR				
	18.10	N2 gun placed to the **right** in the hood	MR				
	18.11	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	18.12	2 Schuko power plugs (230 V) in the front panel to the **right** with splash protection lid and a residual-current circuit breaker	MR				
Lot 4 - Fumehood for lithography	19.1	Outer dimensions 1200 mm x 850 mm x 2950 mm (WxDxH)	MR				
	19.2	Grounded perforated stainless steel tabletop	MR				
	19.3	Sink stainless steel (400 mm x 400 mm x 250 mm WxLxD) placed to the left of the middle of the fume hood, while allowing room for the two waste bottles. Drain in sink in the corner to the left and furthest from the sash opening	MR				
	19.4	Cover for the sink in plane with the table top	MR				
	19.5	DIW gun placed to the **left** in the hood	MR				
	19.6	N2 gun placed to the **right** in the hood	MR				
	19.7	Swagelok quick connector for vacuum tweezer on front panel to the **right**	MR				
	19.8	Integrated space for 2x 4L waste bottles in the tabletop along the **left** wall of the hood	MR				
	19.9	Covers for the holes for the waste bottles, in case the bottles are not used. The covers must be in the same plane as the tabletop	MR				

	19.10	2 Schuko power plugs (230 V) in the front panel to the **right** with splash protection lid and a residual-current circuit breaker	MR				

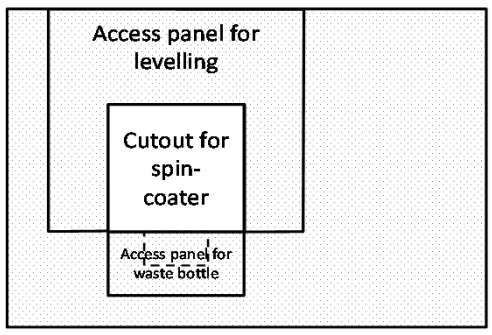
Appendix 1.1 - Embedded DIW gun

Example of a possible way of embedding the DIW gun or N2 gun in the surface.

Appendix 1.2 - LabSpin6 TT free volume



Tabletop view



Cross section