Failure Analysis Associates

Protocol for Evidence Retrieval and Storage Kern Power Plant Bakersfield, California

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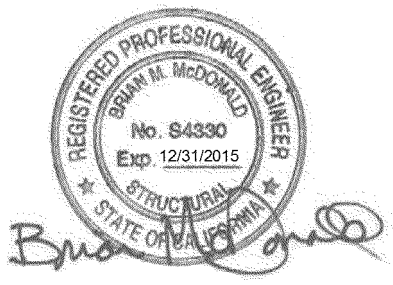

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Introduction

This protocol provides a guide for the careful, expedient and fully-documented recovery and storage of potential evidence contained in the collapse debris at PG&E's Kern Power Plant (KPP) located at Redacted[1] Silverado Contractors (Silverado) will remove the evidence from the debris in a controlled manner, taking feasible precautions not to damage or otherwise change the character of the structural components, connections, deformations and fracture surfaces of the evidence components identified herein.

Evidence recovered from the debris will be transported to an area at the southeast corner of the KPP site, where it will be stored in such a way that it is reasonably secure from unauthorized access and accessible for detailed inspection and possible sample removal for further laboratory inspection/analysis. Evidence will remain in the joint control of OSHA and PG&E (Evidence Custodians) at all times, except for documented transfers of material samples to other parties as approved by the Evidence Custodians. An Evidence Custodian will maintain an access log of all visits to the evidence storage site.

Only the components identified herein will be considered to be evidence (Evidence), which will be recovered, transported and stored to the extent reasonably practical. All debris not listed herein will be disposed of or salvaged at the discretion of Silverado and PG&E.

[1] This protocol does not address the collection or preservation of evidence other than collapse debris. Other evidence, such as blast shrapnel, will be handled separately.

Progression and Documentation of Demolition

Twin boiler buildings at the KPP were taken down by explosive demolition on Saturday, August 3, 2013. Each structure was approximately 60 feet (EW) by 100 feet (NS) in plan, and approximately 115 feet tall. Each boiler building was supported on a 3 (EW) by 4 (NS) grid of steel columns. Prior to explosive demolition, the steel elements bridging the approximately 26-foot gap between the buildings, as well as all ancillary structures (stacks, sheds, etc.), were removed.

It is our understanding that the charges were set and timed to take out the outboard and central rows (NS) of columns of each building, thereby toppling the east boiler structure to the east, and the west structure to the west. In addition to the shape charges used to "cut" the supporting columns, we understand that "kicker" explosives were detonated immediately after the shape charges to push the column sections that were cut free by the shape charges to the east. (The columns of both buildings were pushed to the east, though the west building was toppled to the west.) It is our understanding that all of explosive charges were mounted on first-story outboards and central columns; no charges were placed higher in the structure, and no charges were placed on elements other than these columns. Figure 1 schematically shows the locations of the charges.

In the current toppled state with few exceptions the columns on which explosives had been placed ("demo columns") are generally concealed within the debris and not visually or physically accessible. (Inboard columns that did not have explosives attached are generally visible between the toppled structures.) Physically accessing the demo columns and their connections will require removal of substantial framing, boilers and associated equipment from above. At this time it is not possible to determine precise locations of the demo columns or their condition. As such, it will be necessary to expose them in order to document their locations and orientations, and to identify appropriate means to carefully remove them from the debris.

Prior to the first day of demolition work, and pursuant to notice, PG&E will allow a period during which investigators for the interested parties to approach the debris piles as closely as can safely be allowed so that photographs, video and other observations or measurements can be taken. The safe zone for inspection will be determined in the sole discretion of PG&E's site superintendent, and will be no closer than the outer perimeter of the debris piles. No person will be allowed to enter the debris piles or to go underneath any overhanging structure, debris or material.

We understand that Silverado intends to systematically remove debris in a layered fashion, starting from the top of the debris piles, moving downward.

