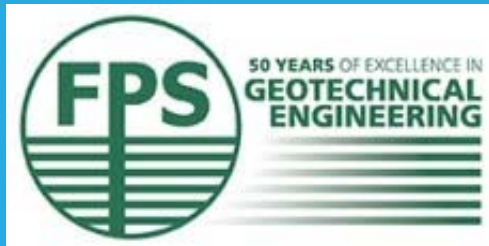


A data transfer format for piling data

Presentation to FPS Technical Committee by Neil Chadwick (Arup), 7 June 2017



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- What should we be trying to achieve?
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A bit of history

- AGS format for GI – 25 years old this year!
- Origins of pile data exchange idea? DIGGS in mid 00s?
- Arup have been thinking about it for a while (pre BIM)
 - ... a few contractors we discussed it with seemed keen (c2015)
 - ... contractors developing own systems for field capture
 - ... we were going to initiate it, but then...
- We found out that AGS Data Format Working Group was looking at it...
 - ... in conjunction with FPS?...
 - ... so we hi-jacked that initiative instead!
 - ... I have developed a draft, with help from Owen Francis (BAM Ritchies) and Steve Walthall (AGS format guru)

Drivers

- Background of digital / BIM initiatives
- Many of us think we should be doing this
- Business case?
 - Clients
 - Asset managers
 - Designers
 - Contractors

The screenshot shows a presentation slide with the following content:

- HM Government logo and text: HM Government
- Digital Built Britain logo and text: Digital Built Britain
- Level 3 Building Information Modelling - Strategic Plan
- State of the Nation 2017: Digital Transformation
- ICE's State of the Nation 2017 report looks at how advances in digital technology and data are transforming how we design, deliver and operate infrastructure.
- Two small images: a highway at night with light trails and a 3D architectural model of a building.
- February 2015
- UCL logo
- ICE State of the Nation 2017: Digital Transformation
- Flooding costs the UK £1 billion per year
- Illustration of a house being flooded, a power line, and a person holding a smartphone.
- Related content section with three small images.

What should we be trying to achieve?

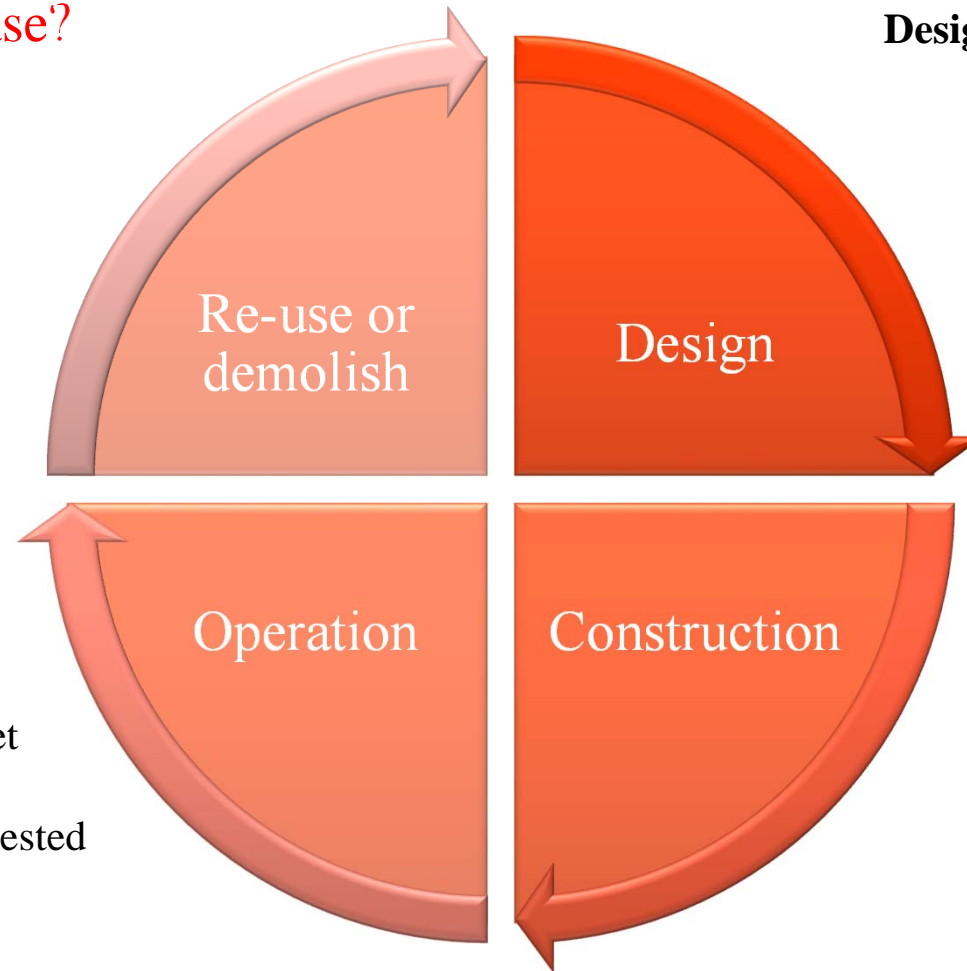
What is the business case?

