WORLDSID- a DESIGN AND BUILD
- REQUEST FOR PROPOSALS -

IMPORTANT INFORMATION ON THIS COVER PAGE!

PLEASE RESPOND TO:

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PLEASE RESPOND BEFORE:

Noon (12:00 p.m.) February 25, 1999,
North America Eastern Standard Time (EST)

Proposals received after this time
cannot be considered.

Prepared for:	ISO WorldSID Task Group
Author:	Marc Beusenberg Biokinetics and Associates Ltd.
Date:	January 29, 1999
Report No. :	R99-02

PREFACE

On behalf of the ISO WorldSID Task Group, I'm happy to present to you this Request for Proposals "WorldSID-α Design and Build". The major objectives of this RFP are:

- to establish a motivated and dedicated design team for WorldSID-α that will design and build the first WorldSID prototype under management of Biokinetics and Associates Ltd.,
- confirm technical contents by obtaining directions for concepts of the complete WorldSID-α assembly including instrumentation and all other deliverables of the WorldSID-α project;
- obtain responses that clearly identify the feasibility of the proposal(s),
- confirm project management issues,
- to identify all other issues related to (sub)contracting the design and build of the WorldSID-α.

Your proposal(s) should be received no later than **Noon (12:00 p.m.) Thursday February 25, 1999, North America Eastern Standard Time (local time in Ottawa)** at the address listed on the cover page.

The formal representatives of the ISO WorldSID Task Group will give all proposals thorough and fair review. The regional advisory groups (Americas, Asia/Pacific and Europe) will assign their representatives after February 25, 1999. Part of the review process will include presentation of the proposals at the March 8-10, 1999 meeting of the ISO WorldSID Task Group in Ottawa, Canada. Details will be given at a later date. Some aspects of the review process are further explained in this RFP.

The ISO WorldSID Task Group kindly invites you to submit your proposal(s) for the complete work or part(s) of the work specified in this RFP. During the evaluation process, the ISO WorldSID Task Group reserves the right to make combinations of parts of the different proposals to obtain the best design team and development plan, and ultimately the best WorldSID-α. Final agreement between the ISO WorldSID Task Group and the selected WorldSID Design Team will be negotiated immediately following the review (expected in the period March 15-31, 1999).

Although the ISO WorldSID Task Group has tried to be as complete as possible in this RFP, please don't hesitate to contact me in case you have further questions. Good luck with preparing your proposal(s).

Marc Beusenberg
WorldSID program manager

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1. SCOPE OF THE WORLDSID DEVELOPMENT PROGRAMME

1.1 INTRODUCTION

With globalisation of automotive and restraint industry and regulatory processes, harmonisation has now become more important than ever before. The development of a unified, worldwide acceptable, new side impact dummy – WorldSID – will be a major break-through in worldwide harmonisation of side impact occupant protection assessment. WorldSID will be developed with the intention to ultimately replace all existing adult side impact dummies, starting with replacing all existing 50th percentile adult side impact dummies and as such forming the basis for any other future adult sized side impact dummy.

The WorldSID development is initiated by the ISO working group on anthropomorphic test devices (ISO/TC22/SC12/WG5). The ISO WorldSID Task Group has been set-up to co-ordinate the development of the dummy. The ISO WorldSID Task Group includes representatives from three regional advisory groups: the Americas, Asia/Pacific and Europe advisory groups. Chairpersons from the three regional groups co-chair this Task Group.

1.2 OBJECTIVE OF THE WORLDSID DEVELOPMENT PROGRAMME

The objective of the WorldSID Development Programme is: **to develop the WorldSID: the new, worldwide acceptable, advanced technology, side impact anthropomorphic test device (crash dummy) for assessment of injury risk to car occupants in lateral collisions**.

1.3 OVERALL WORK PLAN FOR WORLDSID

The development of the WorldSID can be divided in several stages. Table 1-1 includes a short description and major deliverables of these stages. The start of the total programme is defined by the initiation of the ISO WorldSID Task Group (in 1997). The end of the total programme is defined by a verified production version WorldSID, including all specifications for consideration of WorldSID in regulations worldwide.

Table 1-1: Stages of the WorldSID Development Programme

DEVELOPMENT STAGE	DESCRIPTION	MAJOR DELIVERABLES[1]
I. Programme Initiation	Initiation of WorldSID development by ISO/TC22/SC12/WG5. Setting up structure within ISO. Securing funds for Stage II. WorldSID-α project manager assignment.	Start of dummy development
II. WorldSID-α Development	Development of the first prototype with specifications and "generic" math models. Will include evaluation of parts but not full biofidelity evaluation.	• Full WorldSID-α assembly • Comprehensive product specifications • User documentation • Simulation model databases
III. WorldSID-α Evaluations	Worldwide evaluations of the WorldSID-α. Will include thorough biofidelity, repeatability and reproducibility assessment.	• Worldwide evaluation database • Test data analyses • List of dummy improvements
IV. Production Version WorldSID Development	Incorporating improvements until production version WorldSID is achieved. In this stage rather major design changes could be incorporated.	Same as for WorldSID-α but upgraded to production version.
V. WorldSID Verification and Release	Throughout the upgrading of WorldSID-α to the production version, several evaluations will take place until the acceptable design is achieved and injury assessment risk functions are established. In this stage only fine-tuning is expected.	• World-wide evaluation database • Publications and release • Regulation-ready specs

Stage I has now been completed[2] and the beginning of Stage II is marked by the assignment of the project manager for the WorldSID-α development in December 1998.

The ISO WorldSID Task Group has been given the mandate by ISO and by the sponsors of Stage II (WorldSID-α Development) to co-ordinate the WorldSID development. Two aspects play an important role in this mandate:

1. The ISO WorldSID Task Group has the responsibility of guarding the pre-competitive nature of the dummy development, within practical limits. So far, this has resulted in two decisions taken by the Task Group:
   - Assignment of an independent project manager.
   - The open solicitation for proposals for development of the first prototype dummy, WorldSID-α, for which the current RFP is written.

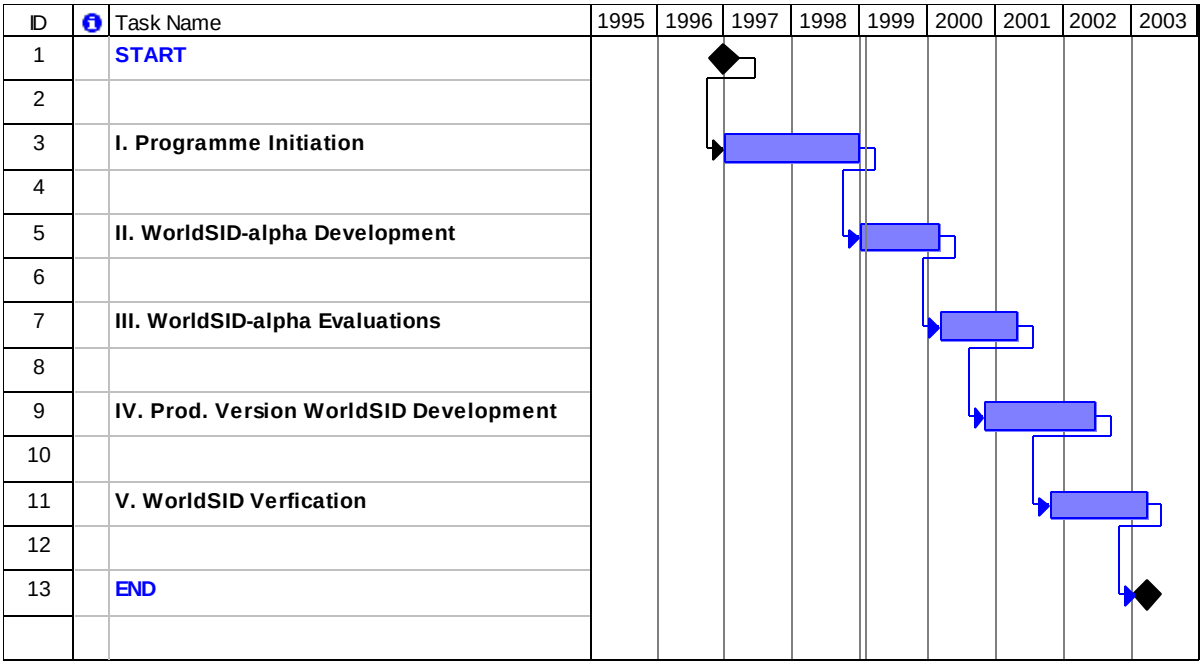
[1] Note that Table 1-1 does not include all deliverables but only summarises the major deliverables of each stage to explain the complete WorldSID Development Programme.

