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Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

14-AMRP-0286

SEP 30 2014

Ms. J. A. Hedges, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton
Richland, Washington 99354

RECEIVED
OCT 06 2014

Dear Ms. Hedges:

COMPLETION OF HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER (TRI-PARTY AGREEMENT) MILESTONE M-089-06-T01

Tri-Party Agreement Milestone M-089-06-T01, "Submit the 30% design of the closure of mixed waste units in the 324 building REC B cell, REC D-cell, and high level vault and low level vault that includes a schedule to complete the design," due September 30, 2014, is complete. This milestone consists of the 30 percent design for remediation of the high radiation dose portion of waste site 300-296 (contamination under 324 B-cell) and the 30 percent design for removal of hot cells and vaults. The 30 percent design for 300-296 remediation was prepared for Washington Closure Hanford LLC (WCH) by AREVA Federal Services as part of the current ongoing design effort. The 30 percent design for hot cell removal was prepared for WCH by Northwest Demolition and Environmental in 2010.

Attachment 1 provides a summary description of the milestone deliverable package. Attachments 2, 3, and 4 provide the 30 percent design for 300-296 remediation, the 30 percent design for hot cell removal, and the schedule for completion of the design, respectively.

If you have any questions, please contact me or your staff may contact R. F. Guercia, of my staff, on (509) 376-5494.

Sincerely,

Mark S. French, Director
River Corridor Division

AMRP:RFG

Attachments

cc w/attachs: See Page 2

SEP 30 2014

cc: w/attachs:
G. Bohnee, NPT
F. W. Bond, Ecology
R. Buck, Wanapum
L. M. Dittmer, CHPRC
D. A. Faulk, EPA
S. L. Feaster, WCH
S. Harris, CTUIR
S. Hudson, HAB
R. Jim, YN
R. A. Kaldor, MSA
K. Niles, ODOE
R. E. Piipo, MSA
D. Rowland, YN
R. R. Skinnarland, Ecology
C. P. Strand, WCH
Administrative Record, H6-08 (300-FF-2 0U)
Environmental Portal

Attachment 1

Attachment 1

Milestone Description: TPA Milestone M-089-06-T01 (Target Milestone Due Date: September 30, 2014)

Submit the 30% design of the closure of mixed waste units in the 324 building REC B-Cell, REC D-Cell, and high level vault and low level vault that includes a schedule to complete the design.

Background/History:

The Hanford Site, located adjacent to and north of Richland, Washington, is operated by the U.S. Department of Energy, Richland Operations Office (RL). The 324 Building is located in the 300 Area of the Hanford Site. The 324 Building was constructed in the 1960s to support materials and chemical process research and development activities ranging from laboratory/bench-scale studies to full engineering-scale pilot plant demonstrations. In the mid-1990s, it was determined that dangerous waste and waste residues were being stored without a permit for greater than 90 days in portions of the 324 Building Radiochemical Engineering Complex (REC) and the High-Level Vault/Low-Level Vault (HLV/LLV) Tanks.

Through the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-89 (Ecology, et al., 1996), agreement was reached to close the non-permitted RCRA unit in the 324 Building. A RCRA closure plan, DOE/RL-96-73, Rev. 3, dated August 2005, addresses the identified building areas requiring closure and provides commitments to achieve the highest degree of compliance practicable, given the special technical difficulties of managing mixed waste that contains high-activity radioactive materials and the physical limitations of working remotely in the areas within the subject closure unit.

Deactivation and demolition preparations were performed at 324 Building from 2005 through 2009 by Washington Closure Hanford (WCH) as part of the River Corridor Closure Contract DE-AC06-05RL14655. In parallel with these preparations, WCH awarded a subcontract to Northwest Demolition and Environmental (NWDE) in February, 2010 to prepare the design and execute the removal of the REC Hot Cells and HLV/LLV. The 30% design for hot cell removal was approved by WCH in July, 2010.

Late in 2009, during removal of highly radioactively contaminated grout from the sump and trench in the 324 REC B-Cell, a visible breach was discovered in the stainless steel liner of the B Cell sump. This newly discovered condition resulted in the need to check for potential radioactive materials under the hot cell prior to initiating removal. To access the area under the hot cell, WCH deactivated and demolished the 324 Maintenance Annex/Pad on the north side of the 324 Building. This area was excavated to approximately -15' below grade and a hydraulic push rig was used to insert a series of closed-end steel tubes called "Geoprobes" under the hot cell. Placement of the first probe was completed in November 2010. Radiation detectors were inserted into the probes to measure radioactivity in the soil. Very high levels of radiation (up to nearly 10,000 R/hr) were detected in the tubes, leading WCH to conclude that significant amounts of radioactive material had leaked from B Cell into the soil. Subsequent sampling of contaminated soil confirmed this conclusion. As a result, ongoing activities to deactivate the building were placed on hold pending a design and remediation of this newly discovered waste site.

Upon discovery of the new waste site, the NWDE contract for removal of the hot cells was cancelled.

In April 2013, TPA milestone M-89-06-T01 was established (target date September 30, 2014): "Submit the 30% design of the closure of mixed waste units in the 324 building REC B-Cell, REC D-Cell, and high level vault and low level vault that includes a schedule to complete the design."

As discussed between RL and Ecology (CCN 176836, dated August 18, 2014, the 30% design of closure of mixed waste units consists of the 30% design for remediation of the high radiation portion of the 300-296 Waste Site (waste site under 324 B-Cell) and the 30% design for removal of the 324 Building hot cells and vaults. This letter report provides a summary description linking the two portions of the design and describes how they fulfill the 30% design of the closure of the mixed waste units (B-Cell, D-Cell, HLV and LLV and associated piping).

Discussion:

As described in DOE/RL-96-73, Rev. 3, the RCRA closure of mixed waste units in the 324 Building requires removal of B-Cell, D-Cell, HLV, LLV and associated piping, and removal of soil to a depth of 0.5 meter under the TSD unit foot print. Furthermore, National Priorites List Change Agreement NPL-141, signed November of 2007, established the enforceable sections of the Closure Plan closure as those performance standards contained Chapter 6.0, and Table 6-1, and P.E. certification requirement in Section 7.9. Remediation of the highly contaminated portion of waste site 300-296, Highly Contaminated Soil Under 324 B-Cell, is a necessary predecessor to the safe removal of the hot cells because the soil underlying B Cell contains very high concentrations of radioactive Cs-137 and Sr-90, and would potentially expose workers to lethal dose rates if the most contaminated portions of the waste site were not handled in a shielded facility. Unacceptable airborne releases and offsite dose consequences could also result if the material were not handled in an appropriately designed nuclear facility. For these reasons, the design for remediation of the most highly contaminated portion of 300-296 is a necessary component of the overall closure of the mixed waste units.

The highly contaminated portion of the waste site is currently defined as soil at a depth less than 10' below the B-Cell floor [final elevation -22'6" below grade] and having a general area soil dose rate exceeding 1 R/hr gamma. (Localized hot spots <3' diameter are allowed to remain in soil). Contamination areas beyond 10' in depth or greater than 2' outside the inner B-Cell shield wall are not included in the initial phase of 300-296 remediation. Adjustments to the definition may be made based on advances in techniques for open-air soil remediation or on additional characterization of the waste site. Figure 1 provides a graphic representation of the waste site.