The four boiler structures of the Kern Power Plant each contain two pressure vessels; a steam drum and a mud drum, which vessels have often been loosely referred to as "boilers." One interested party has requested the ability to examine them. It is our understanding whenever it is safe and practical to do so, Silverado intends to remove these large vessels from the debris pile intact. The vessels will then be set aside on the worksite for a period of at least 48 hours, during

which they may be visually examined by interested parties from the ground. Interested parties will be notified when a vessel is available for such visual examination. After the 48 hour hold period, the vessels may be demolished and/or removed from the site and disposed of. Based on its prior experience with similar structures, Silverado advises that it is not always possible to remove such vessels intact. Where it would be unsafe or impractical to remove any or all of the vessels in their intact state (in the sole discretion of Silverado) the vessel(s) will be cut or otherwise dismantled prior to removal from the debris pile and interested parties will be notified that such procedure has been employed.

We expect to find the demo columns at ground level under the bulk of the debris, and we propose that the demolition work be paused when the demolition reaches a point at which all of the following structural elements are visible and safely accessible for marking and precise location by surveying instrument (Figure 2):

1. All demo column sections separated from the structure by the shape charges, that is, the portions of the columns between the lower and upper shape charges;
2. The upper sections of the demo columns, which may still be connected to the upper structural framing elements (i.e., the section of column above the upper shape charge); and
3. The lower sections of the demo columns, which may still be connected to the base plates and footings (i.e., the section of column below the lower shape charge).

This "hold point" would occur after the bulk of the boilers themselves have been removed, and the nature of the framing debris below the boilers is exposed. We anticipate that experts from multiple parties will be interested in observing and documenting the site at this stage, before the demo columns have been disturbed. As such, the ongoing demolition may need to be held for two or three days depending on how difficult it will be for non-Silverado personnel to safely access the site (perhaps from lifts positioned above the debris). When possible, Silverado will notify all interested parties in advance of reaching a hold point to expedite the evidence documentation and evidence preservation.

A few notes about the demolition hold point:

- At Silverado's discretion, the hold points can occur at different times for the two structures.
- Because of the kicker charges, the locations and orientations of the demo columns may have changed significantly during the blast, and their original location and orientation may not be obvious. As such, each demo column, and each piece of demo column, identified in the debris will be given unique mark that includes its location (by grid, Figure 2) and orientation in the debris. Any demo column piece or other Evidence to be extracted will have its position, orientation and unique ID recorded and photographed.
- After the parties have had a chance to document the site, the demo columns will be precisely located by licensed surveyor. At the surveyor's discretion, this could be done using total station equipment to locate key points in 3D, or using LIDAR.

- Two video cameras will be set up at each structure to continuously document the demolition progress. Live images from the camera will be available real-time to any of the parties using a secure web site. Time-lapse images will be permanently stored and made available to any of the parties at their request. If demo columns or their connections are inadvertently disturbed prior to the hold points, the time lapse images will be used to determine their original position and orientation to the degree possible. Details of the camera vantage points, resolution, time lapse storage, etc. are under development.
- While we expect the demo column evidence to be located at ground level under the bulk of the debris, it is possible that portions of these columns were ejected upward into the structure and are now supported higher in the debris pile. If Silverado identifies any structural elements higher in the debris pile that they suspect could be portions of the demo columns, demolition will be paused while the potential Evidence is evaluated and documented. (This does not imply that Silverado is responsible for identifying or differentiating potential Evidence throughout the height of the debris pile, only that they are obligated to inform PG&E if they observe pieces they believe have come from the demo columns and may be Evidence.)

Evidence Identification and Removal

Evidence List

Based on our review of the structures and our understanding of the demolition process, Exponent has identified items contained in the collapsed structures to be retained as Evidence. In general, we intend to keep as Evidence only the columns that had demolition charges mounted, and selected pieces of refractory brick. Each of those columns is nominally in three pieces: 1) the section above the shape charge, 2) the section below the bottom shape charge, and 3) the central section. It is unknown whether these sections were completely separated, and if they were completely separated, if each section is intact or whether some may be found in more than one piece. Tables 1 and 2 present lists of these sections. The locations of the elements to be recovered, as they were in the standing tower, are shown schematically in Figure 1 and Figure 2. Items not on this list will be disposed of or salvaged at the discretion of Silverado and PG&E.