[2] Whereas funds or contributions for Stage II have been verbally committed, further details are addressed at the time of writing this RFP. Each region contributes an approximately equal share in the development of WorldSID-α.

2. The ISO WorldSID Task Group has the intention of liasing with as many organisations as practically possible to achieve a worldwide consensus on the dummy specifications and other aspects of the dummy development.

Figure 1-1 shows a preliminary time schedule of the WorldSID Development Programme.

Figure 1-1: Preliminary Time Schedule for the WorldSID Development Programme



The remainder of this RFP will detail the requirements for proposals for "WorldSID-α Design and Build". Chapters 2, 3, and 4 provide detailed information on the WorldSID-α development and the requested information to be included in the proposal(s). Chapter 5 provides a brief summary of the proposal requirements. Chapter 6 provides some additional information and proposal options. Please read this complete document before preparing your proposal.

2. "WORLDSID-α DESIGN AND BUILD": TECHNICAL CONTENT

2.1 GENERAL OBJECTIVE

The overall objective of the WorldSID-α development is:

To develop (design and manufacture) the first prototype WorldSID – a mid-sized adult male side impact dummy that has the potential to replace existing 50th percentile adult male side impact dummies, and of which its design can be used as the basis for any future adult side impact dummies for regulatory and research use.

This RFP invites organisations to submit proposals for the design and build of (parts of) the WorldSID-α. As the ISO WorldSID Task Group reserves the right to combine proposals to obtain the best Design Team, the best overall proposal and ultimately the best WorldSID-α, the proposals should follow a specific format as explained in this RFP.

2.2 DELIVERABLES

The final deliverables of the WorldSID-α development are:

1. One fully functional WorldSID-α assembly, including all instrumentation and wiring.
2. A draft WorldSID-α operations manual, which includes details of assembly, disassembly, calibration, wiring, instrumentation, data processing, conditioning and storage.
3. Product specifications of WorldSID-α, i.e. a complete drawing package, material specification and specification of manufacturing tools (moulds, etc. including their drawings).
4. The final version of the design brief, i.e. the written document containing all design specifications and rationales for the design.
5. One Finite Element model of the complete WorldSID-α in such a detail that it can easily be translated into various FE crash simulation packages (LS-Dyna, Pamcrash, Dytran, Radioss) and validated at material and component level. Output parameters of the model should at least be compatible with the instrumentation package of the dummy.
6. One Multi-Body model of the complete WorldSID-α in such a detail that it can easily be translated into various Multi-Body simulation packages (Madymo, etc.) and validated at material and component level. Output parameters of the model should at least be compatible with the instrumentation package of the dummy.
7. A summary report of the development of WorldSID-α.
8. All design and build specifications of non-standard test set-ups used to evaluate the WorldSID-α to prove its feasibility to comply with the design and response specifications, at the minimum at component level.
9. A demonstration workshop once full assembly of the WorldSID-α is ready.

2.3 GENERAL PROPOSAL FORMAT

The ISO WorldSID Task Group requires concepts for (parts of) the WorldSID-α in response to this RFP. These concepts should be supported by means of graphic presentations (the ISO Task Group does not expect detailed CAD drawings being part of the proposal). After submission of a

written proposal but before selection of the concepts is made, you will be given the opportunity to present your proposal to the Task Group.

Proposals in response to this RFP can address the complete dummy, however, they should include sufficient detail such that the design and build of major body parts can be identified separately. The ISO WorldSID Task Group intends to evaluate the proposals on a component (body part) base, and select the best combination of proposals. The major dummy components are: head, neck, arms, shoulders, thorax, abdomen, pelvis, lumbar spine and lower extremities (following the dummy specifications included in Appendix A). Clothing should be treated as an element of these dummy components and partners of the design team will be required to co-operate in case clothing concerns more than one component. The same applies to instrumentation that is shared by components (e.g. interfaces), repetitive use of instrumentation or aspects of wiring.

2.4 WORLDSID-α (DUMMY AND MODEL) SPECIFICATIONS

Successful proposals to the RFP will incorporate the design and response specifications as established by the ISO WorldSID Task Group and presented in Appendix A. The following notes should be taken into account:

- The ISO WorldSID Task Group does not expect full verification of the proposed concepts for (parts of) WorldSID-α to meet all design and response requirements at submission of the proposal(s). The proposals should, however, address the feasibility of meeting the design and response requirements included in Appendix A.
- Proposals should include the interfaces between the different body parts, either as separate parts or as elements of dummy components. This is especially important if instrumentation is considered the interface between body parts.
- Proposals for instrumentation can be submitted separately, however, these proposals also have to show technical feasibility, i.e. demonstrate the applicability in dummy components. The ISO WorldSID Task Group, however, prefers proposals that treat the instrumentation as an integral part of the dummy components.
- The design and response specifications included in Appendix A should not be considered the final set of dummy (and model) specifications. The Design Team will, however, at some point freeze the specifications for design with approval from the ISO WorldSID Task Group (see also section 6.3). These "frozen" specifications will be filed for future reference. No dramatic changes to the set of specifications presented in Appendix A are anticipated but rather some additions, especially concerning biofidelity.
- As the mathematical modelling efforts are primarily included to support the dummy hardware development, the ISO WorldSID Task Group does not expect proposals that address the development of the mathematical models only.

3. TIME SCHEDULE FOR "WORLDSID-α DESIGN AND BUILD"

Table 3-1 provides a list of major milestones for the WorldSID-α development.

Table 3-1: Major Milestones for WorldSID-α Development

DATE	MILESTONE
December 1998	Assignment of WorldSID-α Project Manager.
January 29, 1999	Request for Proposals out.
February 25, 1999	Proposals should be submitted before noon (12:00 p.m. EST).
February 26, 1999	Assignment of regional representatives for review of the proposals.
March 5, 1999	Project Manager report to regional chairs and co-ordination meeting for the review of proposals.
March 8-10, 1999	Presentation of proposals to the ISO WorldSID Task Group.
March 11-31, 1998	Review of proposals and negotiations with potential design team members.
April 1, 1999	WorldSID-α Design Team operational.
April 1999	Update of the design baseline to a comprehensive design brief and delivery of a draft total concept of WorldSID-α (based on the concepts included in the proposals).
June 1999	Approval of WorldSID-α concept and freeze of design and performance specifications. Note: while the ISO WorldSID Task Group may decide to continue updating the design and response specifications, the Design Team has to work with frozen specifications in order to meet the time targets. It is expected that further updates of the design and response specifications after June 1999 will only be incorporated into the design in consecutive stages of the WorldSID Development Programme (see section 1.3).
January 3, 2000	Delivery of the WorldSID-α assembly.
February 2000	Delivery of product documentations (drawing package, material specification, user's manual, calibration specifications, calibration set-up specifications) and mathematical models.
March 20-31, 2000	Demonstration workshop (2-3 days minimum).
March 31, 2000	Delivery of summary report and project end.

Proposals should include a Gantt chart for the development of every major dummy component and should include sufficient detail to identify the deliverables as specified in section 2.2. Furthermore, the milestones listed above should be incorporated into the Gantt chart.

4. ORGANISATION AND COMMUNICATIONS

4.1 CONTRACTING

The selected partners for the design team will be contracted by Biokinetics and Associates Ltd.

4.2 SUBCONTRACTING

Any subcontracting should be clearly identified and has to be provided with the same level of detail as the basic proposal.

4.3 THE WORLDSID DESIGN TEAM

Upon selection of the proposals and agreement with the organisations submitting the proposals, a WorldSID Design Team will be established. This team will consist of only one person per organisation[3] who will also act as contact for all project related matters. The proposal should also specify a standby in case the prime contact cannot be contacted. The Design Team will be headed by the WorldSID programme manager and at project meetings he may be assisted by another staff member of Biokinetics.

On occasion, the WorldSID Design Team meetings may require attendance of other staff of the partners or their subcontractors, however, these will be invited on an as need basis only. A kick-off meeting will be scheduled that requires attendance of all staff involved, including the subcontractors.