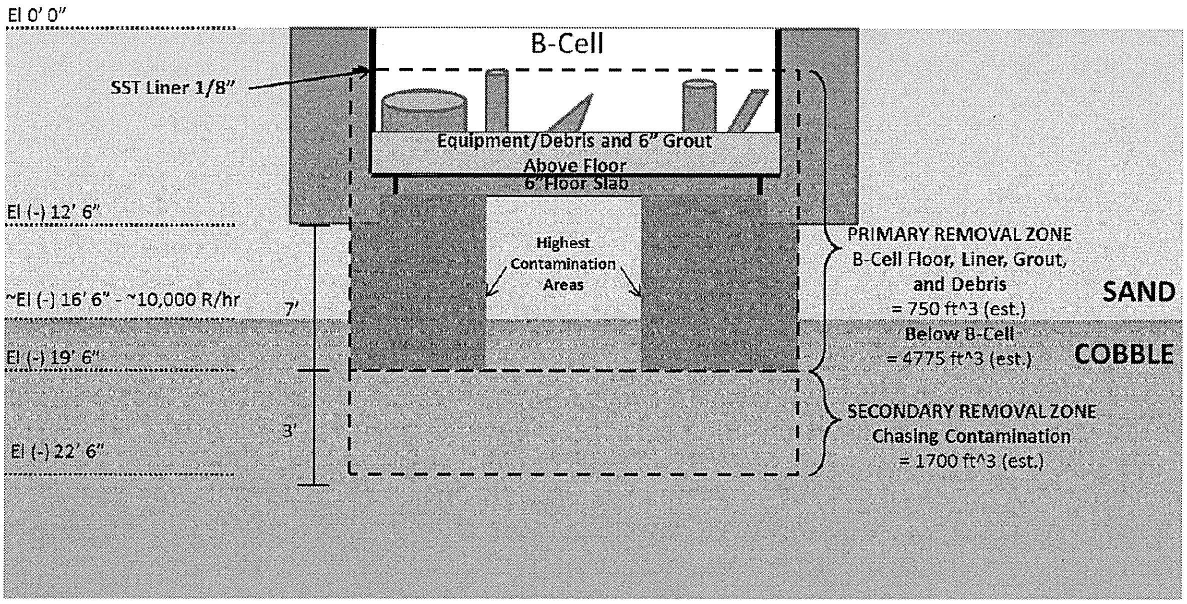

Figure 1. Highly Contaminated Portion of Waste Site 300-296

After remediation of the highly contaminated soil, the waste site will be temporarily backfilled to the level of the B cell footings.

As part of remediation of the waste site, retrieved materials will be placed in hot cells within the REC and stabilized with grout. Some portion of the material may be removed by packaging in shielded containers and removing through the airlock for disposal at the Environmental Restoration Disposal Facility or other appropriate locations.

After completion of highly contaminated waste site remediation and stabilization of the material, the facility will be in a status similar to the assumed starting point before discovery of the waste site. Therefore, for purposes of closure, the execution of hot cell removal similar to the previously awarded NWDE contract, followed by minor below grade removal of any remaining portions of the RCRA unit and 0.5 meters of soil under the unit, would constitute closure consistent with DOE/RL-96-73, Rev 3 and NPL-141.

In accordance with Milestone M-89-06-T01, this transmittal consists of the 30% Design for remediation of the highly contaminated portion of 300-296 (Attachment 2), the 30% Design for Hot Cell Removal (Attachment 3), and a schedule for completion of the 300-296 Remediation design (Attachment 4). Completion of the hot cell removal design will be addressed as part of milestone M-89-06 (June 30, 2016).

Attachment 2

WASHINGTON CLOSURE HANFORD	Job No. 14655

SUPPLIER/SUBCONTRACTOR DOCUMENT STATUS STAMP

- [X] 1. Work may proceed
- [ ] 2. Revise and resubmit. Work may proceed prior to resubmission.
- [ ] 3. Revise and resubmit. Work may proceed prior to resubmission subject to resolution of indicated comments.
- [ ] 4. Revise and resubmit. Work may not proceed.
- [ ] 5. Permission to proceed not required.

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier/subcontractor and does not relieve supplier/subcontractor from full compliance with contractual obligations or release any "holds" placed on the contract.

	CIVIL/STRUCTURAL/ ARCHITECTURAL/ GEOTECHNICAL	ELECTRICAL	MECHANICAL	PROCESS/NUCLEAR	CADD	PROJECT REP. Project Eng	ENVIRONMENTAL	WASTE MANAGEMENT	SAFETY	INDUSTRIAL HYGIENE	FIRE PROTECTION	QA	RADCON	FIELD ENGINEER	TRAINING	OTHER
CHECK REVIEW REQUIREMENT						X										
REVIEWED BY						[initials]										

[signature]
Project Engineer/STR

Date 8/27/14

DOCUMENT ID NUMBER

C036502A00	05-002B	001B
SC/P.O. No.	SSRS ITEM	SUBMITTAL

WCH-DE-032 (02/13/2014)

see the attached

Comments on C036502A00-05-002B-001B

The comment resolutions identified as, "to be addressed in the 60% Design Submittal", included in submittal C036502A00-05-002B-001A (see the attached Review Comment Record) are applicable to this submittal. In addition, the 60% Design Submittal shall include a matrix identifying the location where the comment has been addressed within the 60% Design Submittal.

The 60% Design Submittal must also include a B-Cell structural stabilization design that can be constructed within the project baseline schedule and must include supporting calcs and drawings in accordance with Exhibit "D" Scope of Work.

REVIEW COMMENT RECORD

Document Reviewed: 300-296 Soil Remediation Project Phase I & II 30% Design Reviewers(s): R. J. Reeder, T. Kisenwether, R. Garcia, S. Chase

Revision(s)/Rev. #: B Reviewing Department: WCH Radiological Control and Subcontracts Review Date: 7/9/2014

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
1	Pg 5 section 2.1.1 second paragraph	AFS needs to evaluate the schedule durations for REC Cell clean out and air lock dose reduction based on the assessment report and the 60% design submittal. (TK-RG)	X		PARTIALLY ACCEPTED *Evaluation of the REC Cell clean out options are underway, and a schedule will be provided with the 60% design submittal.* (AFS)
2	Pg. 6, 2nd Paragraph, 1st Sentence and several other locations.	Referenced calculation number is 0300X-CA-N0115. Need global correction. (RR)	X		ACCEPTED *Reference will be corrected with other editorial comments.* (AFS)
3	Page 6 Section 2.1.1	The debris removal/relocation provides generic descriptions for disposition paths. Include specific details concerning debris disposition routes in the 60% design package for WCH to procure waste disposal containers for shipment to ERDF. (TK-RG)	X		ACCEPTED *Several packaging options will be identified in the 60% design package. Final selection will be based on actual dose rate readings taken during operations.* (AFS)
4	All figures.	All figures are blurry. (RR)		X	PARTIALLY ACCEPTED *Most originals appear to be crisp; replacements will be uploaded to ensure clarity. However, there are some images used that cannot be edited/sharpened due to the fact that the original figure is unavailable.* (JS)
5	Page 11 Section 2.1.2	Due to limited space within the cells and disposal issues provide an remediation equipment disposition/disposal/storage plan with the 60% design package. (TK-RG)	X		ACCEPTED *The disposition/disposal/storage plan for new equipment introduced to the REC will be provided with the 60% design package.* (AFS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
6	Pages 12 thru 24 Sections 2.1.2 and 2.1.3 Equipment Installation REA Support Installation	The REA concept appears to be advanced beyond the 30% design stage but several concerns/details will need to be incorporated as the design advances(if not already) and validated during the proof of principle testing including but not limited to the following: - tolerances will need to be tightly controlled to ensure the arms are capable of be mounted at each mounting location (TK) - durability of the remote connections will need to be tested (TK) - reliability of the remote connections will need to be tested (TK) - constructability/installation of the arms will need to be thoroughly tested/validated in a remote environment (TK) - alignment of the arms to the mounting fixtures (TK) - elimination of thread connection issues such as galling, cross threading, stripping (lead ins, dissimilar metals, first thread modifications, etc.) (TK) - simplifying as many features as possible to avoid technical issues with alignment, interchangeability, maintenance, and durability. (TK) - how vulnerable are the hydraulic and mounting connections to damage (oil rings, threads, internal fitting shut off valves, fitting, etc.). (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED (Tolerances, RC Durability/REliability, Constructability/Installation, Alignment to Mount) *Durability and reliability of RCs, as well as REA tolerances, constructability, installation, and alignment shall all be evaluated during the manufacture and testing of the REA during Proof of Principle (PoP).* (Thread Issues) *Although thread connection issues will be evaluated during the PoP, it should be noted that a lot of effort has gone into the design of the threads to avoid potential issues.* (Simplification) *Following the completion of testing, all possible simplifications will be made.* (Vulnerabilty of Connection) *The hydraulic and mounting connections are set inside each of the REA supports, protected from most kinds of impact during transportation.*

