World Nuclear Association

CORDEL
Harmonization and Cooperation Efforts

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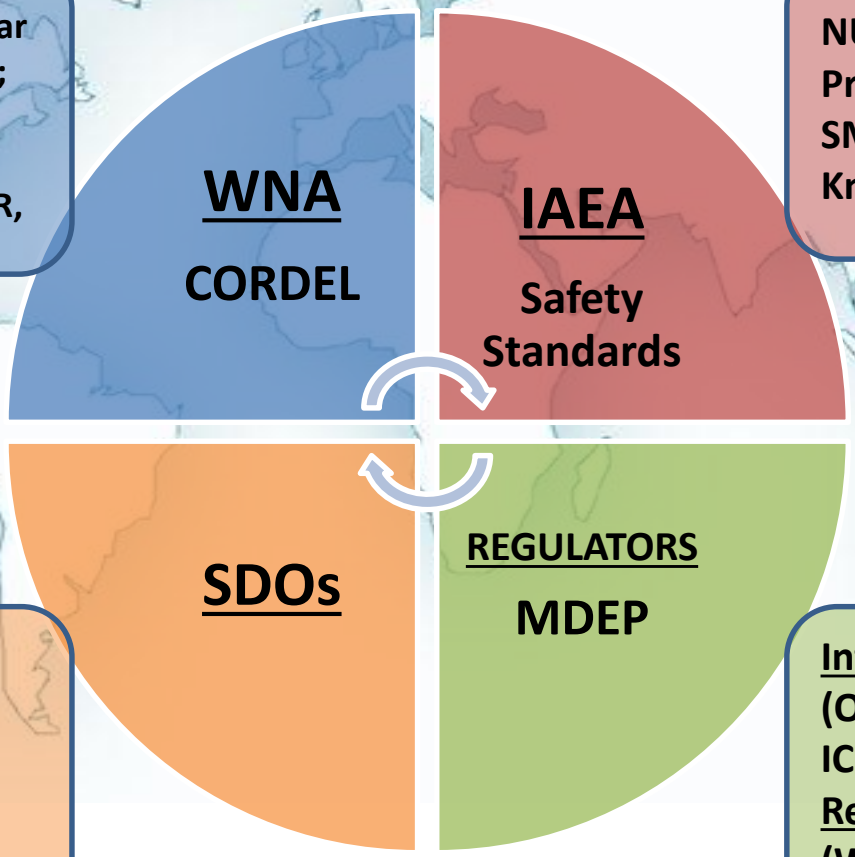
International Nuclear Safety Standardization

Industry

International
(WNA: Supply Chain, Nuclear Law, Capacity Optimization; WANO)
Regional
(EPRI, INPO, FORATOM, EUR, ENISS)