Proposals should include the following detail as far as the design team is concerned:
- brief description of the company,
- brief resume and contact details of the prime contact person and his/her standby,
- listing of all other staff involved in this project with their position and qualifications.

4.4 CONFIDENTIALITY AND PROPRIETARY INFORMATION

Whereas the WorldSID Design Team will share project information, some technical information may be restricted to one specific partner and the programme manager, before release to the ISO WorldSID Task Group. This information should be clearly marked "proprietary" and will only be released to the ISO WorldSID Task Group with approval from both the partner and the programme manager. Upon release to the ISO WorldSID Task Group (for review and approval), information will also be made available to the other partners of the Design Team to benefit from feedback from the expertise at the other partners. Information on any aspect of the project will only be released to the ISO WorldSID Task Group through the programme manager. All

[3] In case a consortium of organisations submits a proposal, it can assign a maximum of one contact person per major dummy component. Upon selection of the proposal, this contact will represent the consortium for the development of that specific dummy part. One contact person may also represent the consortium for more than one body part if more than one body part is selected.

information should be provided with an identification of the source, date and confidentiality status.

At no time, information on the WorldSID-α development will be released or distributed without approval from the programme manager and the ISO WorldSID Task Group, except for information that is already in public domain at that particular time.

4.5 DATA/INFORMATION EXCHANGE

Written information should be made available in MS Office 97 applications (this includes the proposal). As some upgrades of some of the MS Office 97 applications have recently been released, the final decision on the versions of these applications will be made once the design team is established.

Exchange of CAD data will most likely follow the ISO Standard 10303, which specifies the STEP (Standard for the Exchange of Product Model Data) protocol for data exchange of 3D solid models. Exchange of 2D engineering drawings will likely be done using the DXF/DWG format. Both data exchange protocols will be verified with the design team.

4.6 CENTRAL FILE

The programme manager Biokinetics and Associates Ltd. will maintain a central file that will include the most recent project information. Only information contained in this central file will be used to reference the status of work. Partners of the design team are expected to provide the programme manager with regular technical and project management data to keep the central file current. The programme manager will be the only party having access to all parts of the central file. Release of any part of the central file for review and approval by the ISO WorldSID Task Group or other partners of the Design Team, requires approval from both the providing partner and the programme manager. Release of any part of the central file to public domain requires approval from the ISO WorldSID Task Group.

4.7 PROJECT MEETINGS

Project meetings (face-to-face) will be held approximately every month for the complete duration of the project. In addition, the contact person from every partner is expected to be present at the ISO WorldSID Task Group meetings (approximately every 3 months). The programme manager reserves the right to call for a project meeting at any time but will do this only if specific needs arise.

4.8 PROJECT TASK LIST

The programme manager will maintain a task list for the Design Team throughout the project that will specify what immediate tasks need to be done, who is responsible for the tasks and when the task should be completed. This task list will be available to the ISO WorldSID Task Group at any time upon their specific request.

4.9 PROGRESS STATEMENTS

Each partner is required to submit a written monthly progress statement to the programme manager. Minimum requirements for these progress statements are:

- statements describing the technical progress in the period concerned,
- project management issues that require attention or deviate from the original plan, especially those requiring assistance from the project manager or the ISO WorldSID Task Group,
- financial progress as percentage of the contract total.

Progress statements are due within one week after month end.

4.10 GANTT CHART(S)

Proposal(s) should include a Gantt chart with a logical listing of the tasks, time schedule of the tasks and dependencies between the tasks. The preferred format for the Gantt Chart is MS Project 98. The Gantt Chart does not have to include a large detail but should identify the major tasks and logic sequence of the tasks.

4.11 RIGHTS AND PATENTS

No partner can claim intellectual property rights or patent to any design or development that is generated within this project and approved for release in public domain. Proposals should clearly identify any claimed intellectual property right or patent on parts developed prior to commencement of this project that are included in the concept(s). Upon acceptance of the proposal, all rights or patents on parts used in the WorldSID-α development must be waived.

5. PROPOSAL REQUIREMENTS

This chapter provides a summary of proposal requirements, but please read the complete RFP to make sure you have covered all details.

5.1 GENERAL REQUIREMENTS

Efforts and costs to prepare the proposal and finishing the negotiations before April 1, 1999 can be specified in the proposal, but should not be hidden in the costs for design and manufacturing the WorldSID-α (parts)[4]. The same applies to efforts and costs associated with the demonstration workshop.

The proposal(s) should address the different dummy components separately and the deliverables as specified in section 2.2 should be presented per component.

You will be given the option to present the proposal(s) to the ISO WorldSID Task Group and the programme manager in the period March 8-10, 1999.

5.2 TECHNICAL CONTENTS

Per dummy component, (a) concept(s) should be included in the proposal and the feasibility of this (these) concept(s) according to the specification included in Appendix A should be explained. Proof of flexibility of the concept(s) to accommodate viable changes (e.g. due to additional biofidelity response targets) will be considered an asset to the proposal(s). The level of detail of the proposed concept(s) is at your discretion.

5.3 PLANNING DETAILS

The proposal should include a Gantt chart detailing the major tasks, timing (and duration) of tasks and milestones and dependencies between the tasks and milestones. The Gantt chart should identify the development of each component separately as well as expected dependencies on other component developments.

5.4 FINANCIAL AND RESOURCE DETAILS

Contracts will be set up on a fixed price basis for all deliverables according to section 2.2. Options to the proposal(s) (see also chapter 6) should be identified clearly and quoted separately.

All amounts specified in the proposal should be in $US. Contracts will be set up in US currency only.

[4] Costs for preparing the proposals and finishing the negotiations will be reimbursed only for the selected proposals.

All proposals have to provide the following financial and resource details:

- Proposal preparations, contract preparations and project preparations up to and including March 31, 1999 should be specified as one amount per major component (body part).
- Design and build of the WorldSID-α, including all deliverables but excluding the demonstration workshop, should detail labour costs, manmonths of work involved (1 manmonth = 140 working hours) and disbursements for each major dummy component. In addition, a list of disbursements exceeding $ 2,000 should be provided, accompanied by a brief description of the items.
- Costs involved in the preparation and participation in the demonstration workshop can be specified as one total amount.
- Any other costs not mentioned above should be detailed.

5.5 ORGANISATIONAL DETAILS

Subcontracting has to be provided at the same level of detail as the basic proposal.

One organisation can only be represented by one contact person in the design team. An exception applies if a proposal is submitted by a consortium, in which case a maximum of one contact person per major component can take part in the design team. The contact person shall take care of all project aspects for the body parts he/she represents.

Proposal should include a brief description of the organisation, a brief resume of the contact person and his/her standby and a listing of all staff involved in this project with their function and qualifications.

Information exchanged between the partner and the project manager can be treated as confidential and proprietary up to release, with the approval of both parties, to the ISO WorldSID Task Group for its review.

Some data exchange protocols have been proposed in this RFP but need further confirmation with the selected partners. The same applies to data processing protocols (e.g. data filtering).

The design team will have monthly face-to-face meetings.

Progress statements should be provided to the programme manager every month and are due one week after month end.

5.6 SUBMISSION OF THE PROPOSAL(S)

Each proposal should be submitted as 5 bound hard copies and 1 electronic copy (3.5" disk, 100 Mb Zip disk or 1Gb or 2 Gb Jaz disk). The electronic copy should be in MS Office 97 applications or RTF. In addition, all proposals will be given the option to be presented to the ISO WorldSID Task Group. More information on presentation of the proposal will follow soon.

Please remember the final submission time for your proposal is noon (12:00 p.m. EST) Thursday February 25, 1999.

6. ADDITIONAL INFORMATION AND PROJECT OPTIONS

6.1 MORE THAN ONE PROTOTYPE?

Whereas the deliverables (see section 2.2) call for one (1) fully operational assembly of the WorldSID-α, the ISO WorldSID Task Group anticipates that multiple assemblies may be required in the evaluation period following this project. The ISO WorldSID Task Group welcomes proposals (including all technical, planning and financial details) that provide information on the delivery of more than one dummy (or dummy part) as an extended option to (not replacing) the basic proposal. Obviously, the same design and response requirements apply to the additional copies of WorldSID-α (parts) as apply to the first dummy (parts).

