

When Competencies Replace Competence

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Committed bridge
engineer age 7.

But was Brunel
competent?

What competencies did
he have?



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And the devil
As always
Is in the detail

What have I learnt

- 1) I know very little
- 2) I understand less
- 3) Understanding is key
- 4) LET THE BRIDGES SPEAK
- 5) Use fair tests

Put it another way

You might think after 4000yrs
We would know all there is to know about
Masonry bridges
But I don't understand enough
And I am the go to expert in UK!

Where to start?

SOME BASIC THINKING

Richard Feynman

For successful technology
engineering must take precedence
over public relations
for nature cannot be fooled.

Born 100 years ago last year

Public Relations or Engineering



Photograph 2C.33: Abutment with horizontal and vertical cracks wider than 10mm (Severity rating O and L respectively)

Page from NR guide on
Condition marking.

Is the size of the biggest crack
The most significant thing here?

The patch has caused the
damage.

The bearing shelf is tilted.

I raised this. They just removed this pic from the next edition!

**I WOULD ARGUE THAT'S A TRAINING IN
INCOMPETENCE**

Or the Royal Society

Nullis in verba

By no man's word.

That is

Question Everything

(Or we are doomed to learn nothing)

Is it a fair test

There is no test that
can prove something correct.

Science is provisional –
The best theory we have yet!

Codes are even more provisional

The best ideas we could negotiate

At least five years ago

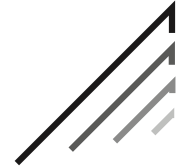
Nothing stands still

Skew Bridges

Just a quick excursion into what our infrastructure is like.

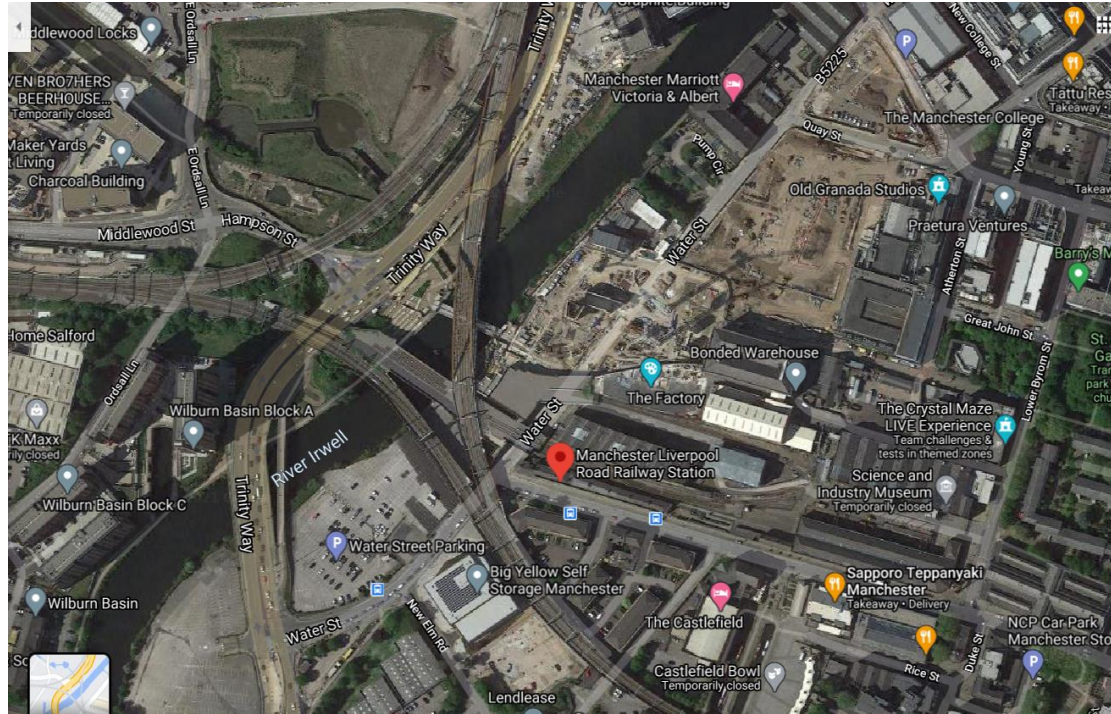
And how management goes.