Government

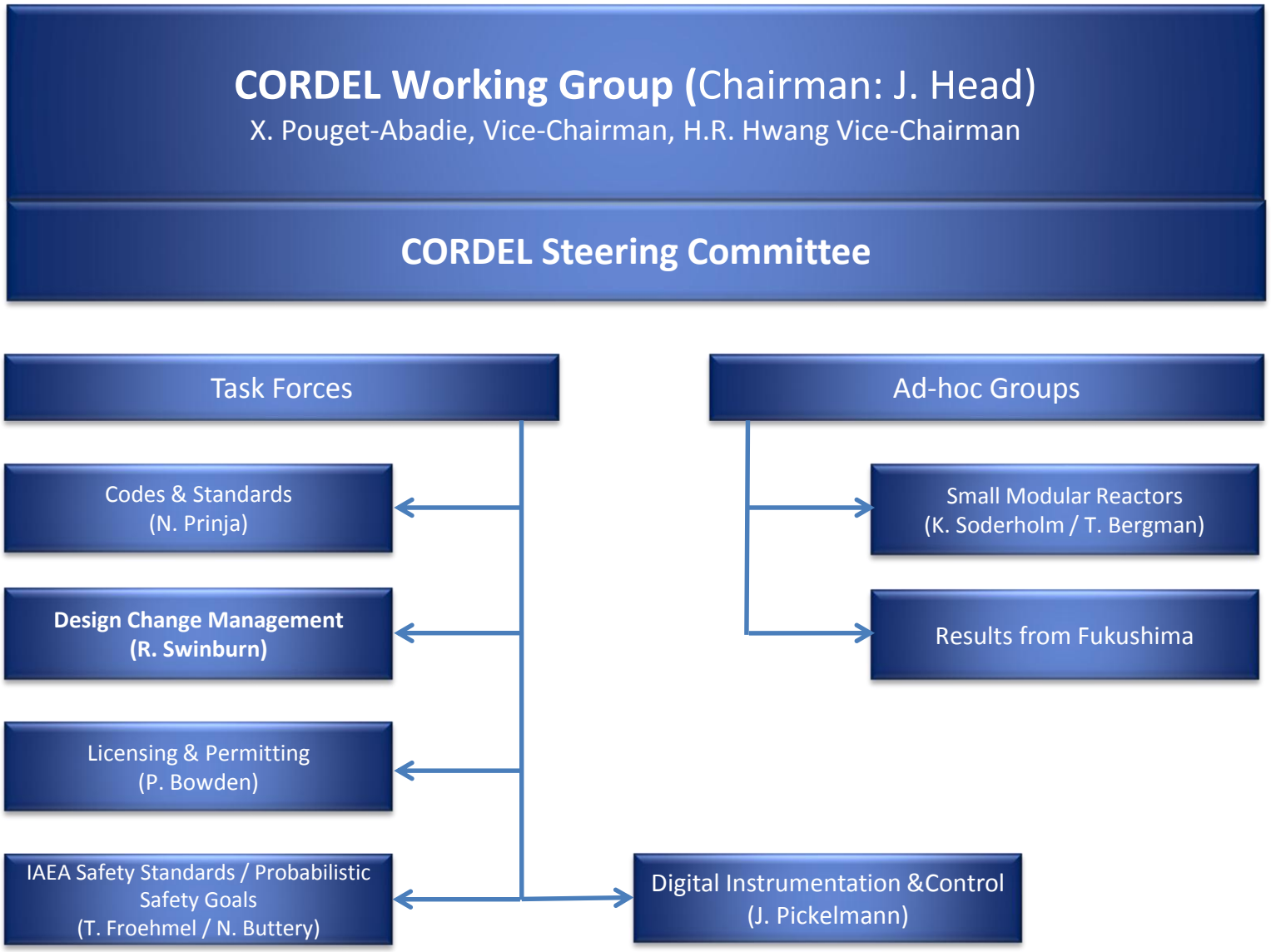
NUSSC
Probabilistic Safety Goals
SMRs
Knowledge Management



ASME, AFCEN, KEPIC, JSME, NIKIET, CSA, IEC, IEEE and ISO

International
(OECD/NEA, OECD/IEA, ICRP, IAEA, EC)
Regional
(WENRA, ENSREG)

Organisational Chart



WNA CORDEL CSTF – Pilot Projects

Requirements for NDT/E Personnel Qualification

Non-linear Analysis Codified Rules (Plastic Collapse, Plastic Instability, Buckling, Fatigue, Plastic Shakedown)

CSTF Actions

Selects topics based on surveys and input from: Industry (CORDEL), Regulators (MDEP) and SDOs and CORDEL WG.

Convenes Expert Group to review current international codes & standards and prepare draft report.

Drafts report (including Comparison and Analysis) circulated internally and externally to achieve consensus.

Requests with support of Regulators appropriate actions be taken by SDOs to converge Codes & Standards

Follow-up by CSTF o actions taken by the various standards and code organizations

CSTF Current Work

1) NDT/E Personnel Qualification
2) Non-Linear analysis Codified Rules
New topics currently being discussed

1) CORDEL CSTF NDE Expert Group
2) CORDEL CSTF Stress Allowable Expert Group

1) Final draft of being circulated, expect to published July 2014.
2)Final draft report being prepared, to be discussed Sept 2014.