6.2 CONTRACT TERMS AND CONDITIONS

The legal issues (liability, applicable law, etc.) involved in establishing the contracts for "WorldSID-α Design and Build" are not detailed at this time. A proposal for this is in preparation and will be part of the final contract stage (late March 1999).

6.3 FINAL DUMMY SPECIFICATIONS?

The set of design and response specifications provided in this RFP should not be considered final, since the ISO WorldSID Task Group seeks as much support throughout the development of the WorldSID as practically possible. Whereas the selected Design Team will, with approval from the Task Group, at some point freeze the specifications for WorldSID-α, this team should also be flexible enough to incorporate some changes or additions to the dummy specifications in the earlier design stages. One of the first tasks of the Design Team will in fact be further definition and finalisation of the design specifications of WorldSID-α. In the mean time, concepts incorporating some flexibility as far as response characteristics are concerned are considered an asset to the proposal.

6.4 AFTER WORLDSID-α…

Organisations that submit a proposal should in principle be prepared to continue development and production after completion of the project. This should be supported by a letter of intent from the CEO of the organisation(s).

APPENDIX A : WORLDSID-α SPECIFICATIONS

This annex includes the updated design baseline for WorldSID-α, based on feedback from all three regions and incorporated by the WorldSID project manager. The document included in this annex will also be made available to all Task Group attendants.

WorldSID- ? Design and Build –Request for Proposals Mailing List

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DESIGN BASELINE WORLDSID-α
1 FEBRUARY 1999

AUTHORS: M.C. Beusenberg, M. van Ratingen, and S. Moss

STATUS: Reviewed by the Regional Advisory Groups

INTRODUCTION

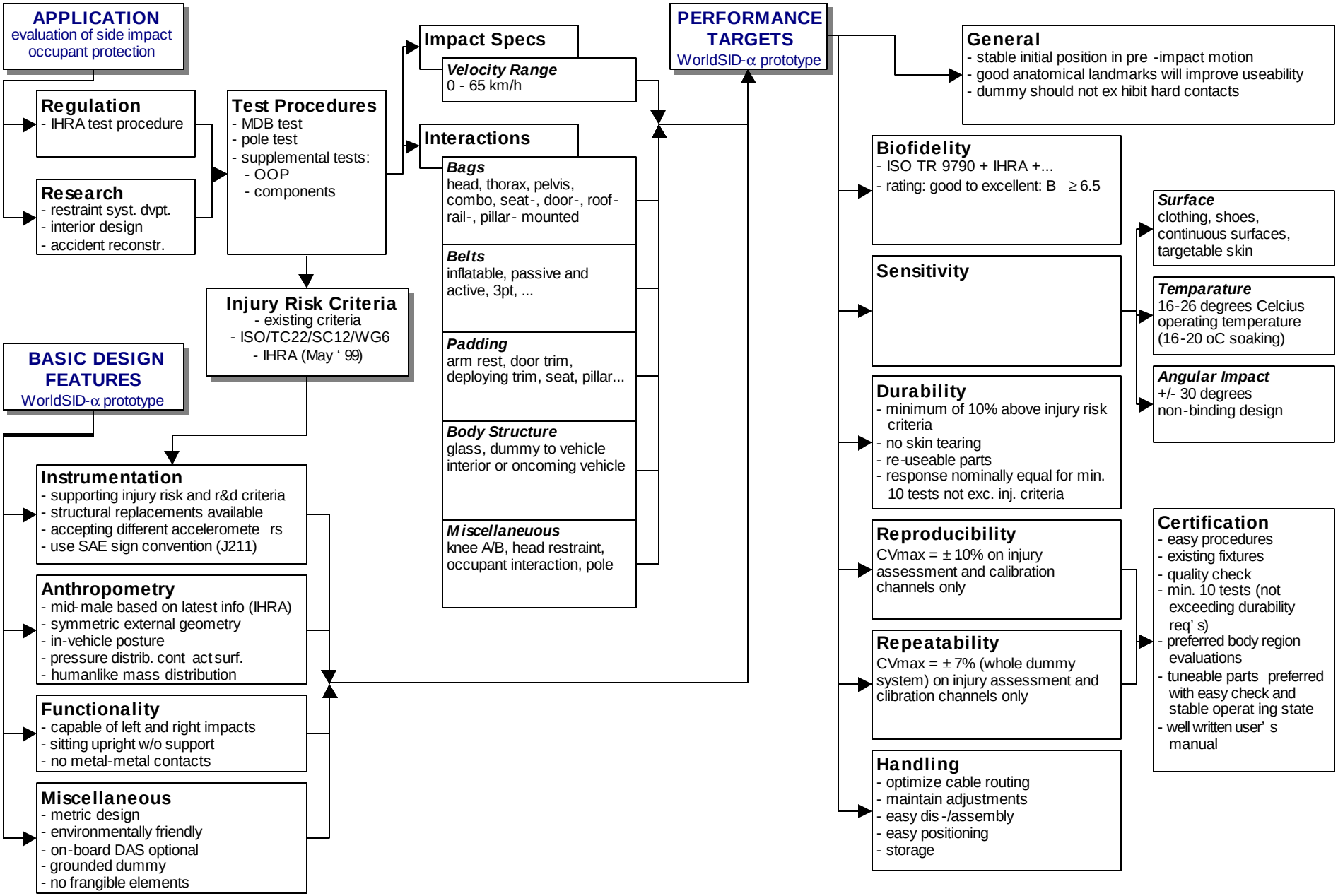
This document (TG-N49R) provides –in telegraphic style- the first set of design and performance specifications for the WorldSID-α as established at the start of its development. These specifications have been established by the programme manager Biokinetics with assistance from TNO and FTSS, and following instructions from the ISO Task Group. This document is based on available information from each of the regional advisory groups and the ISO Task Group and have been reviewed by each regional advisory group.

First included in this document are the general specifications of the WorldSID-α. This is followed by specifications for the body parts head, neck, arms, shoulders, thorax, abdomen, pelvis, lumbar spine and lower extremities. Finally, a short list of additional items is presented for parts or features of the WorldSID-α for which limited or no design specifications have been established yet.

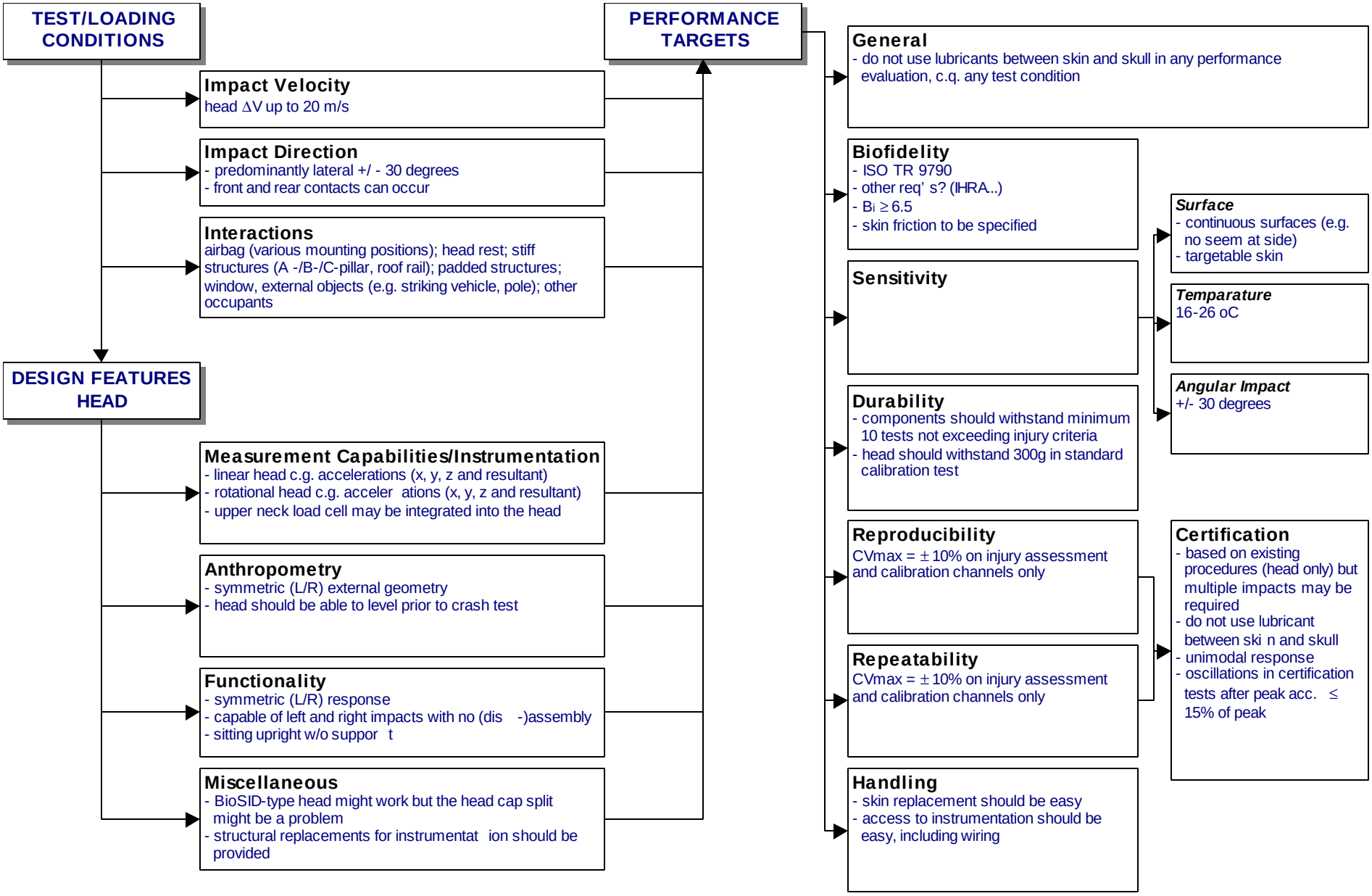
This document will be used by the WorldSID-α Design Team to establish the WorldSID-α design brief which will include furher detail on the design and response specifications for every body part as well as for the interfaces between the parts.