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
6	Pages 12 thru 24 Sections 2.1.2 and 2.1.3 Equipment Installation REA Support Installation (con't)		X		*Minimal short-term exposure however may occur during transport and installation. In addition, if an REA support is not in use, a dummy support will be used to seal the openings in order to protect the fittings from damage and dust.*
		- compatibility of oil ring seals, hoses, valves,, actuators, etc. with the selected hydraulic fluid and the radiation levels (RG)			(Rad Compatibility) *A full component radiation evaluation will be submitted as part of the 60% design review package.*
		- Connection point still seems complex, prone to small amounts of dirt foaling it and light weight for the abuse it will take (SC)			(Connection Complexity) *Although the REA connection is indeed the most complex part of the entire design, an extensive effort has been made to combine simplicity and robustness. As previously mentioned, following the completion of testing all possible simplifications will be made.*
		- It appears that the alignment bolt and pin will work when tool is balanced, but will it when the arm has failed and is not balanced? (SC)			(Tool Alignment) *The fitup of the REA has been designed to allow for some tilt/misalignment, however, if at some point the REA tips too much, it will not connect. The system is designed to have a lift point on the REA that will allow it to tip slightly backward during normal transport, which is contingent on the actual REA position during deployment. In all normal operations, the position of the REA will be set in the collapsed, or most rear position; the lifting points will be designed with this position in mind. If an REA fails and needs to be removed, it is possible that it may not be in this position. That being the case, it would not be reinstalled, but rather disposed*

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type Major	Comment Type Minor	Resolution
6	Pages 12 thru 24 Sections 2.1.2 and 2.1.3 Equipment Installation REA Support Installation (con't)		X		*of. Exact CGs are difficult to predict using computer models; REA fabrication and PoP testing will allow for CG determination to be finalized.*
		-Both sides of the hydraulic "No Leak" connect fittings will be exposed to the cell (the wall fittings for extended period of times) these fittings do not operate if any dirt/debris is present which would be likely in this situation (SC)			(No Leak Exposure) *As previously mentioned, if an REA support is not in use, a dummy support will be used to seal the openings in order to protect the fittings from damage and dust.*
		-Same problem with the Hydraulic tool coupler, any dirt or debris will prevent its use (SC)			(Tool Coupler) *The REA is recommended to be stored with a tool in place at all times to avoid and prevent the buildup of contamination The tool side of fittings will be exposed when not in use, and it should be noted that the tool connections are commercial grade, designed for use in dusty construction environments. In addition, the updated tool holder design will include some sort of seal or shield intended to inclose tool areas.*
		Due to durability concerns with the hydraulic connection feature, alternate design changes should be evaluated as part of the POP testing such as: - have utility through wall hoses, to be connected by manipulators and then have the tools hung on the mounting brackets, also have the arms dedicated to the end effector and move them around cell as required., takes away a lot of moving parts and tight tolerance hydraulic connections. (SC)			Design Changes: (Tool Coupler) *This option had been considered by the Kurion design team, but was not selected as the primary option because of the numerous disadvantages. 1.) This option would place a lot of loose hoses in the cell that could snag on other items and interfere with performed work. 2.) Some sort of cable management would have to be designed for cable restraint. 3.) Tool changes would require more time when*

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
6	Pages 12 thru 24 Sections 2.1.2 and 2.1.3 Equipment Installation REA Support Installation (con't)		X		*using the working MSMs. It was estimated that the proposed remote change would take only a few minutes compared to the several hours required for the MSMs to perform the job. Currently the MSMs are listed as a backup option rather than a requirement, however, it may be a better compromise to have both options available for use. It should be possible to include both the remote and manual/MSM tool changing options, then in the event that the remote tool change fails, the manual one could serve as backup.*(MC)
		- have the internal (cell side) connections made to the REA arm and pass the hydraulic hoses thru the tube sleeves and then make the connection in the gallery. Appropriate contamination control techniques will need to be developed. (BK)			(REA Internal Connection) *A version of this approach has already been designed, and could be used on the PoP equipment if required. However, we believe the method proposed in the design review is a much simpler option. The concern associated with the remote connection in the cell is recognized, along with the idea that the proposed alternative would prevent said issue, however, this alternative has disadvantages worth mentioning. 1.) A long connection piece on the ends of the REA, 5ft in this case, will have to be threaded into the thru-support tubes. This will require more care be given to the movement and handling of the REA within the cell. As noted previously in a comment by WCH, the alignment of the REA to the post is already a potential source of difficulty. 2.) This extension will be exposed to various*