Recommendations to SDOs on convergence actions in each report. See NDE report conclusions

AFSCEN Statement issued at 2014 MDEP Conference.

Industrial Practices and Code Requirements for Certification of NDE Personnel Qualification

The major barriers identified:

- Current code & regulatory Requirements
- Requirements for a third party vs. in house certification
- Employer's Responsibility
- Requirement for a Written Practice vs. Quality Procedure
- Industrial applications

NDE Recommendations (1)

It is the recommendation of the WNA CORDEL Codes & Standards Task FORCE that a harmonised international alternative to the certification of non-destructive examination personnel be included in all the nuclear mechanical codes. This includes but is not limited to the following nuclear codes: RCC-M, ASME Section III, JSME, CSA, KEPIC and PNEA.

This harmonised international alternative would require:

1. Personnel performing non-destructive examinations be qualified and certified in accordance to ISO/EN 9712:2012.

2. Employers establish a Written Practice for the control and administration of NDT personnel training, examination and certification.

3. The written Practice should be reviewed and approved by the employers NDT Level III or the a third party providing the certification.

NDE Recommendations (2)

The written practice should include:

- A description of each level of certification the certificate holder is certified to
- A description of the training, experience and examination that the person has undergone to reach the level of certification
- General responsibilities for the level of certification that the person is certified to
- Visual test results
- Industry sector and NDE method certified to
- Database with all job-specific training the certificate holder has undergone
- Authorisation to operate documentation
- All details of the application of ISO guide 21 shall be included in the Written Practice.

Non-linear Analysis Codified Rules - Scope

- Plastic Collapse / Plastic Instability
- Local failure: stress triaxiality rules
- Buckling: elastic plastic instability
- Fatigue and plastic shakedown
  - 3Sm / efficacity diagram / direct cyclic strain criteria including extrapolation rules
  - Ke, Kv or
- Other applications, like:
  - Stress classification
  - Elastic follow-up
  - LTA/cracked component/creep: not in the scope of this report

Objectives of the Non – Linear Report

Comparison of existing Codes

- Scope and content
- Non-linear analysis
- Stress classification
- Criteria / allowable stress or strain

Propose improvements for LWR Nuclear Codes

- Definitions
- Analytical methods
- Material properties
- Margins and criteria
- Develop precise step by step procedures

Non – Linear Report: Current Schedule

- Revision 7 was released to contributors / meeting participants on September 2013
  - It includes all the contribution and a 1st comparison table

- Revision 8 will include draft procedure for LWR design rules.
- The final Code Comparison report will be published the end of this year.
- Follow-up work on Benchmarks have yet to be defined (3D realistic nozzle with complex piping loads or other cases, etc).