The relative ranking (ratings) of important of the specifications included in this document has not been included since at the time of writing this document, only the input from the Americas region was available. As relative ranking may be helpful during the design process, this issue will be persued and further details should be incorporated into the design brief.

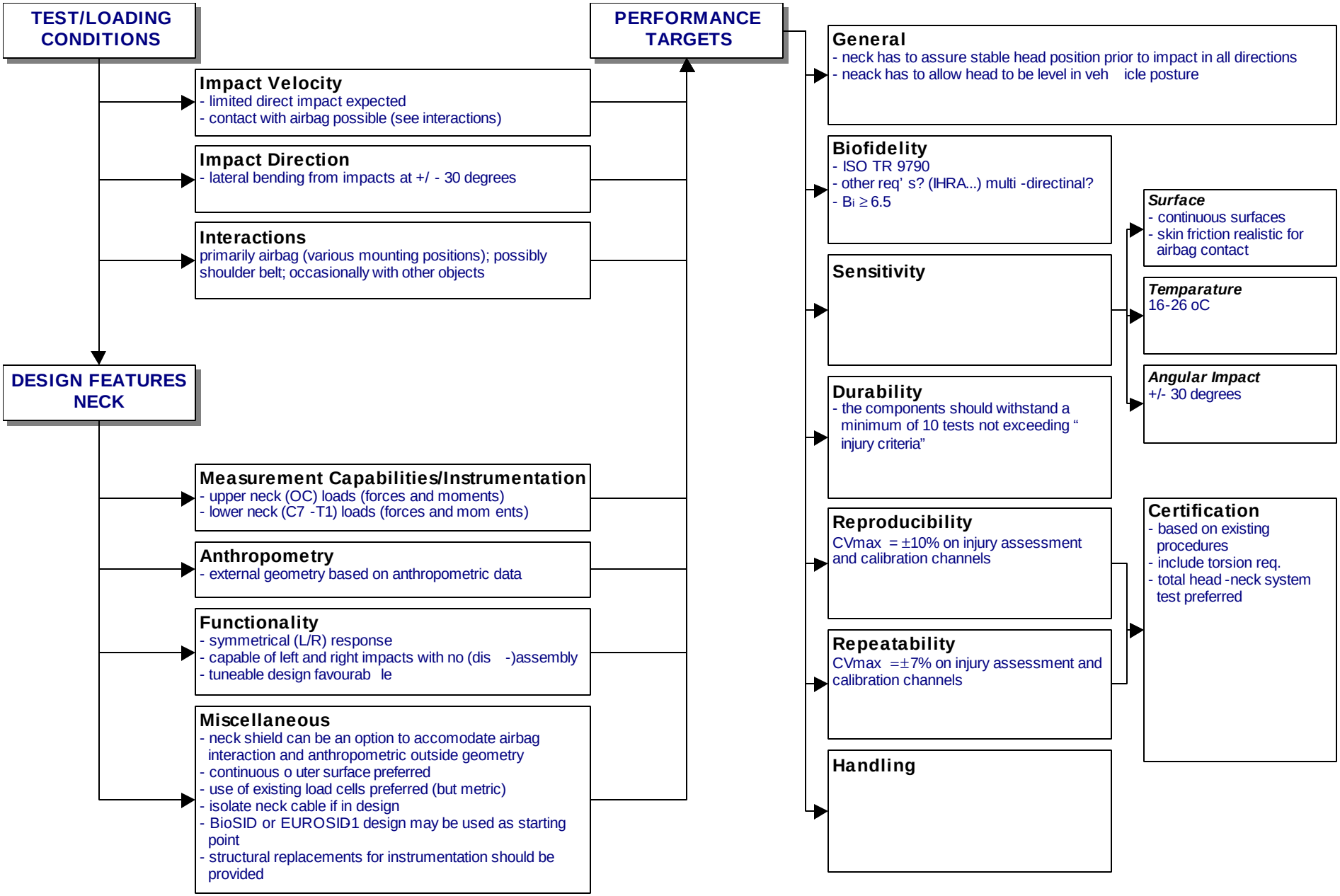
1. GENERAL SPECIFICATIONS – FULL DUMMY



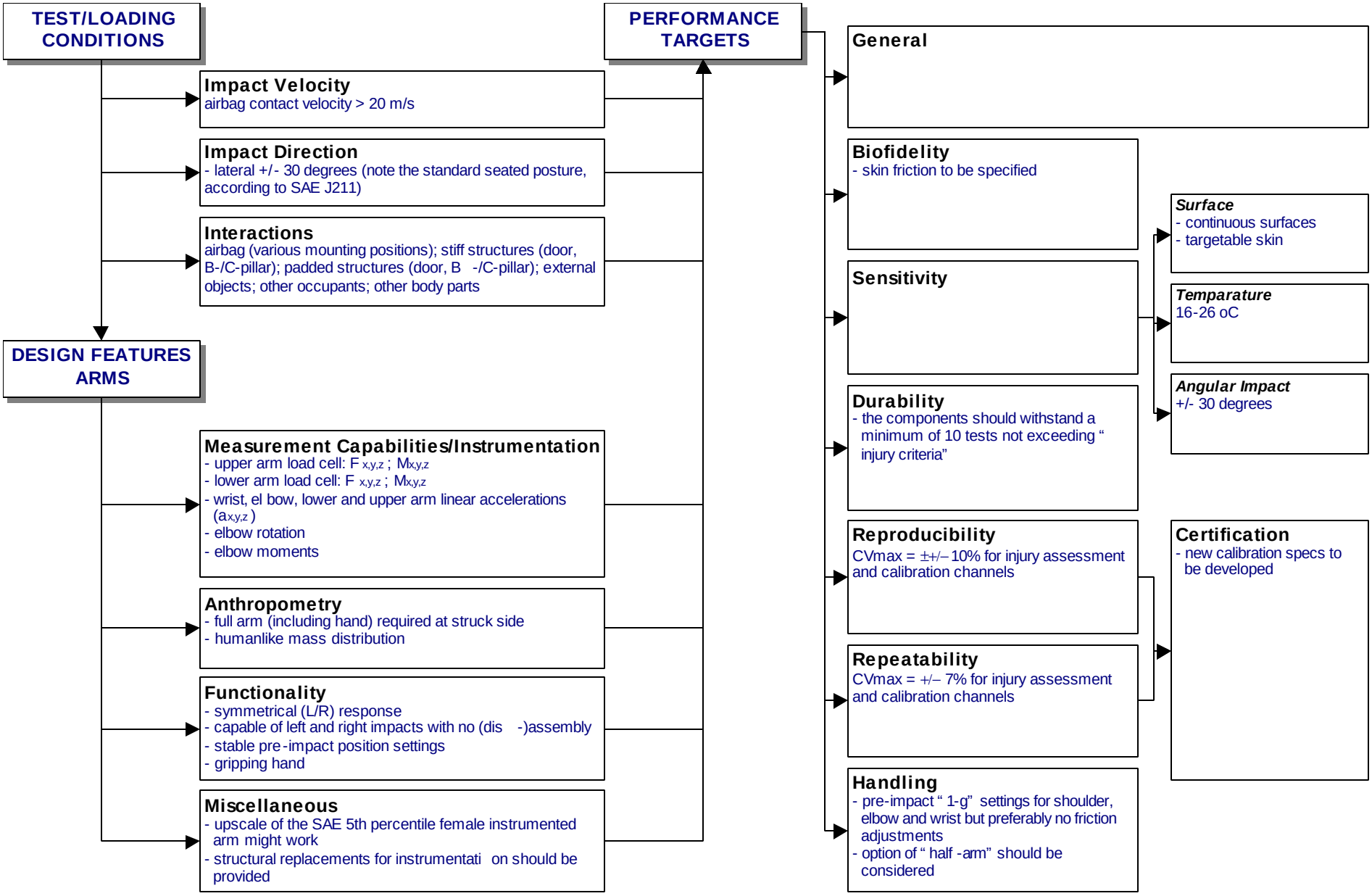
2. SPECIFICATIONS – HEAD



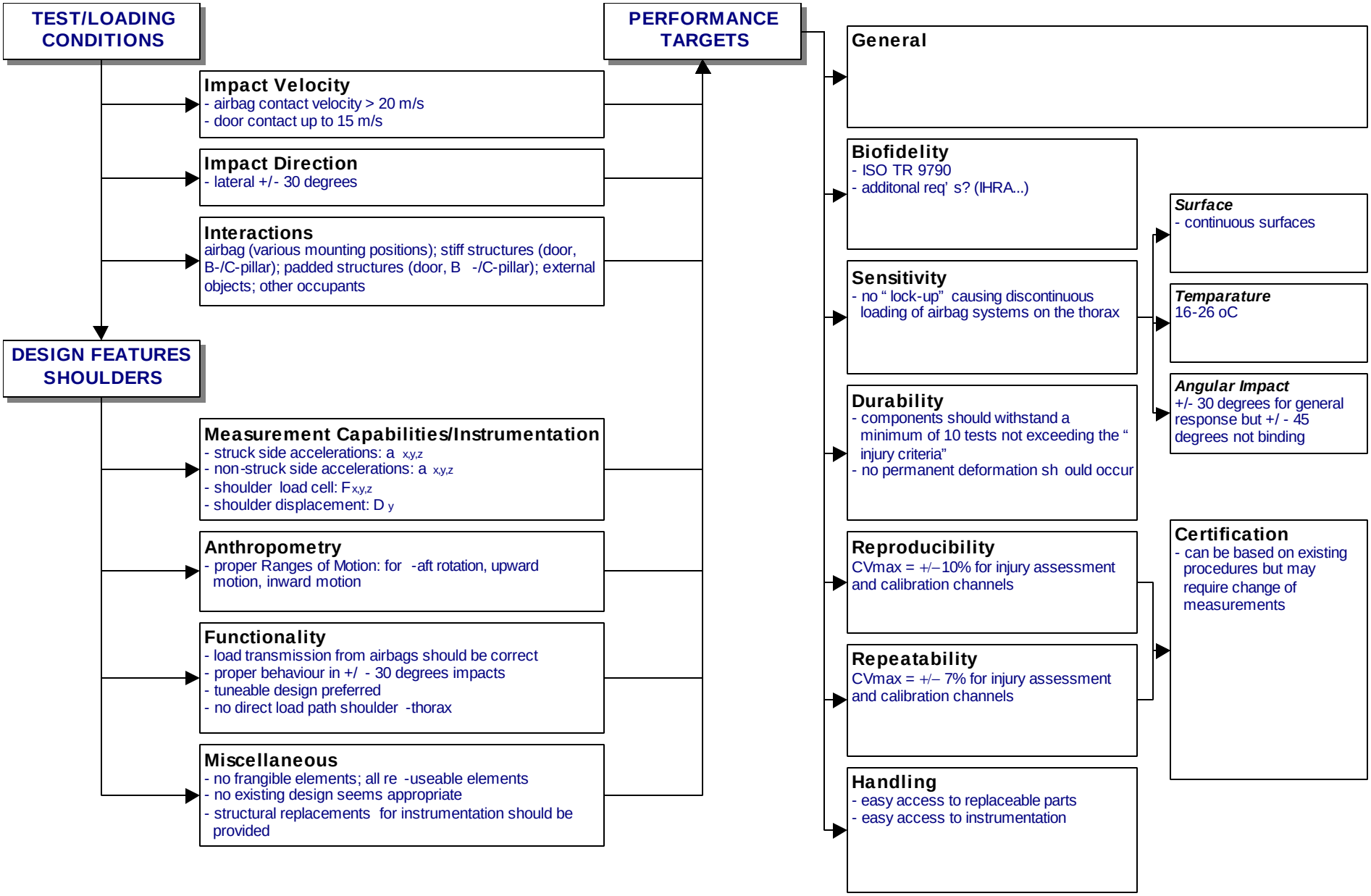
3. SPECIFICATIONS – NECK



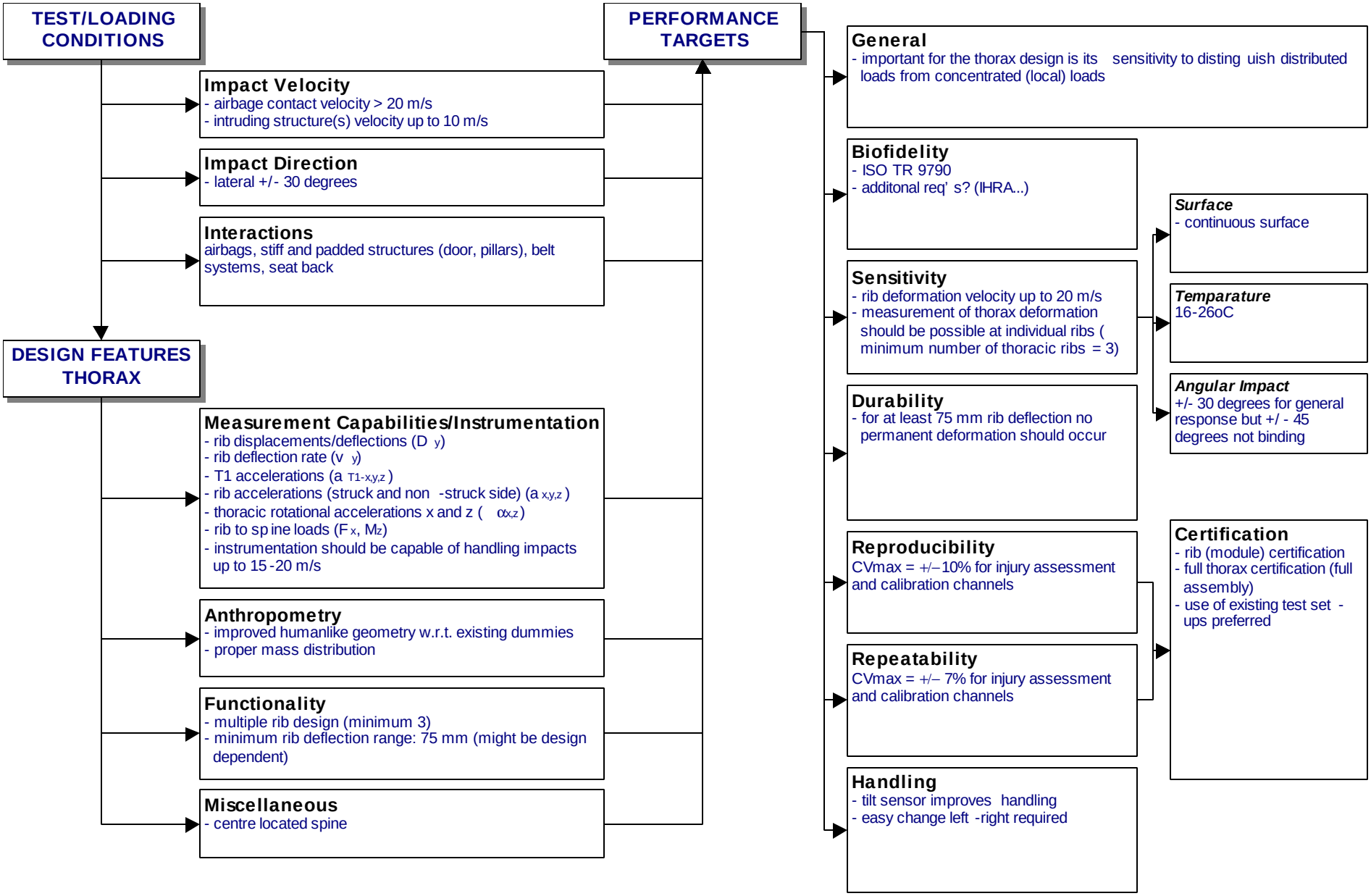
4. SPECIFICATIONS – ARMS



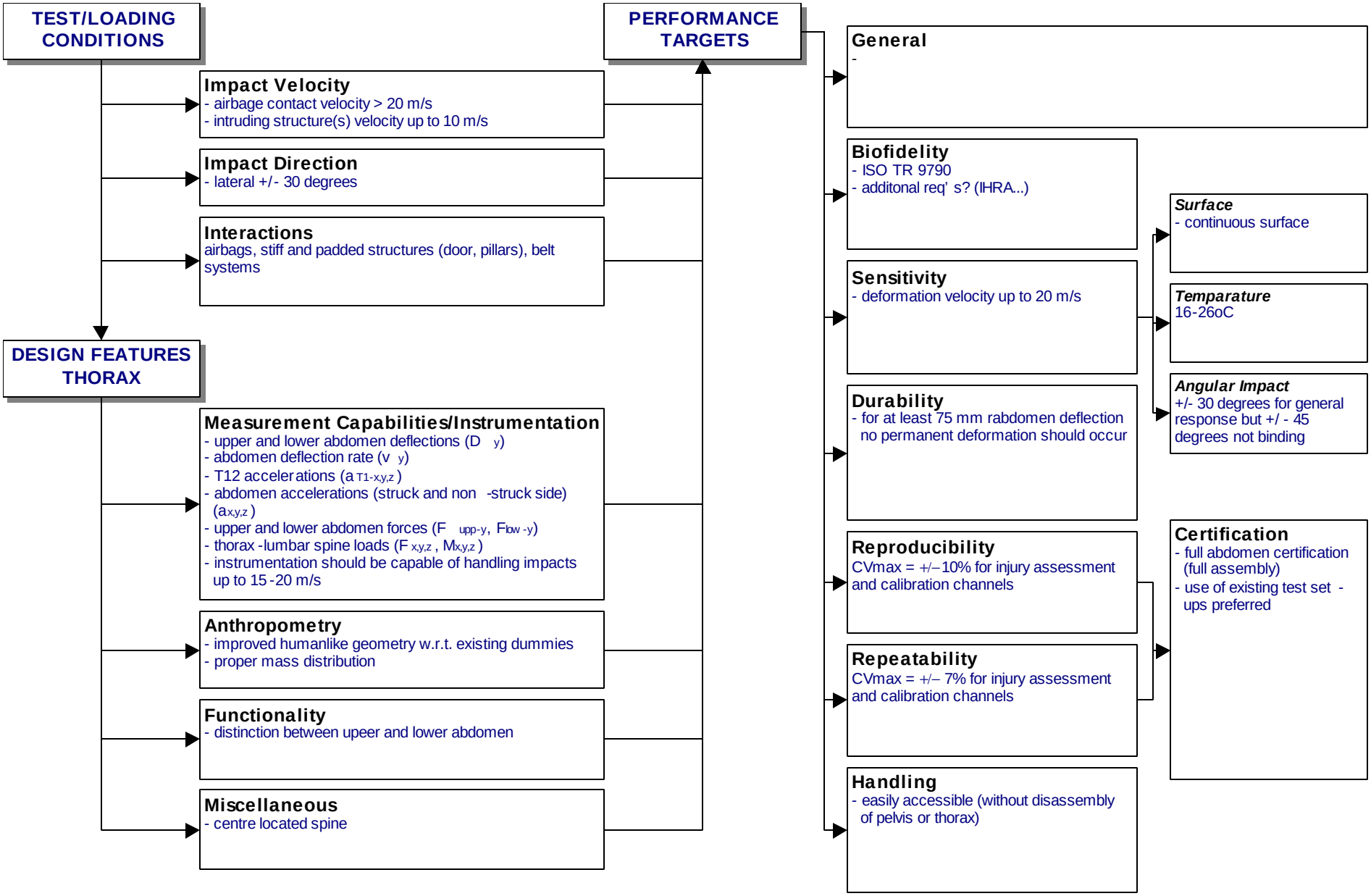
5. SPECIFICATIONS – SHOULDERS