Detailed as-built record

- Improve re-use potential
- Obstruction risk better understood

As-built record of assets

- Information for maintenance
- Improve understanding of asset performance (analytics?)
- Infrastructure owners are interested (HE, NR, HS2)



Design stage – exchange pile schedule

Try to improve current situation

- FPS spreadsheet not used
- data embedded in BIM models, but done in inconsistent way

In addition:

- Data analytics - designers and contractors

Exchange construction data

- Same as in current records but in data form

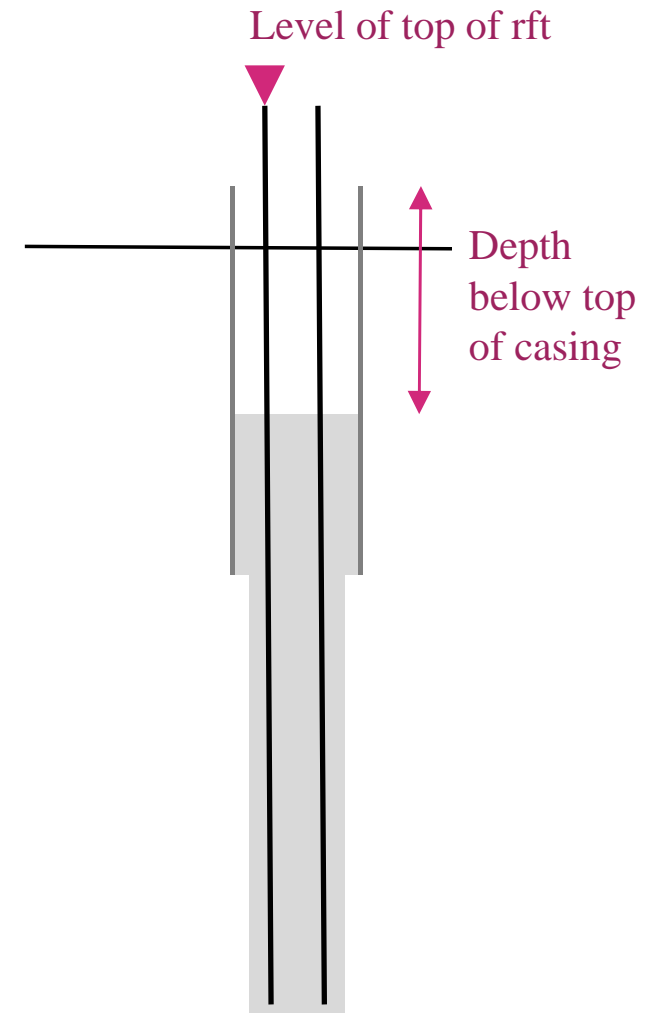
Objectives for the data transfer format

- Able to be used in design phase
 - 'keep' design data (do not overwrite)
 - consider 'ownership' of data
- Full record of construction
 - all data required by SPERW (v3) collected
- As built record
 - what was actually built
 - could be standalone record, if other docs lost
- Easy to implement (adopt same rules and style as AGS for GI)
- Suitable for both simple and complex piling projects
- Aim to record the data that is collected in the field (to minimise risk of error)

Sounds easy?