Look at this bit of Manchester.



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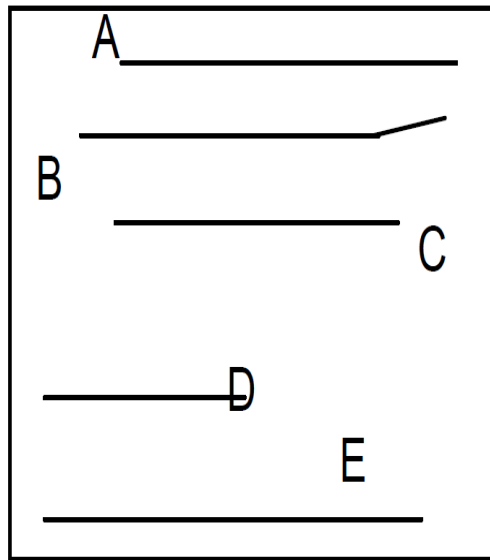
Yet more complex now!



Hidden by lining



DN



A – Longstanding longitudinal fracture 9.5m long x h\l at ends to 2mm wide at high haunches and crown. Located 225mm in from downside arch ring face. Odd pieces of brick missing around fracture.

B – Longstanding longitudinal fracture 8.8m long x h\l at ends to 2mm wide at high haunches and crown. Located 1m to 2.5m in from downside arch ring face. Odd pieces of brick missing around fracture. Displaced at crown o high haunch 5mm at Deansgate end.

C – Longstanding longitudinal fracture 7.3m long x h\l. Located 3.5m in from downside arch ring face.

D – Longstanding longitudinal fracture 3.5m long x h\l. Located 3.7m in from upside arch ring face. Running from crown to haunch

E – Longstanding longitudinal fracture 10.7m long x h\l. Located 1.5m in from downside arch ring face. Running from haunch to haunch.

UP



SOFFIT NTS

Examiner General Comments

Attention required to seepage inside from soffit sheeting water running dn on to pier face, possibility of long term faults occurring
Otherwise NONE

No Engineer's recommendations on the previous year's report for this structure.

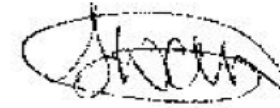
No of Spans	1
Carrying	Rail
Over	Land
Avonguards	
Plumbing Points	
Date Tabs	

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Has all of the structure been examined? No (If no, state reasons below)