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
6	Pages 12 thru 24 Sections 2.1.2 and 2.1.3 Equipment Installation REA Support Installation (con't)		X		*forms of impact that could potentially damage the unit beyond repair. 3.) Contamination from the cell will be pushed down the thru-tube into the gallery spaces, and therefore will require an additional procedure for proper contamination management. It is our belief that the remote fittings will work well with little to no issue, and propose that we test the REA as-is during the PoP. If issues arise with the connection, we can then implement the alternative design suggested, which would already be complete and ready to go during testing.* (MC)
7	Pg. 13, 3rd Paragraph	Water will be lost into the space between the concrete wall an liner. Historically, this has shown up in Rm. 18. Water will also be lost into embedded conduit and process piping that may be cut. Need to evaluate potential pathways for fugitive water, likelihood of contamination spread, and how it will be controlled/monitored. (RR)	X		ACCEPTED *It was proposed that we fill with epoxy any internal pipes that may be breached during coring. It may also be possible to stop, or significantly reduce using water when the core is near the outer surface. This will be evaluated further as part of the 60% design.* (MC) (WS)
8	Pg. 13, Last Paragraph, 1st Sentence	Reads awkward. Check grammar. (RR)		X	ACCEPTED *This section will be reviewed and edited accordingly.* (MC)
9	Pg. 14, Last Paragraph through Pg. 16, 1st Sentence.	Polymer, epoxy and grout are all mentioned for filling annulus around through tubes. Need to be consistent with the options. (RR)		X	ACCEPTED *All referenced to "filling the void" have been changed to "grout."* (MC)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
10	Pg. 18, 1st Paragraph.	The small transfer containment in the NE corner was used to transfer sample from B-Cell and is connected to an embedded sample transfer mechanism within the cell wall. How will installation of through tubes in this location affect future sample transfer ability? The containment and sample transfer mechanism are highly contaminated. How will contamination be controlled during removal?(RR)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *The cores on the NE corner of the cell currently interfere with the glovebox for loadout. A part of this glovebox would need to be removed to install the cores. The actual transfer system, internal to the wall, should not be affected; the glovebox however will be. This work has yet to be planned. Contamination control will be carefully considered. This will be addressed further in the 60% design phase.* (MC)
11	Pgs. 12 through 18 Through Tube Installation	The open port from core drilling may result in high radiation area conditions in the B-Cell galleries until the through tube mechanisms are installed. Is anything planned to minimize worker exposure? (RR)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *When the thru tubes are installed, they will be partially open to the inside of the B-cell. However, current readings already taken from hot cell open ports, similar to the grout hose core drilled open port, show a dose rating near background. Therefore, it appears that minimal streaming doses through these penetrations is the norm. It should be noted that these port openings will be constructed and surrounded by at least 2" of thick steel. A lead outer plate can also be installed to further limit worker dose and exposure. This will be addressed further in the 60% design phase.* (MC)
12	Pgs. 12 through 18 Through Tube Installation	Radiation streaming through the tubes may be a problem during soil remediation. This needs to be evaluated and addressed. (RR)	X		ACCEPTED *Please refer to comment 11, and note that this will be addressed further in the 60% design phase.* (MC)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
13	Page 26 Section 2.2.1 Grout/Fixed Debris Removal	This section is confusing. First paragraph states all the debris can be chipped out using the upper REA and hammer. Is this from one location or will the REA need to be relocated to several mounting locations? The second paragraph states it will be necessary to relocate the Upper REA. for loading out material. The sequence for removing the B Cell grout and debris needs to be detailed (how many REAs are required, minimize REA movements, will the debris fit into the sacks, where will the debris be relocated to, which debris be packaged for shipment to ERDF, what debris can not be size reduced, etc.) in the 60% design package. (TK)	X		ACCEPTED *Section will be reviewed and edited accordingly.* (MC)
14	Page 28 Section 2.2.2 Floor Removal	Is there a reason why the floor saw is limited in length (i.e. if it was the entire floor length less relocations would be require, this would also eliminate alignment issues with trying to match previous cut kerfs)? POP testing should include maximum length cutting/ deployment tests to minimize the number of saw handling events. (TK)	X		COMMENT NOTED and PARTIALLY ACCEPTED *Floor saw length was limited by what we can reasonably handle in the airlock, therefore a partial length reduction was necessary. In this application, the saw may be easily repositioned, making a 1/2 length saw as functional as a 3/4 length saw. This will be addressed further in the 60% design phase.* (MC)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
15	Pg. 29, Paragraph 2.2.3.	Radiation streaming through the binder hose mechanism penetration may be a problem during soil remediation. This needs to be evaluated and addressed. (RR)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *The binder hose penetration should be situated away from normal operation. Additional shielding can be added; however as mentioned in comment 11, current penetration readings within the cell have only been low level. The only likely source of high radiation would be a waste container, which will be always be situated lower that the binder hose penetration. This will be addressed further in the 60% design phase.* (MC)
16	Pg. 29, Section 2.2.3.	**Binder and grout are used interchangeably in the document, need to be consistent.** (TK)		X	ACCEPTED *Definitions have been established in the terms section of the document, and will be updated throughout the remainder of the document.* (JS)
17	Pg. 29, Section 2.2.3.	A aid such as a funnel should be considered for loading the sacks. (TK)	X		PARTIALLY ACCEPTED *A funnel or other fill aid will be considered as the design progresses if PoP and Mock-Up testing prove that it is necessary. This will be addressed further in the 60% design phase.* (HS)
18	Pg. 29, Section 2.2.3.	Build up of binder and soil on the REA buckets and other soil loading equipment needs to be evaluated as apart of the POP testing. (AFS Technical Review Team) (TK)	X		ACCEPTED *The ability to knock binder off the REA and tools will need to be carefully evaluated during testing as described in the test plan objective of KUR-1782P-TPL-001. It should be noted operation experience indicates that this is not only possible, but also typical when working with grout. This will be addressed further in the 60% design phase.* (MC) (WS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
19	Pg. 30, 2nd Paragraph	Survey protocol and a tech basis document for determining sack radioactive material inventory will need to be developed.(RR)	X		ACCEPTED *This information is anticipated to be provided with the 90% design package.* (AFS)
20	Page 30 all paragraghs	Will the soil sacks be leak tight? Will the binder seep out of the sacks? (TK)	X		ACCEPTED *The soil sacks will be leak tight.* (MC)
21	Page 30 Soil Loading second paragraph (after Figure 44)	The fixative sprayed on of the sack while in the transfer barrier may cause issues with over spray build up on parts (detectors, weighing devices, moving parts,etc). Testing should include multiple applications to see if this becomes a problem. (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *Over spray and build up on parts is a concern. The detail design of the transfer barrier includes many feature to limit the buildup of fixative on key parts. Additionally all the moving parts including the spray heads will be modular and can be remotely replaced. Removing the fixative spray entirely is currently preferred and still being considered, although PoP testing will show how feasible this actually is. This will be addressed further in the 60% design phase.* (MC)
22	Page 30 Waste Loading last paragraph	The addition of an external strap for "tilting" the sacks could present hang up issues. testing needs to ensure this external strap does not cause hang-up/catching issues. (TK)	X		ACCEPTED *This will be further evaluated as the design progresses in the 60% design phase.* (WS)
23	Page 31 first paragraph	... "a very fluid mixture of grout will be pumped into...." As the design advances sealing of the cells to prevent leakage and migration of contamination outside of the cells will need to be developed. testing of these seals also must be included (e/g/ smoke testing seals as part of the installation and acceptance. (TK)	X		ACCEPTED *As the design matures to the 60% level, a method of sealing, and the associated techniques for testing the seal will be determined.* (WS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
24	Page 31 second paragraph	"The anticipated soil/binder mix is not expected to be fully saturated and therefore the potential for the soil/binder mix to seep from the penetrations is expected to be very low." How will this be verified? (TK)	X		ACCEPTED *This will be demonstrated during initial binder/soil formulation testing, and further addressed in the 60% design phase.* (WS)
25	Pg. 32, Second to last Paragraph	Increased dose rates from excavation of the B-Cell exhaust duct will need to be considered.(RR)	X		PARTIALLY ACCEPTED *Excavation around the exhaust duct is not within the existing project scope.* (WS) *Added third bullet that reads as "Increased dose rates relative to exposure of the exhaust duct."* (HS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
26	Page 32 Section 2.5 third paragragh	"Therefore, as part of an end-state analysis, structural evaluation of the monoliths should be performed by monolith contractor to guarantee integrity is maintained during lifting and transportation activities. This analysis would be performed for the final dismantled configuration of the REC." Exhibit "D" Section 1.2.1 page 9 - "The SUBCONTRACTOR shall perform a structural analysis of these monoliths to verify that the addition of the solidified debris, soil, cobble, or additional containers will not collapse the cell floors and affect the integrity of these monoliths for the future removal. Depending on the results of the analysis, the SUBCONTRACTOR shall design and install structural reinforcements as required to ensure the future removal of the hot cells in accordance with the provided cut plan." The analysis of the end-state analysis, structural evaluation of the monoliths is AFS's responsibility along with design of structural reinforcements. (TK)	X		ACCEPTED *The use of the wording "... as part of an end-state analysis..." was incorrect in regards to project terminology. Section 2.5 will be corrected to evaluate the end-state structure for lifting and handling. However, the monoliths will contain contaminated soil making the monoliths significantly heavier and, subsequently, the previously developed lifting and handling design inadequate.* *The evaluation will be based on assumptions regarding how the monoliths will be configured for lifting and handling. The AFS team has provided, and will continue to provide a mature end state assessment. End state assessment scope discussions will continue as the design advances.* *The 60% cut plan as received may need to be changed based on 300-296 project activities. Despite the evaluation results, the monolith contractor will have to perform their own calculations based on the new lifting and handling configuration design. The above statement will be changed to "Therefore, structural analysis of the monoliths should be performed to guarantee integrity. This analysis would consider the final dismantled configuration of the REC."* (WS) (RR)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
27	Pg 34 first paragragh	The OTRS option is onerous, time consuming, and, in essence, a full safety analysis that could take a year or better to develop. AFS shall exercise all options and approaches to keep the monolith packaging and shipping in accordance with the monolith SPA requirements. The decay heat calculations need to be provided as soon as possible and included in the 60% design package. The binder/immobilization media proposed does not meet the current monolith packaging requirement. The binder/ immobilization media testing must be conducted as soon as possible and included in the 60% design package. Without DOE-RL pre-approval in concept, the decay heat generation and/or binder/immobilization media issues may jeopardize the packaging and shipment monoliths not meeting the SPA requirements. (TK)	X		ACCEPTED *This is an ongoing issue that will be resolved as the design progresses towards a 60% design deliverable. In addition, this issue is identified on the major issues list, and is being tracked to ensure resolution.* (WS)
28	Pg. 34, Section 2.5.5, 2nd Paragraph.	Change from "maximum waste head" to maximum waste heat.(RR)		X	ACCEPTED *Change has been made.* (JS)
29	Pg. 34, Section 2.5.5,	Identify the reference or calculation where the heat generation values are developed/ documented. (TK)	X		ACCEPTED *Reference to the relevant calculations will be included as the design matures to the 60% level.* (WS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
30	Page 34 Section 2.5.4 second paragragh	Will the radiation levels in the soil/cells have an affect the binder? (TK)	X		COMMENT NOTED *At increased temperatures, the binder cure time is reduced but can be controlled through the use of retardants. In most instances with similar binder materials, properties have been enhanced. Additional research into similar materials is needed. If existing data is not immediately available, testing will be necessary to determine radiation effects.*
31	Page 35 Sections 2.6.1 through 2.6.2	Typo in the first sentence (period and comma). Also the location of the mock up is known. Typo concerning the Uniform International Building Code. This entire section contains typos, missing/misplaced words, etc. recommend a technical edit of these entire sections. Just a general comment this section appears to be more a description than a 30% design discussion. (TK)	X		ACCEPTED *Technical errors have been fixed. Mockup location has been updated. Design discussions of the Mockup Facility are separate, and were present in this design review only to enable a complete description of the REC facility work.* (JS)
32	Page 35 Sections 2.6.3	Section contains typos, missing/misplaced words. "... the operations center located at the Mock up Facility will be moved to the 324 Facility...." How will additional testing, RAs. ORRs, training, trouble shooting, etc. take place at the mock up if there is no operations center? (TK)	X		ACCEPTED *Section will be reviewed and edited accordingly.* Replacement operations center will be provided at mockup facility to continue testing/training. (JS)
33	Pg. 36, Paragraph before Table 3.	RCTs that have supported crane repair in the airlock have indicated that it normally takes 2 to 3 entries before repairs are complete. For example, one entry to troubleshoot and another to make repairs. Exposure estimates may be low.(RR)	X		ACCEPTED *Exposure estimate will be updated as part of the 60% design effort.* (AFS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
34	Pg. 37, 2nd full Paragraph.	The existing radiological work screening will need to be updated prior to removing manipulators.(RR)		X	ACCEPTED *The work screening will be updated prior to removing manipulators. This is not a design issue. It is an operational issue and will be done during operations.*(AFS)
35	Pg. 37, 4th Paragraph.	C-Cell crawl space dose rates are about 250 mrem/hr on average. The 20 hour estimate seems low. If each person is limited to 250 mrem, 20 different people will be needed. How much confidence is there in number of hours and workers estimated to complete the task? Dose rates in the A-Cell and Airlock crawl spaces are unknown and will need to be determined in order to have meaningful exposure estimates for work in those areas. (RR)	X		ACCEPTED *This was an initial estimate with the expectation that a complete ALARA evaluation will be performed based on actual survey and work planning data developed. This will be reviewed during the 60% design effort, but it is expected to be an open issue pending final resolution on whether floor reinforcement will be required.* (AFS)
36	Page 37 Section 2.7	The section heading indicates that contamination control is included, but there is no discussion of contamination control techniques. A table should be provided that summarizes exposure estimates, this table should stay consistent though out the entire project and updated at each design phases and as work progresses. (TK)	X		ACCEPTED *Contamination control baseline will be provided with the 60% design package.* (AFS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
37	Pages 38 - 39 Section 3.1	While the Upper REA provides back up capability for the handling of soil sacks and debris there is no backup to support the installation of the soil remediation equipment. If a failure of the B Cell cranes is encountered the schedule impacts to "start from scratch" with recovery are not acceptable. To minimize the schedule impacts consideration it would appear prudent that the designs for the replacement crane system proposed by AFS be developed as a contingency (no building of the system or parts acquisition should be made at this time). Also has any investigation been performed as to the availability of "repair parts" should a crane repair be required? (TK-RG)	X		COMMENT NOTED *Evaluation of this comment will be performed and addressed in the 60% design.* (WS) *Repair part availability will be performed prior to commencement of operations.*
38	Pg. 39, Section 3.2	Discuss any plans to reactivate the MSM repair shop.(RR)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *Currently, there are no plans to create any kind of MSM repair area. The approach is to use an attrition method in which MSM are replaced with other MSMs. There are almost 20 MSMs currently working in 324, and only a few will be needed to perform our operations. The two new MSMs in the Mockup can serve as additional back-up.* (MC)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
39	Pg. 39, Section 3.2	The inspection report provided by the manipulator manufacturer identified several manipulators that require repair and adjustment. This section does not identify if those recommendations are going to be implemented. The dose estimates also does not address these repairs. (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *Two representatives toured the 324 facility from CRL and made a report, and although there are a couple of minor issues with the manipulators, they all appear to be in working order. However, they are old and CRL has indicated we should expect repairs. See comment 38 for intended approach. If we see a high need for replacement of MSMs, then we may look to make a repair contract with CRL to support those efforts or purchase a couple of new MSMs to replace the old ones.* (MC)
40	Pg. 41, 1st Paragraph	Reference to Figure 46 should be Figure 47. (RR)		X	ACCEPTED *Reference will be changed and the correct location for Fig 46 will be added.* (JS)
41	Section 4.0	Discuss how equipment components (e.g., hoses, seals, electronics) will be affected by high dose rates and total exposure during remediation.(RR)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *During our 60% design review, a total material list of all in-cell equipment will be made and analyzed based on published radiation degradation. Any material's operational life and functionality that appear suspect or create cause for concern will be replaced with alternatives.* (MC)
42	Page 44, Section 4.1.6	Will the shear be used to size reduce the installed GeoProbes/HHUs, or will these be removed prior to remediation?(RR)	X		ACCEPTED *Yes, shear will be used to remove the probes.* (MC)
43	Pg. 47, 2nd Paragraph	Suggest working with Environmental Lead & Nuclear Safety to see if Phosphate can be added to cooling water to bind contaminants to the soil, instead of cutting dry.(RR)		X	COMMENTS NOTED and PARTIALLY ACCEPTED *Dry cutting will be performed for PoP purposes. Testing results will be evaluated and changes may occur as deemed necessary.* (WS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
44	Pg. 47, 2nd Paragraph, Last Sentence	The dust collection system used during B-Cell sump and trench cleanout became saturated and started blowing dust into the cell. Is that an issue with this system?(RR)	X		COMMENTS NOTED *The subject of using a vacuum for dust control was discussed during the assessment phase. After talking with the operational personnel they concluded that the incident described was more of a handling issue rather than an problem related to the vacuum equipment design. Following the incident, the vacuum was used extensively.* (MC)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
45	Page 54 Section 4.7	Previous experience with indicate that cameras and lights need to be expendable and expandable. Cheap and quick to replace and have a variety of ways that the same light/camera can be deployed by different methods. "Specialized" systems tend to be overly complicated and end requiring significant troubleshooting and maintenance. Consider the following as the video and lighting system design advances (SC): A system where the lights and cameras are controlled from main operating area, with video splitters going to localized or remote locations. Is simplified, with very few drawbacks (SC) Keep cameras and lights commercially available and inexpensive, they get bumped broken and abused long before radiation gets to them, previous experience has shown that radiation hardened cameras are not worth the price vs. having to replace them a little more frequently. (SC)			ACCEPTED *We concur with the suggested design philosophy. Commercial grade systems (non Rad hardened) are being specified for the cameras and lights.* *Custom installation/deployment systems are being designed to allow deployment of the lights and cameras thru existing sleeves in the cell walls. This is being done to eliminate manned entries for light and camera installation. The number of crane operations required for positioning lights and cameras will be kept at a minimum or reduced.* *The deployment systems will be kept as simple as possible while giving the operator the ability to install and position lights where needed without making a manned entry.* *Radiation hardening is not being considered in the design at this time. Cameras are being installed as far from radiation sources as possible.* *This will all be addressed further in the 60% design phase.* (VR)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type Major	Comment Type Minor	Resolution
46	Page 58 Section 4.9	Setup the BROKK to access/reach the entire area within all cells (i.e. long enough cords) and have an engineered lifting point (attach a bail that was on top of Brokk that could be remotely engaged) early in the project. Then it could help in multiple scenarios. To just have a BROKK and wait for the "need" may cause extended down times. The BROKK could be utilized to recover schedule if REA and other equipment down time are encountered. (SC) Additional detail needs to be provided concerning the BROKK (size, capacity/ capability, attachments, radiation tolerance, etc.) (TK. How many BROKKs will be procured? (TK)			COMMENTS NOTED and PARTIALLY ACCEPTED *These are all good suggestions. A lifting point and cable management scheme will be considered before any potential installation of the equipment. Currently, we intend to procure one Brokk equipped with a bucket, shear and hammer. It is not planned to have the Brokk be rad-hardened, but it's electrical system will be shielded. There are number of issues with procuring a radition hardened version, which make this choice impractical from a cost and schedule. We are not recommending this, however if this is client's preference then we can provide full pricing details. This will be evaluated for inclusion in the 60% design.* (MC)
47	Page 63 Section 5.1.2 second paragrapgh	The micro pile addition adds additional work and costs not presented in the conceptual design. As the design advances include alternative approaches (i.e. what happens if the west foundation is not undermined, are there other alternatives, etc.).	X		ACCEPTED *The micro-pile installation is similar to binder curtain installation. The differences are in the materials used and depths of installation. However, as the design advances, geotechnical engineering consultation will be utilized, and alternative approaches will be considered as feasible. This will be addressed further in the 60% design phase.* (RR)
48	Pg. 64, Last Paragraph	Need to evaluate potential pathways for fugitive water, likelihood of contamination spread, and how it will be controlled/ monitored when drilling to install steel dowels.(RR)	X		ACCEPTED *Drilling for the dowels will not proceed thru-wall drilling. It is anticipated that the water used can be collected using absorbent material, and be monitored real time using Radcon support. This will be addressed further in the 60% design phase.* (RR)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
49	Pg. 64, Last Paragraph, Last Sentence	The existing wall may have fixed contamination in various areas, especially around existing penetrations. Need to address contamination control methods when the surface is roughened.(RR)	X		ACCEPTED *It is anticipated that construction work activities will be controlled through work packages as required through IWCP. Contamination identification and control will be considered, and Radcon support to be utilized. This will be addressed further in the 60% design phase.* (RR)
50	Page 72 section 7.2	The debris removal activities should include a focus on removing as much existing combustible inventory from the cells as possible.	X		COMMENT NOTED *Combustible inventory will be tracked as debris is removed from the cells. This will be addressed further in the 60% design phase.* (AFS)
51	Page 79 Section 9.3	The section does not contain any discussion of constructability reviews (see comment on 23 of this document).	X		COMMENT NOTED *Information for Quality and Constructability Reviews will be provided with the 60% design package.* (AFS)
52	Page A-6	Calculation C002 should have been provided in the 30% package. (TK) Four calculations were provide in the 30% package. (TK)	X		ACCEPTED *Scoping calculation KUR-1782F-CALC-C002 will be provided for the foundation design.* (WS)
53	Page A-7	Consider utilizing technical procedures in place of some IWCP packages. MSDS for fixatives and decontamination fluids need to be provided	X		COMMENT NOTED *Technical procedures versus IWCP packages will be considered and discussed with WCH as work progresses. The deliverable list identifies only a MSDS list. Actual MSDS are not specifically required until submittal of the IFF/IFC package but can be provided upon final selection.* (AFS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
54	Pages A-8 thru A-12	Include consumables, equipment and supplies for debris removal, size reduction, fixatives, decontamination supplies, shielding, etc.	X		COMMENTED NOTED *The comment has been noted, although no changes were made. The "equipment list" is intended to list equipment only, without the inclusion of consumables, fixatives, or other supplies.* (HS)
55	Hoisting and Rigging Components	Ensure all hoisting and riggng components are desgined, fabricated, tested, and marked in accordance with the Hanford Hoisting and Rigging Manual, also need to ensure personnel are qualified in accordance with the manual. (TK)	X		COMMENT NOTED *The comment has been noted, although no changes were made. All items will be designed to meet project requirements.* (HS)
56	Drawings General	There are no signatures in the revision blocks. Do the Kurion procedures allow this? (TK)	X		COMMENT NOTED *The comment has been noted. Kurion procedures require only Project Manager signatures for In-Process drawings. Future In-Process drawings will comply with the Kurion procedure.* (WS)
57	Drawings General	Are the drawings to scale, if so what is the scale. Add the scale to the drawings. (TK)	X		ACCEPTED *As the design progresses to 60% drawing scale will be added to the drawings.* (WS)
58	Drawing KUR-1872F-DWG-C003	The horizontal grout curtain location (shown in Section B on KUR-1782F-DWG-C004) is not shown on the drawing. A drawing showing the excavation required to install the horizontal grout curtain will be required. (TK)	X		PARTIALLY ACCEPT *As of the 30% design, the horizontal curtain wall installation is to be performed by directional drilling. As the design evolves, or when the actual location of drilling is identified, it will be shown on the drawings. This will be addressed further in the 60% design phase.* (RR)