A few of the difficulties encountered:


- Design or as built or both? e.g. co-ordinates
- Record depths (from what) or levels
- Design loads etc.
- Reinforcement



Review – list of ‘groups’ (tables)

| | | | | | | | | | | |
|------|------------------------------------|--|-----------------------------------|--|--|------|---|-------------------|------------------|--|
| PROJ | Project details | | | | | | | | | |
| ELEM | Pile / wall element identification | | | | | CONC | Concrete delivered/batched | | | |
| | EREQ | Employer requirements for design | | | | | CSMP | Concrete sampling | | |
| | DESN | Design pile/wall schedule | | | | | | CTST | Concrete testing | |
| | ABUI | Pile/wall as built summary | | | | | | | | |
| | BORE | Bored pile progress record | | | | FLUI | Support fluid sampling and testing | | | |
| | BDPH | Bored pile / wall details with depth | | | | | | | | |
| | | Table for Base Grouting to be added | | | | PERF | Pile/wall performance criteria under test | | | |
| | CFAM | CFA monitoring during installation | | | | | | | | |
| | DRIV | Driven or helical pile progress record | | | | LOAD | Pile/wall design loads | | | |
| | DDPH | Driven or helical pile / wall details with depth | | | | | | | | |
| | DREC | Driven pile / wall driving record | | | | DRFT | Design reinforcement | | | |
| | PRFT | As built pile / wall reinforcement | | | | | | | | |
| | INST | Instrumentation and installations | | | | | | | | |
| | GEOL | Description of excavated ground | | | | | | | | |
| | IOBS | Inspections or observations during piling | | | | | | | | |
| | ITGY | Integrity testing | | | | | | | | |
| | PTST | Pile load testing general and summary | | | | | | | | |
| | | PTLS | Pile test load and settlement | | | | | | | |
| | | PTIR | Pile test instrumentation reading | | | | | | | |
| | NCRM | Non conformances / remedial action | | | | | | | | |

| | A | B | C | D | E | F | G | |
|----|-------------|--|---|------------------------------|-----|--|------------------|--|
| 1 | ABUI | Pile/wall as built summary | | | | | | |
| 2 | | Remarks | For very simple cases this may be the only table used (other than PROJ and ELEM). However best practice would be to populate the other tables too. Consider adding to it to remove need for DESN? | | | | | |
| 3 | | Group Name: ABUI - Pile/wall as built summary | | | | | | |
| 4 | | Status | Heading | Suggested Unit / Type | | Description | Example | |
| 5 | | * | ELEM_ID | | ID | Pile/wall element reference | P001 | |
| 6 | PTYP | | ABUI_PTYP | m | PA | Pile / wall type | BORED | |
| 7 | SIZE | | ABUI_SIZE | | PU | Diameter or section size/reference | 900 | |
| 8 | UNIT | | ABUI_UNIT | | U | Section size units | mm | |
| 9 | PPL | | ABUI_PPL | m | 2DP | Piling platform level (commencing surface) | 16.15 | |
| 10 | WLBM | | ABUI_WLBM | m | 2DP | Working level on which base machine stands | | |
| 11 | HEAD | | ABUI_HEAD | m | 2DP | Pile / wall element head level as constructed | 16.05 | |
| 12 | COL | | ABUI_COL | m | 2DP | Pile / wall element cut-off level as constructed | 15.50 | |
| 13 | LEN | | ABUI_LEN | m | 1DP | Length below cut-off level | 20.3 | |
| 14 | TOE | | ABUI_TOE | m | 1DP | Toe elevation | -10.7 | |
| 15 | LOCX | | ABUI_LOCX | m | 2DP | Project grid x/E co-ordinate of element | 565.25 | |
| 16 | LOCY | | ABUI_LOCY | m | 2DP | Project grid y/N co-ordinate of element | 421.09 | |
| 17 | RAKE | | ABUI_RAKE | deg | ODP | Actual verticality or gradient of raked pile (as H/V from vert | 1/124 | |
| 18 | RBRG | | ABUI_RBRG | deg | ODP | Bearing of non vertical pile (from project grid y/N axis) | 135 | |
| 19 | RMTH | | ABUI_RMTH | | X | Method of verticality measurement | Rig mast survey | |
| 20 | PREB | | ABUI_PREB | | X | Pre-bore summary details | 10m at 600 dia | |
| 21 | STAR | | ABUI_STAR | yyyy-mm-ddThh:mm | DT | Start date/time of element construction (excluding pre-boring) | 2016-11-23T10:20 | |
| 22 | END | | ABUI_END | yyyy-mm-ddThh:mm | DT | End date/time of element (excluding trimming or re-driving) | 2016-11-23T17:55 | |
| 23 | CASG | | ABUI_CASG | | X | Casing type | Temporary | |
| 24 | CELV | | ABUI_CELV | m | 2DP | Casing base elevation | 12.23 | |