6. SPECIFICATIONS – THORAX



7. SPECIFICATIONS – ABDOMEN



8. SPECIFICATIONS – PELVIS

TEST/LOADING CONDITIONS

Impact Velocity
- airbage contact velocity > 20 m/s (?)
- intruding structure(s) velocity up to 10 m/s

Impact Direction
- lateral +/- 30 degrees

Interactions
airbags, stiff and padded structures (door, pillars), belt systems

DESIGN FEATURES PELVIS

Measurement Capabilities/Instrumentation
- pubic symphysis load (F_y)
- pelvis accelerations (at pelvis c. of g.) ($a_{x,y,z}$)
- acetabulum load cell L & R (struck/non -struck) (F_y)
- iliac load cell L & R (struck/non -struck) (F_y)

Anthropometry
- humanlike mass distribution
- humanlike ranges of motion in hip joints

Functionality
- no hidden load paths

Miscellaneous
- no frangible elements/inserts
- pelvis plug (if required) should have better durability
- structural replacement s for instrumentation should be provided

PERFORMANCE TARGETS

General
specific attention should be paid to simulating the load transfers that occur within the pelvis, both lateral (from stru ck side through pubic/sacrum area to non-struck side, including the leg), as well as vertical (coupling with upper body through lumbar spine).

Biofidelity
- ISO TR 9790
- additonal req' s? (IHRA...)

Sensitivity
-

Surface
- continuous surface

Temparature
16-26 oC

Angular Impact
+/- 30 degrees

Durability
- components should withstand a minimum of 10 tests not exceeding " injury criteria"