Piece Marking

To the extent reasonably and safely possible, prior to removal of any Evidence item, PG&E or Silverado (or their delegates) will mark it with permanent marker or tag it with a securely fixed evidence tag with a unique identifier. The identifier will record the placement within the debris (grid), orientation (by marking top and EW or NS ends), and the matching surfaces to other pieces separated during the course of this demolition. After marking and prior to removal, the piece will be photographed in place. If additional marking is required by demolition cuts, it shall be unique and unambiguous. Should safety concerns require that any piece of Evidence be removed from the debris prior to marking, the removal process will be documented by photographs and/or video and the Evidence will be marked or tagged, as noted above, after such removal and the approximate location of the Evidence within the debris grid will be logged.

Because of the possibility that pieces may not still be located near where they were in the structure, no attempt will be made by PG&E or Silverado to identify the original locations of the Evidence pieces. Grid sections identified on each piece prior to removal will indicate the grid in which the piece was found, not necessarily where it originated.

In addition to marking the Evidence, each recovered piece will be recorded by an Evidence Custodian (or delegate) in the Evidence Log. For each piece of recovered Evidence, the log will record the date of recovery and storage location, and will be signed by the Custodian to indicate that the piece was properly recovered and stored in compliance with this plan. To maintain a clearly recorded chain of custody, future transfer of evidence, if any, will require an evidence release/receipt form signed by the Evidence Custodian (or delegate).

Removal

To the degree that is safe and practical, evidence removal shall conform to the following principles:

- To minimize marring of Evidence, synthetic fiber slings will be used for lifting evidence items whenever safe and feasible. Steel grapples, slings, cables or chains can be used at the discretion of Silverado if locations on Evidence surfaces marred by the steel are marked as demolition damage. In addition, if safe extraction requires the attachment of lifting lugs to the Evidence pieces, such attachments shall be marked to indicate they were made as part of this demolition.
- Generally, elements on the top of the pile shall be removed first, and the process will proceed by layers. Silverado is responsible to determine the sequence of evidence and debris removal such that it can be done safely with minimal additional damage (scrapes, dents, permanent bending) to the evidence. If field conditions and site safety do not allow systematic debris and evidence removal in this manner, Silverado will notify PG&E.
- Silverado will make reasonable efforts to identify Evidence and will avoid making demolition cuts on any identified Evidence piece within two feet of a shape charge location (unless safety concerns dictate otherwise), connection, fracture surface or any area of local, conspicuous damage or deformation. If safe removal dictates that an identified piece of Evidence be cut, and to the extent safely possible, both sides of a demolition cut will be uniquely marked and photographed prior to the cut such that the matching pieces can be clearly identified later. The cuts will be photo-documented in detail before, during and after the cutting. Locations of demolition cuts or unintended demolition damage shall be spray painted orange so they can be easily identified later as being associated with this demolition.

Evidence Storage and Security

Protocols for handling and storage of blast shrapnel and other material collected away from the structures are not part of this protocol, which deals solely with generally larger pieces removed from the debris pile as part of ongoing demolition work.

Evidence removed from the collapsed structures as part of the demolition will be stored in a secured location in the southeast corner of the KPP yard. Evidence will be stored open to weather, but fracture surfaces or other features may be appropriately coated or otherwise protected at the discretion of the Evidence Custodian(s). Column sections will be stored off the ground on stable blocks, cribbing or other dunnage in such a way to provide convenient access for inspection and sample removal. Large steel sections other than lengths of columns (or beams) shall be stored off the ground on stable cribbing or dunnage.

The KPP site is currently secured by chain link perimeter fencing topped with barbed wire, a locked gate, and 24/7 security personnel. The evidence area will be further protected by additional fencing to delineate it within the KPP site. As such, parties wishing to inspect the removed evidence will need to make arrangements with PG&E and OSHA.

Known Hazards

Some construction hazards are unique to demolition, particularly continued demolition of collapsed structures. One potential hazard is the presence of strain energy stored within the bent and distorted steel that could cause the steel to rebound when cut free. Personnel should stay as far from the debris pile as possible during demolition. Though it appears that the debris has generally settled into a relatively stable pile, there remains a serious risk of shifting and falling steel as the demolition progresses and the debris piles are disturbed. The intended progression of the demolition is prevalently top to bottom, minimizing disturbance of lower, supporting elements of the pile. However, as demolition progresses Silverado may opt to provide bracing should the debris pile become unstable as evidenced by visual or audio indications of shifting. Details of the means and methods to be employed by Silverado to minimize these risks are outside the scope of this protocol; Silverado's safety procedures shall have precedence over anything contained in this protocol.