| BORE | Bored pile progress record | | | | | |
|------|---|---|------------------|-----------------------------|--|-------------------------|
| | Remarks | For a bored pile (incl CFA, also d-wall). Time related record of construction activity. | | | | |
| | Group Name: BORE - Bored pile progress record | | | | | |
| | Status | Heading | Suggested | Description | Example | |
| | * | ELEM_ID | ID | Pile/wall element reference | P001 | |
| STAR | * | BORE_STAR | yyyy-mm-ddThh:mm | DT | Date/time of start of activity | 2016-11-23T14:35 |
| END | * | BORE_END | yyyy-mm-ddThh:mm | DT | Date/time of end of activity | 2016-11-23T16:05 |
| ACTT | | BORE_ACTT | | PA | Activity type | CONCRETE |
| DESC | | BORE_DESC | | X | Activity description/method | Tremie |
| DPRE | | BORE_DPRE | m | 2DP | Depth to base of prebore | 8.5 |
| EXC | | BORE_EXC | m | 2DP | Depth to base of pile/wall excavation | 5.5 |
| TCON | | BORE_TCON | m | 2DP | Depth to top of concrete | 10.5 |
| BCAS | | BORE_BCAS | m | 2DP | Depth to base of casing | |
| RELV | | BORE_RELV | m | 2DP | Elevation of reference datum | 16.23 |
| RDTM | | BORE_RDTM | | X | Description of reference datum | Top of casing |
| PREB | | BORE_PREB | | X | Prebore diameter and details | 600 auger, backspun out |
| METH | | BORE_METH | | X | Support fluid | Bentonite |
| FDEP | | BORE_FDEP | m | 1DP | Depth to top of support fluid (maximum) | 2.2 |
| TDEP | | BORE_TDEP | m | 1DP | Tremie depth | 9.5 |
| |  | CONC_ID | | ID | Concrete batch/ticket reference | 12345678 |
| RIG | | BORE_RIG | | X | Rig type and reference | BG40 (rig 2) |
| RTL | | BORE_RTL | | X | Boring/excavation tool | Auger |
| ROP | | BORE_ROP | | X | Rig operator | J. Smith |
| RBK | | BORE_RBK | | X | Rig banksman | |
| GREM | | BORE_GREM | | X | Groundwater observations | Seepage at 8.5m |
| DREM | | BORE_DREM | | X | Delay/obstruction/unexpected event remarks | Minor collapse at 8.7m |
| REM | | BORE_REM | | X | General remarks | |

| BDPH | Bored pile / wall details with depth | | | | Include prebore dia | |
|---|--------------------------------------|---|-----------|-----|--|-----------------|
| | Remarks | For a bored pile (incl CFA, also d-wall). Record of what the final pile looks like (except for reinforcement which is in a separate table - although we should perhaps look at a way of better linking these tables). | | | | |
| Group Name: BDPH - Bored pile / wall details with depth | | | | | | |
| | Status | Heading | Suggested | | Description | Example |
| | * | ELEM_ID | | ID | Pile/wall element reference | P001 |
| TOP | * | BDPH_TOP | m | 2DP | Depth of top of reported section | 0.2 |
| BASE | * | BDPH_BASE | m | 2DP | Depth of base of reported section | 5.5 |
| RELV | | BDPH_RELV | m | 2DP | Elevation of reference datum | 16.23 |
| RDTM | | BDPH_RDTM | | X | Description of reference datum | Top of casing |
| EDIA | | BDPH_EDIA | mm | ODP | Diameter of bore / outside of casing | 1020 |
| CDIA | | BDPH_CDIA | mm | ODP | Diameter of concrete section | 900 |
| CAS | | BDPH_CAS | | X | Description of permanent casing / sleeve | Double sleeve |
| DETL | | BDPH_DETL | | X | Additional construction details | Grouted annulus |
| REM | | BDPH_REM | | X | General remarks | |
| | | FILE_FSET | | X | Associated file reference (eg piling record sheet) | PR-P001 |
| Notes | | | | | | |
| All depths in this Group reported as depth below reference datum (e.g. top of casing) | | | | | | |
| May double up on lengths for complex casing | | | | | | |

Where to from here?

Current status

- Issue draft as is to initial select group now to get initial feedback
- If positive, advertise and issue to wider audience
- FPS feedback for next meeting?

Questions to the floor...

- Do you agree with the aims and objectives (and scope)?
- Barriers to adoption?
- FPS or AGS ownership?
- Who wants to help?