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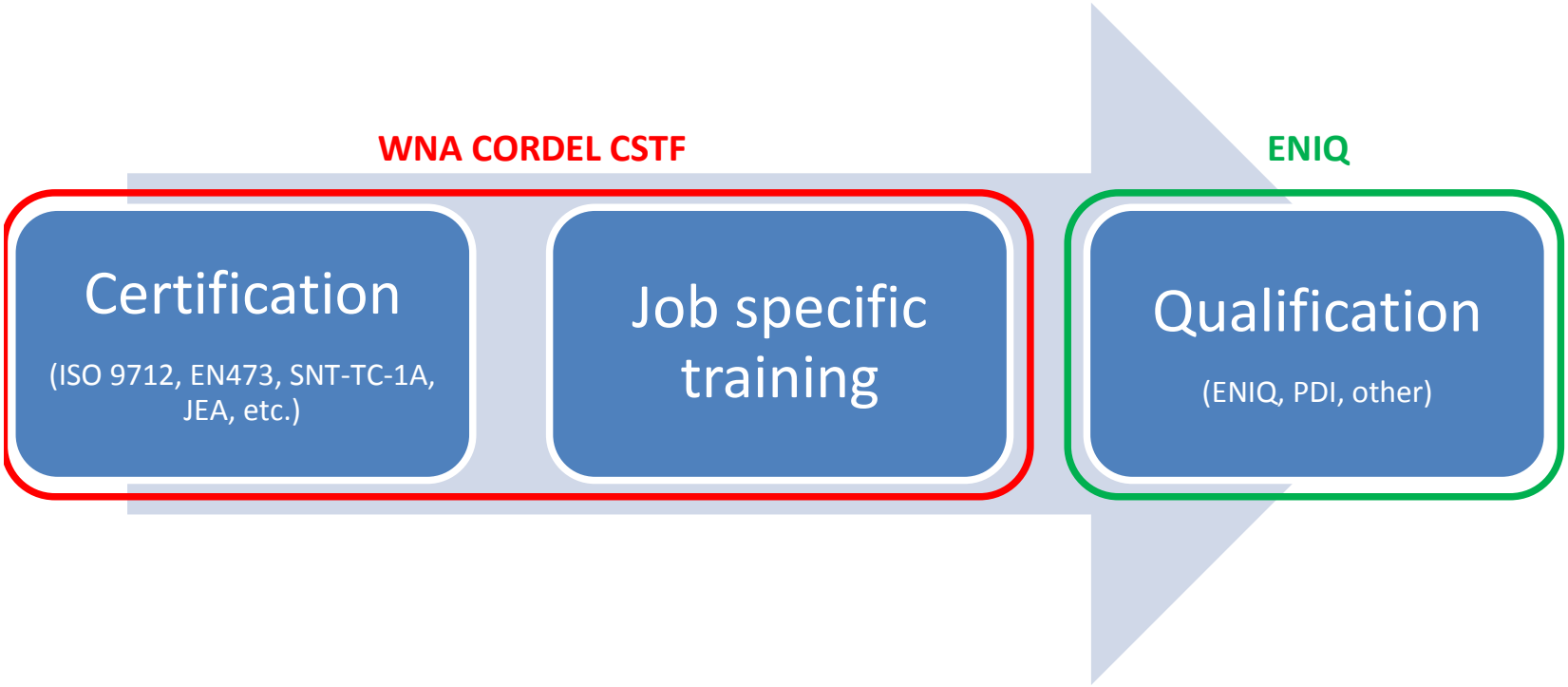
Non-Destructive Examination Personnel Qualification – Background Information

Background


WNA CORDEL CSTF
ENIQ
Certification
(ISO 9712, EN473, SNT-TC-1A, JEA, etc.)
Job specific training
Qualification
(ENIQ, PDI, other)

Current Codes and Referenced Standards (1)

ASME

Section III:

- Written Practice following SNT-TC-1A + added requirements

Section V:

2010 edition:

- Written practice following SNT-TC-1A
- Written practice following CP-189
- Written practice following SNT-TC-1A or CP-189 + third party such as ACCP can be used to fulfil examination requirements

2013 edition:

- Written practice following SNT-TC-1A
- Written practice following CP-189
- Written practice following SNT-TC-1A or CP-189 + third party such as ACCP & ISO/EN/912 can be used to fulfil the training, experience and examination requirements.

RCC-M

Section III:

2007 edition:

- Qualification and certification of personnel done according to NF EN 473
- Outside Europe, certification granted by an independent organization, certification can be done using an equivalent standard (require approval from contractor and to meet regulatory requirements)

2013 edition:

- Qualification and certification according to ISO EN 9712
- Outside Europe, certification granted by an independent organization, certification can be done using an equivalent standard (require approval from contractor and to meet regulatory requirements)

Current Codes and Referenced Standards (2)

JSME	• Qualification and Certification according to JIS Z 2305 (ISO 9712 MOD) • Equivalent qualification system that has a certain transparency in the qualification process. • Specific qualification rules other than JIS Z 2305 is not specified in JSME but we may interpret that SNT-TC-1A with ASME III will be acceptable for import equipment.
KEPIC	• Qualification and Certification according to a modified SNT-TC-1A
CSA	• Qualification and Certification according to SNT-TC-1A / CGSB
NIKIET	• Qualification and Certification according to PNAEG-7-010-89 or a similar document. PNAEG-7-010-89 provides only general requirements and should be used in conjunction with the mandatory requirements set by the regulator. • Certification can be achieved through an internal certification program or through an external organisation licensed by the Governmental Nuclear Regulatory body • A central certification body organises the certification requirements.