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Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
59	Drawing KUR-1872F-DWG-M001 sh 2	A reference to sheet 3 needs to be added which identifies the equipment labeling needs. (TK)	X		COMMENT NOTED *The comment has been noted, although no changes were made. The general arrangement drawings are neither intended for nor the correct instrument for labeling of equipment.* (HS)
60	Drawing KUR-1872F-DWG-M001 sh 3	It appears the current tool holder location may cause clearance issues with the trafer barrier or the NE REA mounting location (unless the elevation difference prevents). Consider an alternate location. What is the concentric circular object east of the south west REA? (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *The tool holder can be mounted at any 4" penetration location. Note that tool change is accomplished. This will be addressed further in the 60% design phase.* (MC)
61	General location drawings	Locations for several major pieces of equipment are not shown on the general location drawings (operations center, hydraulic supply units for REAs & BROKK, cable and hose routing, (TK)	X		ACCEPTED *The 60% design drawings will include the information identified.* (WS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
62	KUR-1782F-DWG-E010 all sheets	How many REAs can be operated at the same time and what tooling can be operated at the same time? Will one HPU be able to power both REAs and associated tooling? If only two REAs can be operated at a time will the cabling need rerouting to each REA location? Provide an acronym list for the single line dwgs. Sh1 - remove some of the background building features so the dwg is clearer (currently difficult to follow all the single lines). What is the air compressor for?	X		COMMENTS NOTED and PARTIALLY ACCEPTED *-The HPU will be sized to allow for two REAs to operate simultaneously with any potential tool attached.* *-Yes one HPU will be able to power both REAs and associated tooling* *-No cable rerouting will be required. Each REA station will have permanent supply, return, and electrical services provided to each of the four installation locations. Which station is "active" or controlled will be determined by the operator selection at the control station.* *-An acronym list for the single line drawings will be added as suggested.* *-Some of the background building features will be removed so the drawing is more clear.* *-The compressor is currently shown in a manner that suggests that air services may be needed to purge/ plug grouting lines. The final determination for the need of a compressor will occur as the system processes are finalized.*