Soffit sheeted

SIGNED



EXAMINERS NAME

Steve Walters

Has the structure been viewed under live load? Yes

DATE

2 Feb 2012

Amey Comments & Recommendations**Notes for attention**

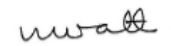
None

See attached Summary Sheet ☐

Further action required / query ☐

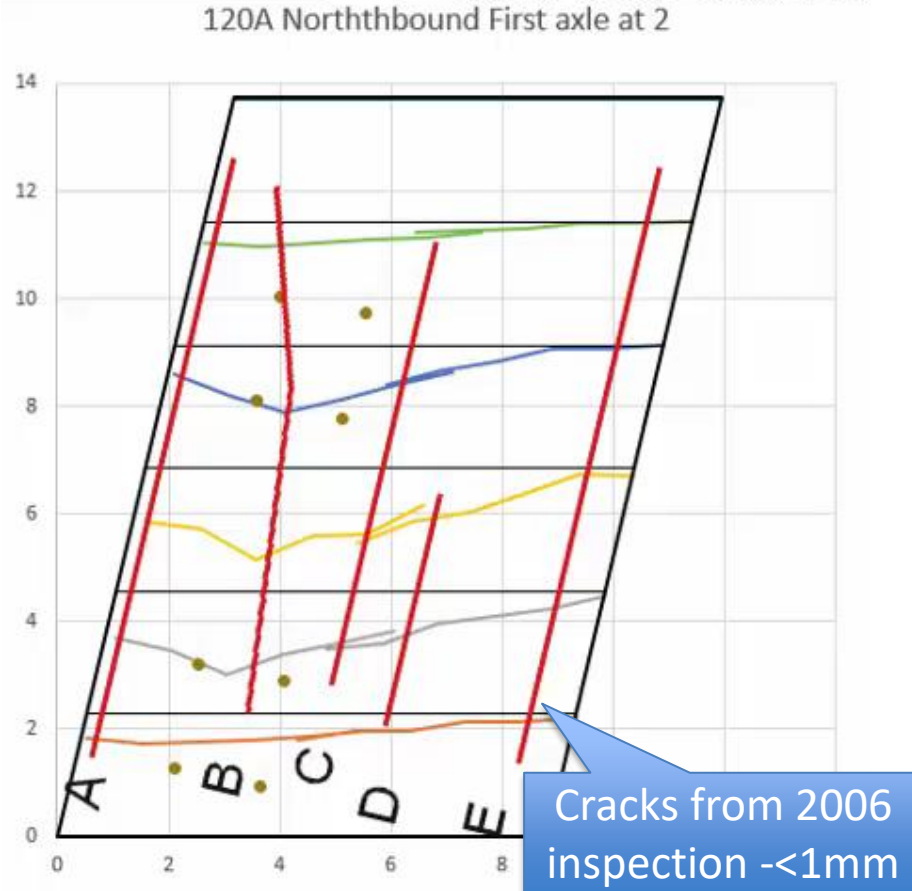
No action required at present ☒

Signed



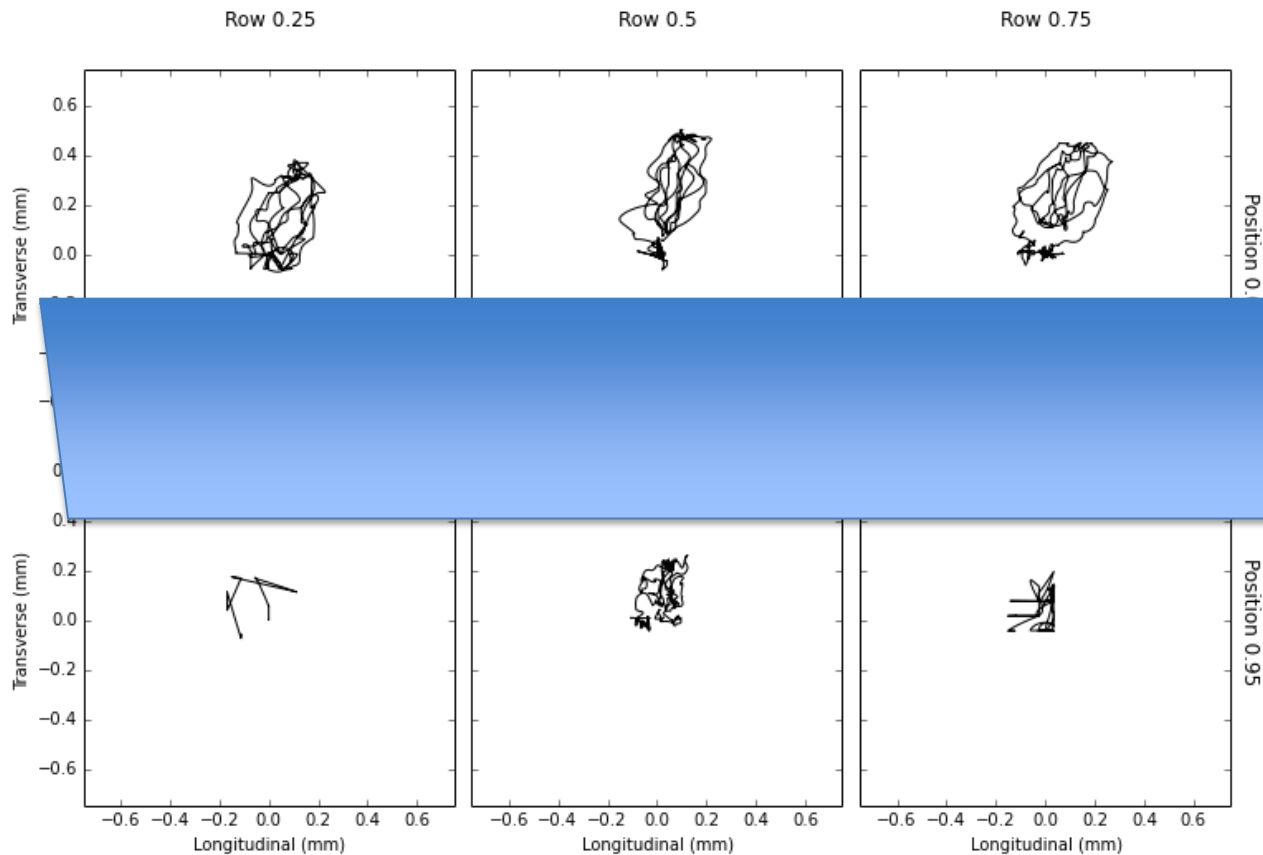


**Deflection poles for dense
measurement of vertical
deflection**



Concentrated
deflections
Note diff
between long
and short term
measurement

Width change (through lining)



Cracks were 1mm wide in 2006



Note the lining

Moiré Tell-Tale

After the crack
was stitched

If you don't
measure, you
don't know

Available in NZ
Links at end



To understand why

We must first understand what

Stop applying indefensible treatments

It's a stiffness not a strength issue

Don't panic – measure and think.

Sometimes you only find the problem by
measurement

But remember

IS IT A FAIR TEST?

Fit for purpose

Most of the monitoring I see isn't

What do we need to measure to tell us something useful?

Can it be measured effectively?

What are the costs of not doing it?

Competence in measurement

Needs the engineer able to identify what he needs to know

The monitoring co. to be able to offer things that work.

SOMEONE PLANNING INTERPRETATION

From the start

Measurement



Single strain gauge on angle brace.

Single 50mm strain gauge on bottom of flange.



Photograph 2C.31: Longitudinal crack in barrel arch maximum width >5 to 10mm
(Severity rating K)

Curved beds, skew bridge

Where cracked and WHY?



Photograph 2C.29: Example of a stone abutment with a displaced block (Severity rating Ex)

Loose stone OK
But WHY
Stone projecting?



Photograph 2C.27: Example of an abutment with missing stone (Severity rating Ex)

Loose stone OK but
Curl under?
Big gap further back?



What?

Single stone?

Why broken?