Current Codes and Referenced Standards (3)

1. Variability exist within a single code as well as between codes
2. Codes requirements have already converged to a certain extent
3. Requirements for a written practice
4. Requirement for a Second Party certification vs. Third Party certification

Third Party vs. Second Party Certification (1)

Requirements for the certification body (Third Party vs. Second Party) is one of the main significant roadblock in the convergence of certification requirements

Third Party Certification:

- Delivered by an nationally recognised organisation which is fully independent from the employer
- In Europe: Recognised Third Party Organisations (RTPO) must be certified according to ISO EN 17024:2003
- RTPO to be used can be defined by regulator or client

Advantages:

- Provides a consistency and transferability

Issues:

- Less control over training for certification. Provided by RTPO (which is audited by company)

Third Party vs. Second Party Certification (2)

In house certification:

- Company defined training program based on specific standards such as SNT-TC-1A or CP-106
- The details of the training program should be recorded in the written practice
- Very popular in North America

Advantage:

- Complete control over the training and certification of your personnel
- Very flexible and training can be tailored to personel and work they will do

Issues:

- No transferability
- Little consistency in between companies

Employer's Responsibility (1)

The employer retains all responsibilities for the overall quality of NDE operations, whether he uses in-company certification, third-party certification or a combination of both.

ISOEN9712:2012 section 5.5.2:

The employer is responsible for *"all that concerns the authorization to operate, i.e. providing job-specific training (if necessary); issuing the written authorisation to operate, the results of NDE operations; ensuring that the annual visual acuity requirements […] are met; verifying continuity in the application of the NDE method without significant interruption; ensuring that personnel hold valid certification relevant to their tasks within the organisation; maintaining appropriate records"*

Employer's Responsibility (2)

It is clearly stated in ISOEN9712:2012 that the certification "provides an attestation of general competence of the NDE operator. It does not represent and authorisation to operate, since this remains the responsibility of the employer, and the certified employee may require additional specialized knowledge of parameters such as equipment, NDE procedures, materials and products specific for the employer.

Where required by regulatory requirements and codes, the authorisation to operate shall be given in writing by the employer in accordance with a quality procedure that defines any employer-required job-specific training and examinations designed to verify the certificate holder's knowledge of relevant industry code(s), standard(s), NDE procedures, equipment, and acceptance criteria for the tested products"

Written Practice vs. Quality Procedure

Quality Procedure (ICNTD Recommendations)	Written Practice
• Applicable codes and standards • General responsibilities of level 1,2 and 3 • Certification requirements (sector, method, level) • Persons designated by the employer to be responsible for issuing the authorisation to operate • Control of in-house training and examination supplementary to that carried out during the ISO 9712 qualification and certification process. This will include job specific training for tasks outside the scope of the individual's certification and updating with respect to new equipment or techniques • Responsibility for maintenance of records. The employer must maintain records for each of his NDE personnel including: • Training • Education • Work experience • Vision test results • Certification examination results	a) Level of qualification b) Vision test requirements c) Training course content d) Required training time e) Experience time f) Administration and grading of examination g) Requirements for initial certification h) Requirements for recertification i) Revocation and suspension of certification j) Reinstatement of certification k) Limited certification

Industrial application (1)

Europe	Inside Europe: Requirement to use Third party such as COFREND, BINDT, etc. according to EN 473 and ISO 9712. Certification bodies such as BINDT's PCN have already introduced ISO EN 9712. Has to be a national body recognised by the national government. This leads to certification from the specific national body in order to be recognised by the regulator. For pressure equipment, non-destructive tests of permanent joints must be carried out by "suitably qualified personnel". For pressure equipment of categories III to IV, NDE personnel must be approved by a "third party organisation" (RTPO) recognised by a member state pursuant to article 13. Outside Europe: International companies have multiple certification PCN/ASNT-TC-1A
Asia	Japan: JIS Z 2305 (ISO 9712 MOD) for certification aimed at work for national projects ASNT-TC-1A in order to have the N-stamp according to ASME China: HAF 602 for components that will be used within China. Certification granted by recognised third party organisation to an equivalent standard meeting the specified regulatory requirements is used. Korea: N/A.