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
62	KUR-1782F-DWG-E010 all sheets (con't)	Suggest separating the hydraulic single line features (other wise know as a P&ID) from the electrical/control single line. (TK)	X		*-The hydraulic and electric single line features will be separated on future drawing submittals as requested. They were included only to present a single high level controls system in one package.* *This will all be addressed further in the 60% design phase.*(MC)
63	KUR-1782F-DWG-MREC-1130-000	The weight of the thru support may require rigging to install, the design should incorporate a method for installation that will not damage the assembly (choking the assembly could damage the internal components causing alignment/function issues. Also need to ensure there is a mechanism in place to rig the components into place inside the REC. (TK)	X		ACCEPTED *This is a good suggestion and will be incorporated into the 60% design review.* (MC)
64	KUR-1782F-DWG-MREC-1200-000	Incorporate rigging connections. Estimated weight? How will the REA be staged into the cells (rigged horizontal, vertical, angled)? The post appears quite large, are the circular vertical plate and gussets required fro support? Add reference building elevations tot he vertical views. What is the bottom elevation when fully extended? (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *The estimated weight of rigging connections is 4000lbs. The REA will be staged vertically and will require some kind of stand in the airlock to hold and support it during crane transfers. The post requires significant gusseting to support the worst case loads. The rest will be added to prints for 60% design review.* (MC)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
65	KUR-1782F-DWG-MREC-1300-000	Incorporate rigging connections. How will the REA be staged into the cells (rigged horizontal, vertical, angled)? Title appears to be wrong, isn't this the Upper REA? Estimated weight? Add reference building elevations tot he vertical views. What is the bottom elevation when fully extended? What is the collapsed height? (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *Please see comment 64.* (MC)
66	KUR-1782F-DWG-MREC-1400-000	Will the tool holder provide sufficient space for all the REA attachments? Incorporate rigging connections. Estimated weight? (TK)	X		ACCEPTED *Yes, the tool holder will be sized to hold the tools. The subject of rigging connection and the estimated weight will be addressed during the 60% design phase.* (MC)
67	KUR-1782F-DWG-MREC-2000-000	Suggest incorporating a tray under the transfer barrier to catch debris/contamination. If possible include a mechanism to clean out the tray. (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *In the detail design for the Transfer Barrier a lot of work is being done to minimize contamination spread. It may be possible to put a tray under the TB during storage at the side of the airlock, however it should be noted that a tray would interfere with the door operation.* (MC)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
68	KUR-1782F-DWG-MREC-4200-000	Is the bag stand supported by an REA while being loaded? If this stand is utilized when loading there maybe soil/binder build up issues. It appears the support arms rotate, if so how does the 50G attachment work when rotating? Does this stand also handle the bag when transferring to the transfer barrier? Is there a different bag handling device for the transfer barrier to the A?C/D cells? Estimated weight? (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *The bag stand is an attachment for the Upper REA, and will always be attached to the REA. The bag holder is designed to swing so the bag is always positioned downward when the REA moves. The sack will be filled by the lower REA. The low strength binder material is not anticipated to be a problem, even if build-up occurs; testing at PoP and the Mock-Up will prove whether build-up is a problem.* *The support arms will rotate only via the articulation of the boom, stick, and `bucket' movements of the REA.* *This quick coupler, or bag stand, is also used in the transfer barrier, and will not only hold the sacks while being filled , but will also load the sacks into the waste cart on the transfer barrier. A different device will be used for subsequent handling of the waste sacks below the crane hooks for additional tasks such as the transport of the sack to the other cells for deposit.* *This will all be evaluated for inclusion in the 60% design.* (MC) (HS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
69	KUR-1782F-DWG-MREC-5000-000	Incorporate rigging connections. Estimated weight? How will the grout tube be staged into the cells ? More parts shown than listed in the parts table. (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *These comments shall be incorporated and considered during the 60% design review process.* (MC)
70	KUR-1782F-DWG-MREC-8100-000	It is not clear how this dam works. AFS needs to set up a meeting to review the concept and details of how this dam is installed, sealed, tested, does it affect the door operation, etc. (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *The comment has been noted, and it is agreed that a meeting to address the forward progression of this issue should take place.* (WS)
71	KUR-1782F-DWG-MREC-8200-000	Estimated weight? What is the function of this component? Rigging connection when not handling a REA? (TK)	X		COMMENTS NOTED *This is an offset hook for the rear REA positions. It is backup tool that would allow the 5 ton B-Cell crane to reach the back REAs in the event that the 3 ton crane should fail. This will be evaluated for inclusion in the 60% design.* (MC)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
72	KUR-1782F-DWG-I-REC-9000-000	Is RSE utilizing Kurion's drawing procedures? Check the drawing numbering some dwg are numbering .... -MREC-9000 - RSE is numbering ... -I-REC -9000. Electrical components need to have NEC certifications (global comment). Revision sign off section of drawings not being utilized (global comment). (TK)	X		PARTIALLY ACCEPTED *Drawing numbering will be corrected to reflect consistency.* *Electrical components will be evaluated for NEC certifications. This will all be addressed in the 60% phase.* *Kurion procedure specifies only PM signature for in process drawings.* (WS) *RSE will comply with the Kurion drawing number formatting. Kurion will then Codify the drawing number format to be implemented.* (VR)
73	KUR-1782F-DWG-I-REC-9200-000	Is it necessary to fill the step plug weldment with steel shot. This light bar will be heavy which will result in handling, installation and operation difficulties, if this amount of shielding is required the installation of these will need rigging points on the light bar and in the faciltiy to rig them into place. (TK)	X		COMMENTS NOTED and PARTIALLY ACCEPTED *The 30% design of the step plug was left as fill with steel shot which served as a baseline to continue working from. This baseline was determined from the existing step plug drawing for B-Cell. RSE has requested Dade Moeller to perform a shielding calculation based on available survey data and estimated doses from transient source terms during operations. Shielding will be adjusted in the step plugs to the required levels determined from the output of the above mentioned calculation. When sizes, weights and locations are finalized, rigging or lifting fixtures will be included to handle the cameras and lights. This will all be addressed in the 60% phase.* (VR)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
74	KUR-1782F-DWG-I-REC-9500-000 KUR-1782F-DWG-E010	There will only be one Operations Control trailer (or Remote Lighting and Vision Control Station) utilize consistent names between Kurion and RSE drawings. Will the mock up have a lighting and control station for additional training, ORR, and other uses once the work in 324 has been initiated? (TK)	X		ACCEPTED *Terminology will be standardized.* *The need for a dedicated mockup control station will be determined as the design progresses to 60%.* (WS) *The Mockup will have similar lighting, camera capability, and control station for additional training, ORR, and other uses following the initiation of work at the 324 site. The systems will be identical, except for maybe specific light or camera quantities. This will all be addressed in the 60% phase. (VR)*
75	KUR-1782F-CALC-C001, Section 6.1 Section 8 and 13	All software utilized for the 300-296 subcontract shall have the validation and verification process completed prior to submittal of the 60% Design Package (Global Comment). Is the statement in section 8 conflicting with section 6.1? 13. Attachment 1 is missing. (TK)	X		ACCEPTED *The V&V for the SAP2000 software program is complete and calculations will reflect this for calculations using SAP2000. Any other safety software V&V will be complete prior to completion of the 60% design.* *Section 8 served as a temporary placeholder for V&V language. The assumption in 6.1 will be removed since the SAP2000 V&V is complete.* *Attachment 1, refers to the SAP2000 model and analysis file. This will be provided when the calculation is formally approved and issued as a Rev 0 calculation.* (RR)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type Major	Comment Type Minor	Resolution
76	KUR-1782F-CALC-C003	Attachments 1 thru 5 are missing (TK)	X		ACCEPTED *The attachments, refer to the SAP2000 model and analysis files. These will be provided when the calculation is formally approved and issued as a Rev 0 calculation.* (RR)
77	KUR-1782F-CALC-M001	Calculation is not signed. In process block not checked No report history completed Was the 35G the correct excavator data to utilize (e.g. UREA is 50G)? Are both the upper and lower REA mounting configuration analyzed?			ACCEPTED *Calculation signed* *In process block checked* *Report history completed* *The Lower REA support was evaluated in this report (the long vertical support is subjected to a more aggressive loading than that of the short UREA support; bending of a long-cantilevered member). The LREA is equipped with the 35G components. The data for the 35G are the appropriate inputs.* *The UREA will be evaluated in the 60% design package. Even though the capacity of the UREA with the 50G components is greater, the design of the support is such that it is more favorably loaded (connection at the vertical support is near the lower through wall support).* *Only the LREA mounting was evaluated in the 30% design package. Both will be evaluated in the 60% design (refer to the previous comment).*

