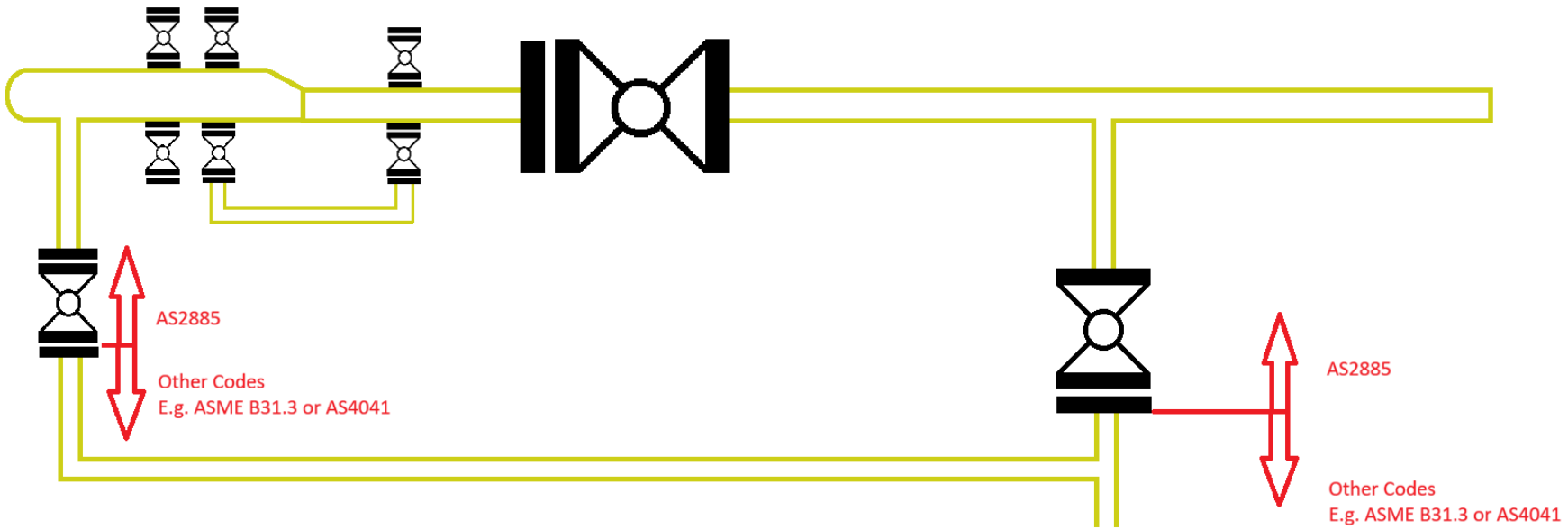
AS/NZS 2885 PIPELINE ASSEMBLIES CONSTRUCTION

WELDING

HYDROSTATIC TESTING

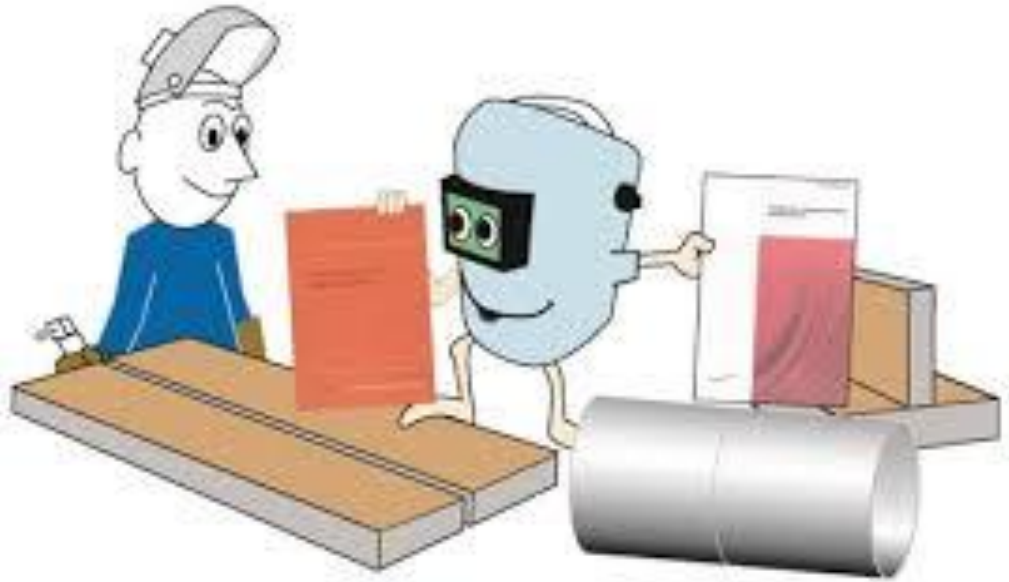
WHAT IS A AS/NZS 2885 PIPELINE ASSEMBLY

- Pig receiver, launcher or mainline valve station pipework
- Typically consists of:
  - A range of sizes and wall thicknesses
  - Various Fittings