Industrial application (2)

Russia

Certification must be carried our according to PNAEG-7-010-89 or similar document, following an internal procedure or an external organisations licensed by the Governmental Nuclear Regulatory body (GAN). The methods, procedures and responsibilities of the operator are defined in a supporting document.

There is a trend to forbid inspector`s certification on the manufacturer`s (or installer`s) side and allow certification only in the certification centres.

North America

USA:
ASNT-TC-1A
ACCP
CP-189
Canada:
CGB

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Non-linear Analysis Design Rules

Codes and Rules Considered

RCC-M:	B 3200 and C3200 and appendix ZF
ASME III:	NB 3200 and NC 3200 and appendix XIII
JSME:	PVP Publication + during the seminar
RCC-MRx:	RB 3200 and RC 3200 and Appendices 3 and 10
KTA:	KTA 3201-2
R5 Rule	Vol.2/3
ASME VIII div 2	Part 5
EN 13445	Appendix B
Russian Code	

Initial Findings

No Code covers all the aspects

- RCC-MRx: more advanced, but not user friendly
- ASME VIII: covers practically all with a step by step approach
- ASME III: clear definitions and limitations
- RCCM: partially covers, not user friendly
- KTA: only general consideration, no clear procedures
- The others have very limited scopes
- R5: shakedown
- PNAEG: fatigue
- EN13445: limit analysis

Comparison Table: Monolithic

	Code comparison									
	Plastic collapse				Plastic instability				Stress triaxiality	
	Limit Analysis		Direct elastic-plastic analysis		Limit Analysis		Direct elastic-plastic analysis		Direct elastic-plastic analysis	
	Material properties	Criteria	Material properties	Criteria	Material properties	Criteria	Material properties	Criteria	Material properties	Criteria
RCCM	Y	Y	N	N	N	N	N	P	N	N
ASME III	Y	Y	N	N	Y	Y	N	N	N	N
JSME	?	?	?	?	?	?	?	?	?	?
RCC-MRx	Y	Y	N	N	Y	Y	Y	Y	N	N
Russia	N	N	N	N	N	N	N	N	N	N
KTA	N	P	N	P	N	P	N	P	N	N
R5	N	N	N	N	N	N	N	N	N	N
ASME VIII	Y	Y	Y	Y	N	N	N	N	Y	Y
EN 13445	Y	Y	N	N	N	N	N	N	N	N

Y Yes N No P Partially

Comparison Table: Cyclic

	Code comparison						
	Plastic shakedow				Ke		
	Direct elastic-plastic analysis				Direct elastic-plastic analysis		
	Material properties	Material constitutive equation	Criteria	Extrapolation rules	Material properties	Material constitutive equation	Criteria
RCCM	N	N	N	N	N	N	N
ASME III	N	N	N	N	N	N	N
JSME	?	?	?	?	?	?	?
RCC-MRx	P	P	N	N	N	N	N
Russia	N	N	N	N	Y	Y	Y
KTA	N	N	N	N	N	N	N
R5	P	N	P	N	N	N	N
ASME VIII	N	N	N	N	Y	Y	Y
EN 13445	N	N	N	N	N	N	N

Final Report Procedures

- Similar to Code Case
- Precise step by step procedures
- Proposed set of data to perform analysis / design specification
- Propose set of criteria / design specification
- 3 groups of procedures:
  - Monotonic: plastic collapse, instability, elastic plastic instability, local failure
  - Cyclic: fatigue, plastic shakedown
  - Others: elastic follow-up, nozzle/piping, stress classification, etc
- 2 types of components: vessels and piping systems