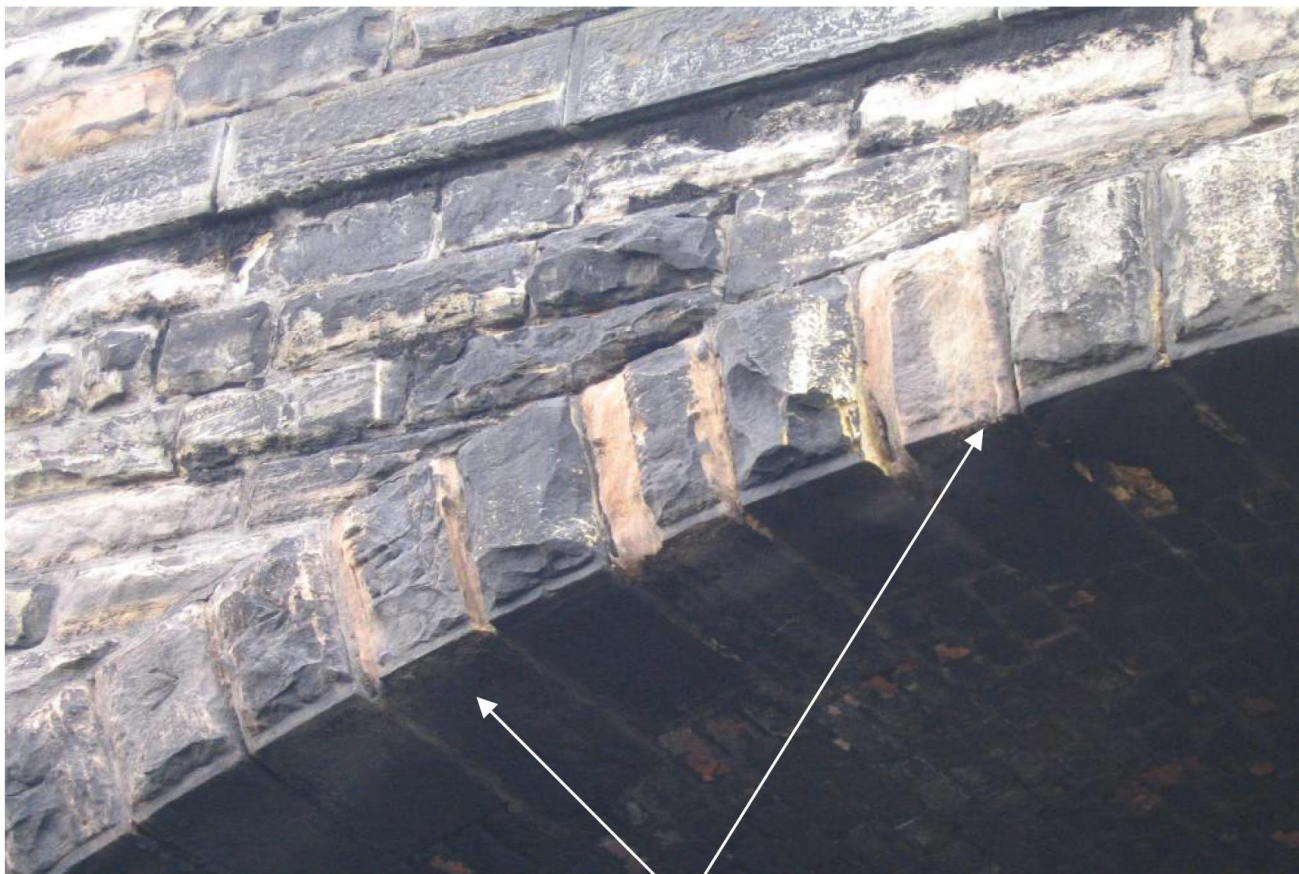
Photograph 2C.22: Example of a stone abutment with pointing profile is flush with the front face of the stonework where the depth of the defect $\geq 20\text{mm}$ (Severity rating D)