The potential for unexploded ordnance on the site is outside the scope of this protocol and will be handled pursuant Silverado Contractors' Blast Assessment Plan, which is attached hereto.

Evidence Custody

PG&E will designate an Evidence Custodian, and Cal OSHA at their discretion can designate a joint Evidence Custodian, for all Evidence recovered from the collapsed structures during demolition and stored at the KPP site. The Evidence Custodians are responsible for overseeing the proper documentation of the evidence source(s) and transfer(s) from the KPP site, as well as responding to requests for access to the evidence. To expedite the demolition process and subsequent access to the Evidence by other parties, the Evidence Custodians can delegate these responsibilities as required.

Clear documentation of the chain of custody will be maintained. Any transfer of Evidence from the KPP site will require release and receipt forms signed by both Evidence Custodians. The release/receipt forms will record the Evidence piece number and date/time of the transfer(s), and will be kept on file at the KPP site.

Limitations

It is understood that the highest priority is minimizing further risks to workers, equipment and property. It is also understood that proper planning cannot eliminate all risk, but every attempt should be made to minimize these risks, at the expense of time, schedule, and cost. The means and methods of the demolition, and associated efforts to ensure the well-being of site personnel, shall be solely determined by Silverado Contractors. Safety of personnel as determined by Silverado shall take precedence over any of the recommendations or requirements of this protocol.