AS/NZS2885.2 WELD PROCEDURE QUALIFICATION PROCESS

- Weld procedures may be qualified through 4 avenues (AS/NZS 2885.2 Clause 6.4)
  1. By testing
  2. To alternative standard
  3. Without testing
  4. By engineering



AS/NZS2885.2 WELD PROCEDURE QUALIFICATION PROCESS

- 1. Qualification by Testing (AS/NZS 2885.2 clause 6.4.2)
  - For qualification by testing, the following process applies:
    - pWPS development
    - pWPS approved
    - Obtaining material
    - Undertaking welding trial
    - NDT
    - Mechanical testing
    - Compilation of WPS
    - Approval of WPS

AS/NZS2885.2 WELD PROCEDURE QUALIFICATION PROCESS

- 2. Qualification to alternative standard (AS/NZS 2885.2 clause 6.4.3)
  - Qualification can be to AS4041/AS3992 or ASME B31.3/ASME BPVC-IX
  - For qualification to above standards, **ALL** of the following conditions apply:
    - Welds between pipeline assembly COMPONENTS and welding of MAINLINE PIPE to pipeline assembly COMPONENTS
    - The material grades are lower than 450MPa SMYS
    - The method of qualification is approved by a qualified welding engineer
    - Pipeline assembly has been designed using a Standard **OTHER THAN AS/NZS 2885.1**

AS/NZS2885.2 WELD PROCEDURE QUALIFICATION PROCESS

- 3. Qualification by Prequalification Without Testing (AS/NZS 2885.2 clause 6.4.4)
  - Qualification without testing can occur when **ALL** of the following conditions are met
    - Design temperature 0°C or above
    - Process is cellulosic MMAW
    - E6010 electrodes vertical down
    - Joints are butt joints
    - Weld preparation in accordance with Figure 5.2
    - Diameter range DN50-DN500
    - Wall thickness is ≥4.8mm and ≤10mm
    - Pipe grade X52 or lower
    - CE <0.4
    - Number of weld passes <3
    - Time laps root to hot pass <8 mins
    - Heat input <0.5kj/mm
    - Burn off rate <1.00
    - Pre-heat not less than WTIA TN01

AS/NZS2885.2 WELD PROCEDURE QUALIFICATION PROCESS

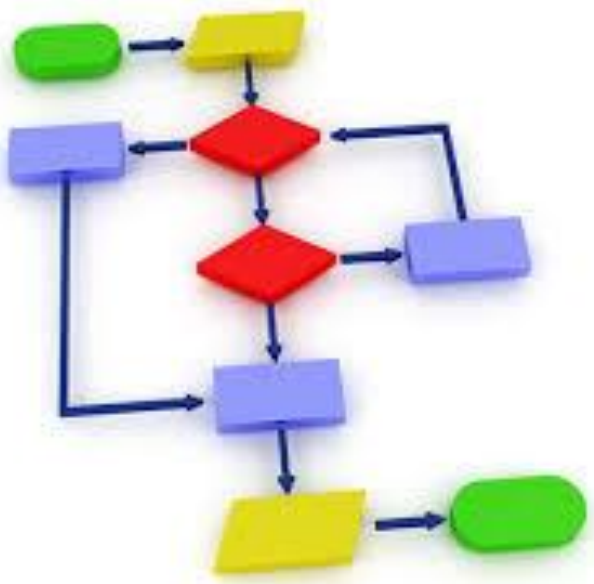
- 4. Qualification by the Use of Engineering (AS/NZS 2885.2 clause 6.4.5)
  - Qualification by use of engineering can occur when **ALL** of the following conditions are met
    - Qualification by testing not practicable
    - Approval obtained
    - Working under direct continuous supervision by welding engineer
    - Welding is documented in a WPS

AS/NZS 2885.2 ESSENTIAL VARIABLE OVERVIEW

Item	Implication
Material • SMYS • CE • Change in PWHT parameters	• **Material compatibility** • For grades > 480 MPa (e.g. X70) **steel manufactures require individual WPS**
Change in wall thickness • Typically 0.5T to 1.5T	No substantial implications
Diameter grouping • D ≤ 60.3mm • 60.3mm < D ≤ 508mm • D > 508mm	Significantly **increases the number of WPS**
Process • Change welding process • Manual / semi auto / auto • Change of auto system • Change of bug manufacturer or model	No substantial implications
Design • Preparation • Weld shape, • Backing, • Passes, • Position • Direction of welding	No substantial implications
Filler • Change in welding consumable • Classification, • Electrode diameter • Manufacturer/factory of origin (cellulose)	No substantial implications
Shielding • Change of gas mixture, • Flow • Cup size • Backing gas type	No substantial implications

AS/NZS 2885.2 ESSENTIAL VARIABLE OVERVIEW - CONTINUED

Item	Implication
Electrical Characteristics • Polarity • AC/DC • Arc type • Change in welding machine model • Contact tip distance (25%)	GMAW/FCAW) **same make/model** of welding equipment to be used
Number of welders • Decrease of welders for root/hot pass	No substantial implications
Removal of Line Up Clamp • Reduction of root pass prior to release • Change to extreme lift	No substantial implications
Tack Welding • Reduction in number or size of tacks	Slight implication for various diameters or configurations
Time between individual passes • Increase beyond qualified range	Slight implication where large thickness welds may be partially completed and left over night
PWHT and/or cooling • PWHT • Change in post weld cooling	No substantial implications
Heat input or burn off rate • Change of heat input (15%)	No substantial implications
Cleaning • Equipment and method used	No substantial implications, though a little subjective