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type Major	Comment Type Minor	Resolution
77	KUR-1782F-CALC-M001 (cont)	Please explain "back drive"?			*Back drive occurs when a member that is held in position hydraulically or inertially moves when a force with sufficient magnitude acts on it. The back-drive mentioned in the assumption section of the report is referring to the hydraulically held boom and stick of the 35G. The force applied to the boom and/or stick by the bucket actuation would cause the pressures in the boom or stick cylinders to increase to a point where the pressure relief in that circuit is actuated. Once the pressure relieves, that portion of the REA will move in the direction of the force.*
		Does the weight of the excavator arm and attachment (heaviest) need to be included in the solid bodies table?			*The weight of the excavator arm and the heaviest tool is included in the tables defining the loads. This load is identified as Remote Load 2 with a value of 2200 lbs (refer to Tables 7-5, 7-7, and 7-9). The 2200lbs assumption for the excavator parts and tool will be added to the assumptions list.*
		Title for Table 7-21 appears to be incorrect.			*The table title was changed to Component Information for the Transfer Barrier.*
		Section 8.1 Identify the higher strength steel for the REA tube inserts.			*The material planned for the REA inserts is ROUND BAR, 4 ½", STEEL, ASTM A108, 12L14 with a yield strength of 70 ksi.*

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
77	KUR-1782F-CALC-M001 (cont)	Does fatigue need to be considered/ evaluated for the components that do not meet the design factor of 2? (TK)			*Fatigue analysis was not planned for evaluation for several reasons:* *- The load case evaluated is considered to be the worst case loading. It occurs in a configuration causing the greatest moment on the REA mounting (bucket actuation with the arm in the lowermost position). A small percentage of actuations will be performed in this configuration.* *- The maximum stress shown in any of the cases is 37.4 ksi (approximately 75% of the yield strength).* *- The locations that exhibit stresses above the 25 ksi in the figures are very small when compared to the surfaces experiencing less stress in the load configurations.* *- The number of digging/lifting cycles is relatively small for any of the REAs (easily less than 10,000, probably less than 5000 and likely 2500 to 3500 cycles).*
78	Calculations General	Provide the in progress calculation(s) and geotechnical information for the new B-Cell foundation in particular the data that indicates that micro piling will be required. (TK)	X		ACCEPTED *Scoping calculation KUR-1782F-CALC-C002 will be provided for the foundation design.* (WS)(RR)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
79	KUR-1782-TPL-001	Section 5 - last bullet is not applicable, no testing will be performed n the 324 cells. Section 8 - include photos of the testing. Will the testing include compression testing? Include calibration data if any if utilized. Section 10 - Provide WCH a copy of the Test Procedure (TK)	X		PARTIALLY ACCEPTED *The last bullet will be removed.* *Photos will be included and specified in the documentation section.* *Compression testing of the binder formulation is specified in the Binder Formulation Test Procedure KUR-1782P-TPR-005, Rev 0. Calibration data is indeed collected for applicable equipment. This will be evaluated for inclusion in the 60% design.* (WS) *The test procedure for test plan KUR-1782P-TPL-001 has not been drafted at this time, and will be included in the 60% design.*