Appendix A

Sketches

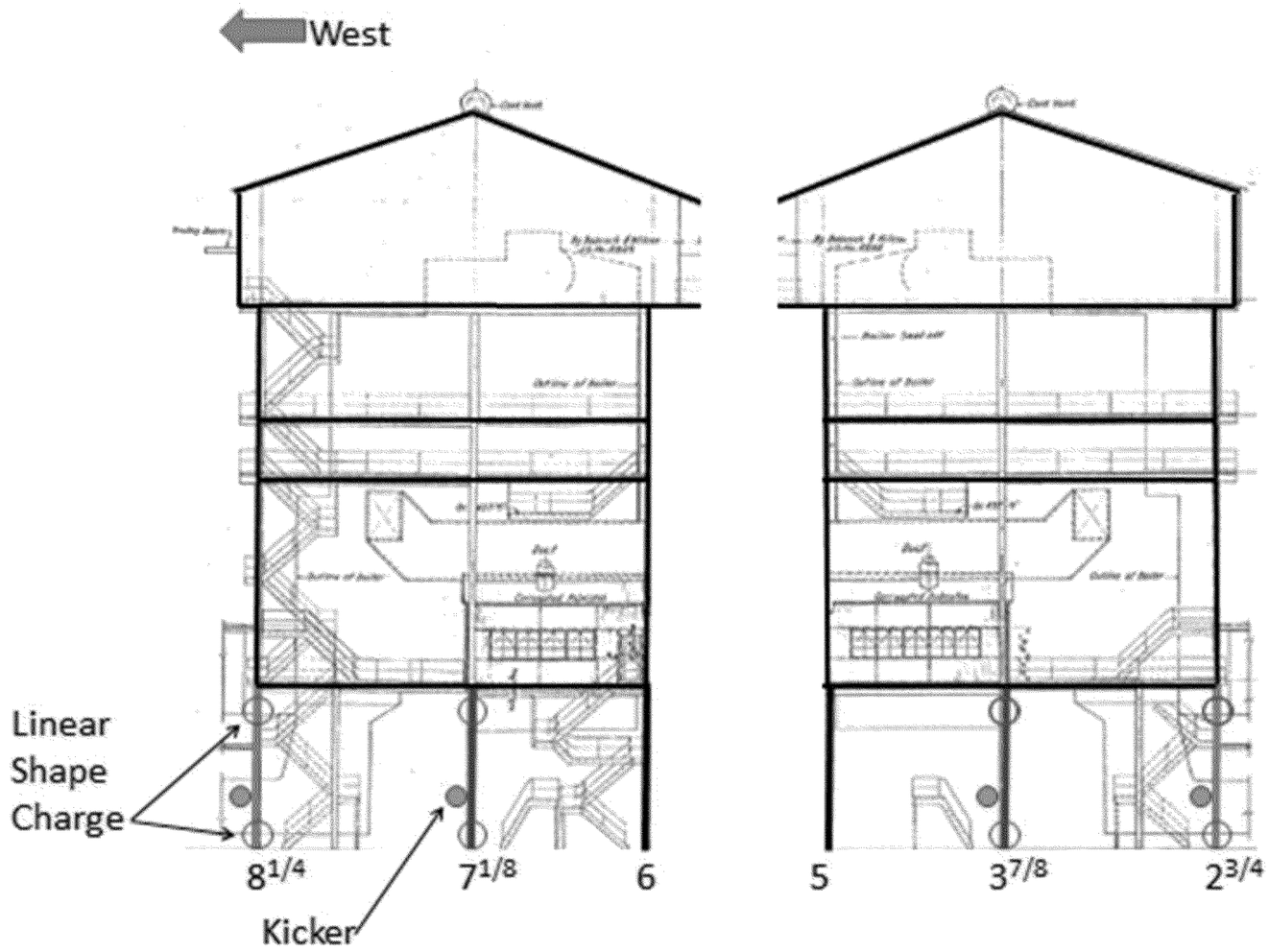

Figure 1. Reported locations of charges.