CONTRAST TO ALTERNATIVE CODES

- AS/NZS 2885.2 Vs Other codes (ASME IX and AS3992)

Aspect	AS/NZS 2885.2	Other Codes (ASME IX, AS 3992)
Diameter Ranges	3 defined diameter ranges	All diameters
Machine Make/Model (FCAW/GMAW)	Essential variable	No Essential Variable
Material Consideration	• Material strength • CE > 0.10	Based on material groupings/compatibility
Wall Thickness Tolerances	Varies upon tier 1/2/3 criteria	Generally allows for higher tolerances
Number of Tack Welds	Essential variable	Not considered an essential variable
Number of Welders	Essential variable	Not considered an essential variable
Cleaning Equipment/Method	Essential variable	Not considered an essential variable

APPLICATION OF AS2885.2 TO PIPELINE ASSEMBLIES AND THE RESULT

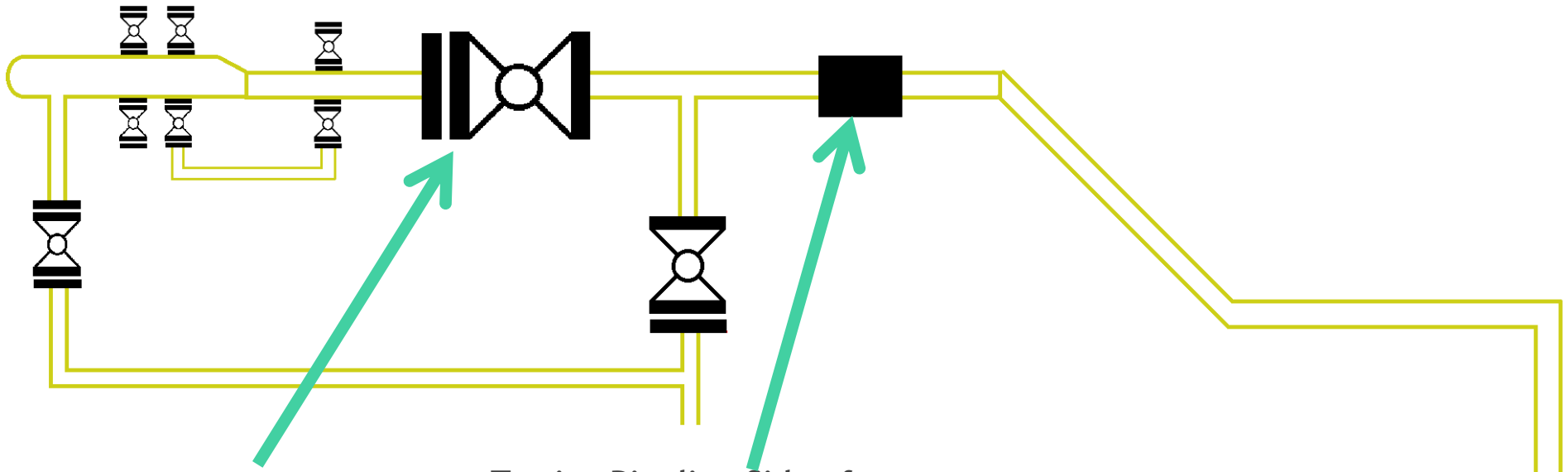
- 25-40 addition WPS
- Typical WPS cost $25k-60k each
- Qualification timeframes up to 6 months
- Material grouping not considered
- Additional welding equipment required
- Limited workshop fabricators

WELDING OPTIONS FOR OPTIMISATION

The following welding options may be considered (discussion):

1. Reinstate clause 6.4.3 of AS/NZS 2885.2 as per 2016 version (or similar) allowing AS4041/AS3992 or ASME B31.3/ASME IX WPS to be utilised
2. Change essential variables under AS/NZS 2885.2 for PIPELINE ASSEMBLIES to align with other piping codes
3. Update AS/NZS 2885.1 with further consideration of the impact on welding
4. Do nothing – Maintain escalated project costs and duration

HYDROSTATIC TESTING BREAKS



Testing Through Pipeline Assembly

- Cleaning may need to occur prior to valve installation
- Pressure rating of components may not meet required pipeline test pressure
- Risk of damage to ball valves from debris
- Disruptive to facilities construction

Testing Pipeline Side of MIJ

- Cannot put test header on without removing pipeline assembly
- Disruption to facility construction
- Possible subsidence on riser section before tie-in occurs

Testing outside facilities

- Requires pre-testing gooseneck section
- Possibly combined above ground/below ground test

HYDROSTATIC TESTING BREAKS

Consideration For Hydrostatic Testing Design

- Consider bends and service crossings
- Consider specification requirements
- Pipeline test pressure and component pressure rating
- Battery limits between contractors
- Consultation with a contractor