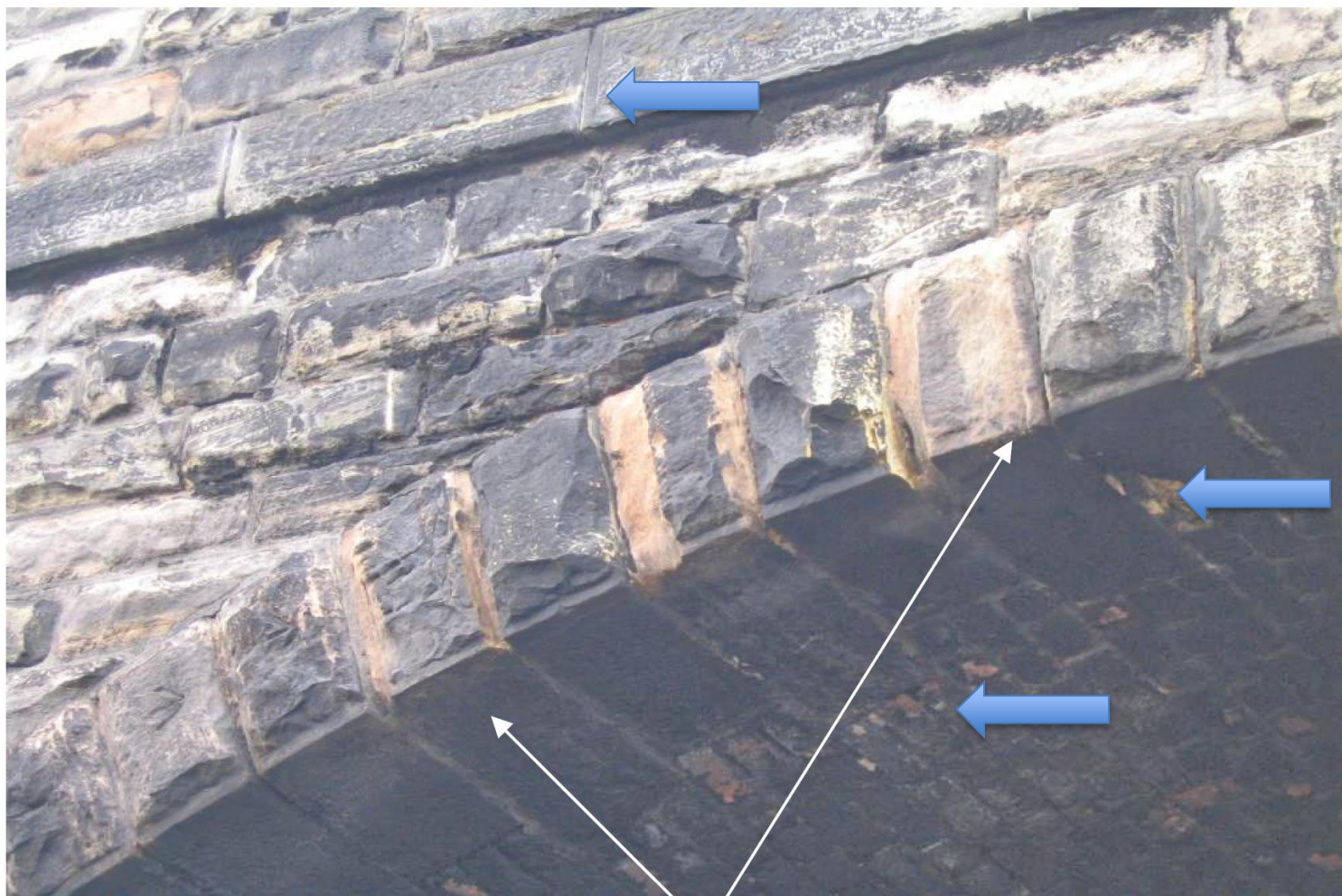
Photograph 2C.24: Example of a stone wing wall where the depth of the defect $\geq 20\text{mm}$ (Severity rating D)

What?

What is the defect?



Photograph 2C.18: Example of a stone voussoir where the depth of the defect $\geq 20\text{mm}$ (Severity rating D)





BUT 2 very
different forms of
damage
Split-stone?

Photograph 2C.19: Example of a stone wing wall where the depth of the defect $\geq 20\text{mm}$ (Severity rating D)



Photograph 2C.17: Bulging with associated cracking to be scored twice, once as severity rating F (bulging) under general masonry and once as severity rating N (horizontal crack, maximum width/displacement 5mm to 10mm) under cracked masonry

And no mention of the
buddleia causing the
problem?

Or the severely displaced
bricks?

RIGHT UP TO DATE

File

Video



2020-12-25 13:15:56... 1/1/20-36

2020-12-25 13:15:56

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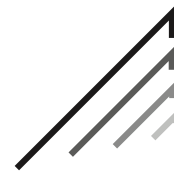


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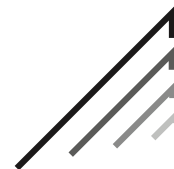








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A 24m section of the bridge parapet collapsed

THANK YOU