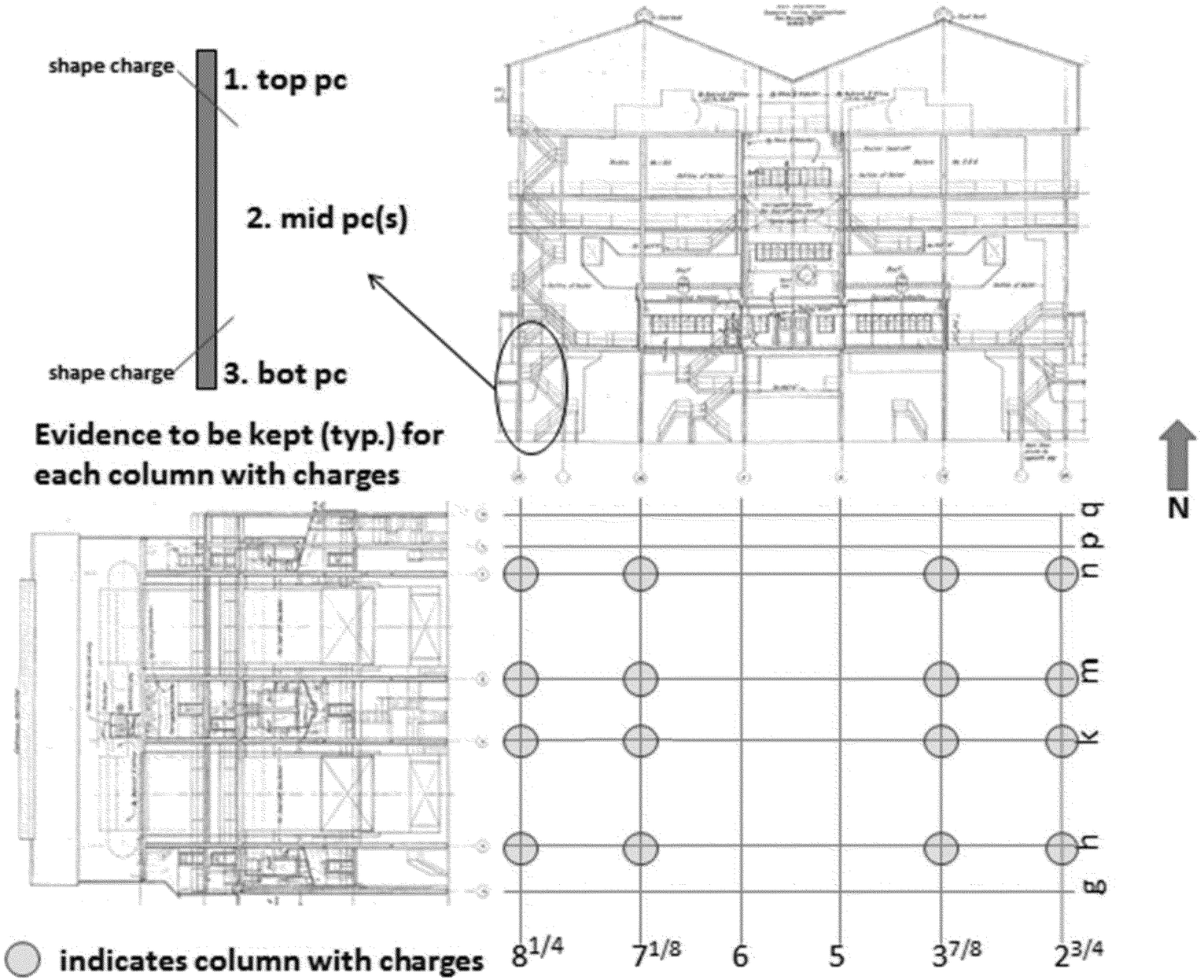

Figure 2. Location grid and evidence piece definition.

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Appendix B

Tables

Evidence List for Boiler 1&2 Structure					
Num	Description	Grid	Evidence ID(s)	Date Removed	Grid where Found
1	Top of column (above top LSC)	$2^{3/4}$-h			
2	Middle section of column (between LSCs)				
3	Bottom of column (below bottom LSC)				
4	Top of column (above top LSC)	$2^{3/4}$-k			
5	Middle section of column (between LSCs)				
6	Bottom of column (below bottom LSC)				
7	Top of column (above top LSC)	$2^{3/4}$-m			
8	Middle section of column (between LSCs)				
9	Bottom of column (below bottom LSC)				
10	Top of column (above top LSC)	$2^{3/4}$-n			
11	Middle section of column (between LSCs)				
12	Bottom of column (below bottom LSC)				
13	Top of column (above top LSC)	$3^{7/8}$-h			
14	Middle section of column (between LSCs)				
15	Bottom of column (below bottom LSC)				
16	Top of column (above top LSC)	$3^{7/8}$-k			
17	Middle section of column (between LSCs)				
18	Bottom of column (below bottom LSC)				
19	Top of column (above top LSC)	$3^{7/8}$-m			
20	Middle section of column (between LSCs)				
21	Bottom of column (below bottom LSC)				
22	Top of column (above top LSC)	$3^{7/8}$-n			
23	Middle section of column (between LSCs)				
24	Bottom of column (below bottom LSC)				
25	Refractory Brick	$3^{7/8}$-$2^{3/4}$/h-k			
26	Refractory Brick	$3^{7/8}$-$2^{3/4}$/m-n			

Evidence List for Boiler 3&4 Structure					
Num	**Description**	**Grid**	**Evidence ID(s)**	**Date Removed**	**Grid where Found**
1	Top of column (above top LSC)	$8^{1/4}$-h			
2	Middle section of column (between LSCs)				
3	Bottom of column (below bottom LSC)				
4	Top of column (above top LSC)	$8^{1/4}$-k			
5	Middle section of column (between LSCs)				
6	Bottom of column (below bottom LSC)				
7	Top of column (above top LSC)	$8^{1/4}$-m			
8	Middle section of column (between LSCs)				
9	Bottom of column (below bottom LSC)				
10	Top of column (above top LSC)	$8^{1/4}$-n			
11	Middle section of column (between LSCs)				
12	Bottom of column (below bottom LSC)				
13	Top of column (above top LSC)	$7^{1/8}$-h			
14	Middle section of column (between LSCs)				
15	Bottom of column (below bottom LSC)				
16	Top of column (above top LSC)	$7^{1/8}$-k			
17	Middle section of column (between LSCs)				
18	Bottom of column (below bottom LSC)				
19	Top of column (above top LSC)	$7^{1/8}$-m			
20	Middle section of column (between LSCs)				
21	Bottom of column (below bottom LSC)				
22	Top of column (above top LSC)	$7^{1/8}$-n			
23	Middle section of column (between LSCs)				
24	Bottom of column (below bottom LSC)				
25	Refractory Brick	$7^{1/8}$-$8^{1/4}$/h-k			
26	Refractory Brick	$7^{1/8}$-$8^{1/4}$/m-n			