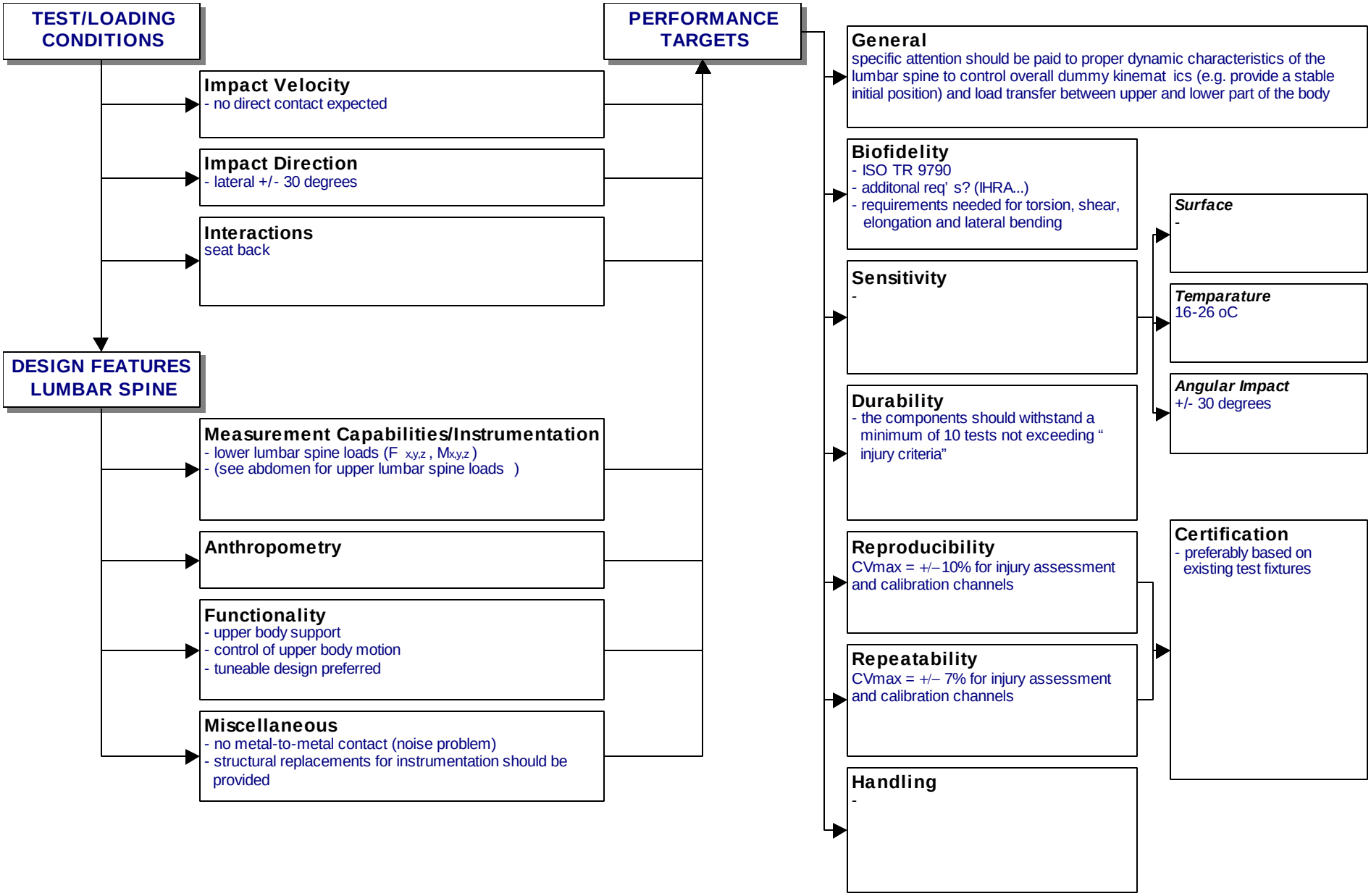
Reproducibility
CVmax = +/–10% for injury assessment and calibration channels

Repeatability
CVmax = +/– 7% for injury assessment and calibration channels

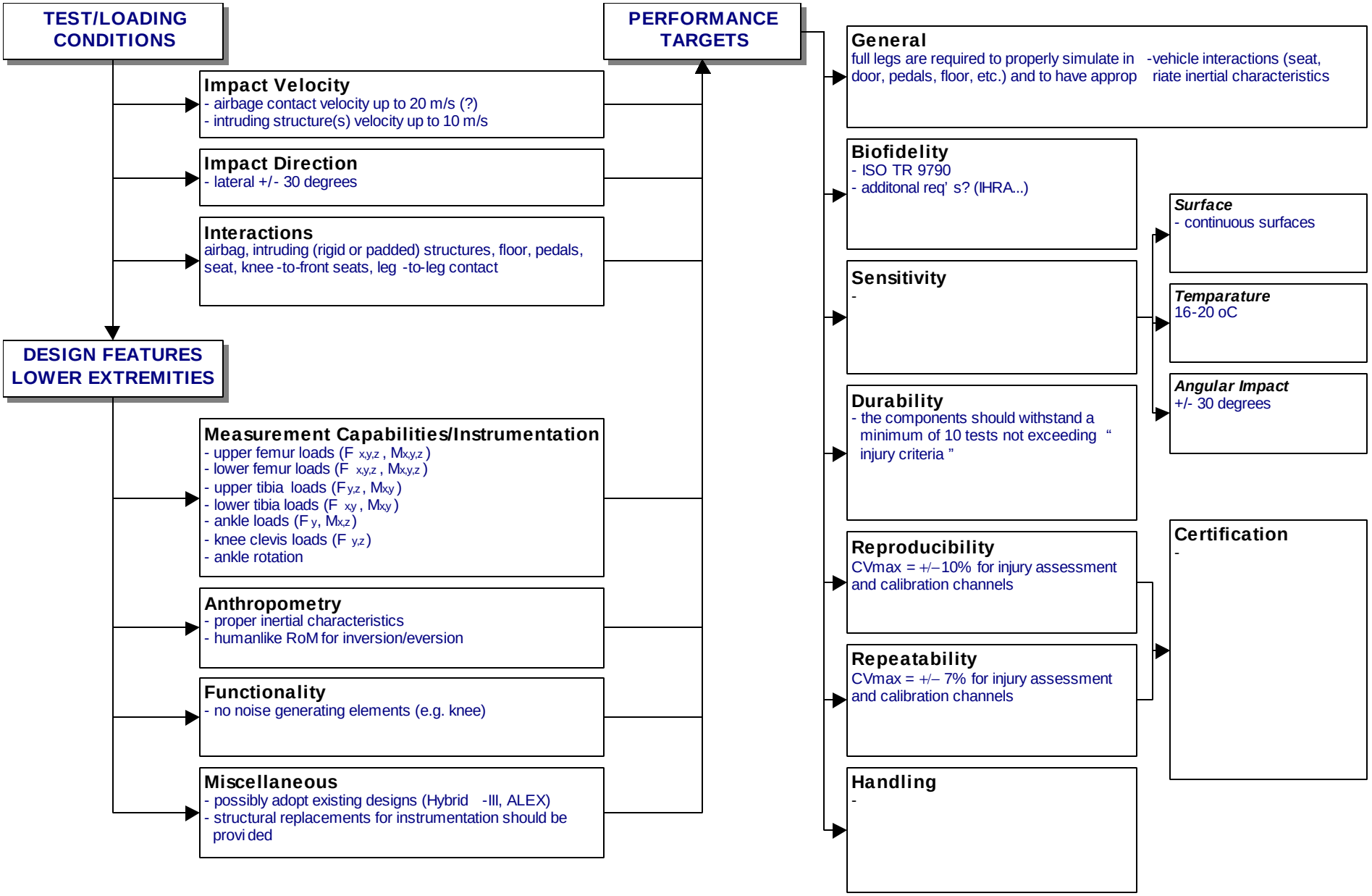
Certification
- preferably based on existing test fixtures and procedures

Handling
- easy access to instrumentation
- tilt sensor will enhance handling

9. SPECIFICATIONS - LUMBAR SPINE



10. SPECIFICATIONS – LOWER EXTREMITIES



SPECIFICATIONS – ADDITIONAL ITEMS

ADDITIONAL ITEMS

- **Anthropometry Database** : Uncertainty still exists over the anthropometry database(s) to use to specify the 50th percentile male subject. IHRA intends to review this issue but the IHRA timeframe may not be completely appropriate for the WorldSID-α design activities. Anthropometry specifications will include both geometry (internal and external) as well as inertia (mass and mass distribition/moments of inertia). The WorldSID-α Design Team will further address this issue.
- **Clothing**: Standardized clothing will be necessary to ensure appropriate interaction with the seat (primarily). Whereas skin characteristics have been mentioned (but not quantified yet) for various body parts, this seems insufficient to ensure appropriate dummy-to-seat interacion. An alternative approach could be to specify (quantify) dummy-to-seat interaction and design a tight fitting jacket for the dummy, i.e. make the skin characterization redundant for some body parts. The WorldSID-α Design Team will further address this issue.
- **In-Dummy Data Acquisition System** : The inclusion of an in-dummy data acquisition system (DAS) will have a great effect on the design of the WorldSID-α. Considering the level of effort and cost required to incorporate an in-dummy data acquisition system and the possible effort and cost required to enhance the capabilities of existing in-dummy data acquisition systems, in seems unlikely at this time that this specification will be met completely. An alternative approach is used here: the RFP requests for design concepts for the WorldSID-α that allow future incorporation of an in-dummy data acquisition system.
- **Reference to SAE J826 H-Point Manikin** : Existing side impact dummies do not have their H-point in the same location as the SAE J826 H-point manikin. The origin of these differences is unclear and the H-point position needs to be clarified based on the anthropometry data. The WorldSID-α Design Team will further address this issue.