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
80	KUR-1782-TPL-002	Table 1 - add the following: - aligning to a previous cut kerf (TK) - stainless clad floor with the dry diamond blade will probably require the saw to be run at very low Blade rotation. Can hydraulic unit/saw be bought to be blade variable speed? I think the speed in your report is the tracking speed, not RPM. (testing will shake out rpm required) (SC) - If the saw concept fails consider track milling machine vs saw blade (SC) Section 10 - Provide WCH a copy of the Test Procedure (TK) Include testing for removing the first section of cut floor piece (floor pieces will require some sort of lifting mechanism until a hole big enough for REA clam shell bucket can be used) (SC)	X		PARTIALLY ACCEPTED *A crane is not available at the PoP site, so attempting to align the cut kerf at the PoP test is not reasonable. This will be done at the Mockup facility, where a crane will be available.* *PoP testing will determine appropriate saw operating parameters as well as dry cutting characteristics.* *Other methods will be evaluated if the saw cannot be adjusted to perform the cutting operations effectively.* *Saw procedure is still in draft form, but will be provided as requested.* *The test plan and procedure will be revised to include a "first section removal" test objective.* *This will all be evaluated for inclusion in the 60% design.* (WS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
81	KUR-1782-TPL-003	Table 1: - Provide drawings that show the "operating envelope" for validation during the POP testing. Also provide "operating envelope" drawing(s) for the four REAs when installed/ utilized inside of B-Cell (plan and vertical views) (TK) - Demonstrate bag filling operations and associated spillage/cross contamination (TK) - If measurement devices are utilized provide calibration documentation (TK) Section 10 - Provide WCH a copy of the Test Procedure (TK) - Include durability testing of the hydraulic and electrical connections (e.g. can the hydraulic connection be damaged during handling to the point that the fitting would develop leakage issues, are the components susceptible to damage during assembly and disassembly,y and then reassembly/ disassembly, several times)) (TK) - Incorporate "upset conditions" testing (SC) - Do both the upper and lower REA configurations need to be POP tested? (RG) - Add drilling of the mounting holes as one of the test Objectives (equipment, technique, contamination control, removal/handling of the "cell side" core, etc.). (RG)	X		PARTIALLY ACCEPTED *Envelop drawing will be developed to support testing as an attachment to the test plan and procedure.* *Bag fill and handling testing is specified in the test procedure KUR-1782P-TST-003.* *Test and measurement equipment that requires calibration will have calibration information documented on appropriate form in the test procedure.* *The REA test procedure is still in draft form, but will be provided for information as requested.* *Durability testing of the connections will be included during PoP testing, as well as at the Mockup during operations training.* *The addition of upset condition testing will be evaluated and addressed prior to PoP testing.* *Only the lower REA will be PoP tested. The upper REA will be tested at the Mockup facility.* *The POP wall will be core drilled to show the general feasibility for drilling the wall. Technique for core removal and contamination control will be performed at the Mockup, and not at the PoP due to wall design and accessibility limitations.* *This will all be evaluated for inclusion in the 60% design.* (WS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
82	KUR-1782-TPL-004	If this equipment will be utilized inside the 324 building the amount of head room and space required to perform the drilling and grout injection needs to be evaluated as part of the testing to ensure the equipment will work inside the 324 building. Section 10 - Provide WCH a copy of the Test Procedure (TK)	X		COMMENT NOTED *Regardless of the final design for the foundation and soil stabilization, issues related to equipment size and allowable space will be considered during design progression.* *The test procedure has not been drafted at this time, and will be evaluated for inclusion in the 60% design.* (WS)
83	General Test Plans	Throughout the test plans test for a positive result, they should also test the negative as well (SC): - Using REA's as an example it states they will test that a connection can be made, also needs to test the negative, can we remove if arm failed out of balance (SC) - This can be expanded to all aspects (can an operator be visually fooled to think they are engaged picking up a bag when you are not actually engaged) This kind of testing is just as important as positive testing (SC) - If weigh and the REA can not hold the saw fixture in place consider holding down the track saw with a vacuum/suction device similar to vacuum load lifters (SC)	X		COMMENT NOTED *The addition of upset condition testing will be evaluated and addressed prior to PoP testing.* (WS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
84	Additional POP Testing	Consider additional POP testing of the following: - transfer barrier prove the design/ability to apply fixative (SC) - failure/recovery/back up testing (i.e. REA's If the arm fails when a hammer is extended fully out, I do not believe that the mechanism shown could be uncoupled, which would give no backup/recovery option, transfer barrier movement failure, spills, etc., spillage when loading the sacks/bags, others?) (SC)	X		COMMENT NOTED *The transfer barrier will not be constructed for initial PoP testing. Transfer barrier testing will occur at the Mockup facility.* *The current drafts of the test procedures allow the test director to adjust the procedure to address test objectives or respond to upset conditions as they arise. The addition of upset condition testing will be evaluated and addressed prior to PoP testing as well. This will be evaluated for inclusion in the 60% design.* (WS)
85	Debris Tracking Within REC	Every effort to remove waste (that is physically possible to remove) versus packing it in the A cell, or leaving it in a state should be pursued. Previous experience is that you never have enough space, and you will produce more volume than you anticipate. Locate waste that can fit into waste containers and be removed with few material changes or specialty containers and take the time to clear the space as much as possible. (SC) Add column to the Tables 2 & 7 that identifies the waste container to be utilized and associated container handling mechanism. (TK-BH).	X		COMMENT NOTED *See comment 1. AFS is evaluating the REC Cell clean out options and will provide additional information in the 60% design package.* (AFS)

REVIEW COMMENT RECORD

Item	Reference Number (Section, Figure, Table, Page)	Comment	Comment Type		Resolution
			Major	Minor	
86	Global Comment	Including the AFS team review comments was very good. WCH Observations: - AFS's Construction Sub-tier, only provided 1 comment on the package. More in depth constructability reviews need to be performed by AFS's team. Constructability of the equipment, techniques, and approaches are key to the success of this project. (TK)	X		COMMENT NOTED. *See comment 51.* (AFS)
87	Global Comment	This package will be included in a TPA Milestone Submittal to the DOE and Ecology for closing Milestone M-089-06-T01. As a result this document will end up in the Hanford Administrative Record (which is viewable by the public). Comments affecting quality of the document (incomplete sections, missing references, spelling/typos, etc.) need to be corrected. Other technical comments (majority of the comments) can be incorporated in the 60% Design Submittal. (TK)	X		ACCEPTED *A thorough technical review of the document will be performed. Technical comments will be evaluated for incorporation either for 30% or at 60% depending on the complexity of the comment and the time needed to implement the comment.* (WS) *Editorial comments will be addressed.* (JS)
88	Specifications	While the specifications specific to this project are not ready at this stage, example specifications should have been provided for WCH to evaluate format and content.	X		ACCEPTED *Additional information added to reflect the use of equipment data sheets as well as CSI 3 part specifications and drawing note specifications. Going forward, draft specifications will be provided for the 60% design.* (WS)
89	General Global	Numerous documents, forms, checklists, calculations, etc. are not fully completed (missing signatures, blocks not completed, etc.). Documentation must be completed properly.	X		PARTIALLY ACCEPTED *Review of current Kurion engineering procedures requires only the Project Manager signature for in-proccess engineering documents.* (WS)
90	Exhibit "D" Requirement 2.2.1.2.1 30% Design Deliverable	No design review meeting minutes were included.	X		ACCEPTED *Design Review meeting information regarding the discussions of RCR comment resolutions will be provided.* (AFS)

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By WCH Document Control at 10:56 am, Aug 27, 2014

C036502A00-05-002B-001B

AREVA

A-300-296-00150 R2

August 26, 2014

Washington Closure Hanford
2620 Fermi Avenue
MSIN H4-11
Richland, WA 99354
Attention: Hanford-RCCC/Submittal Coordinator

C036502A00, 300-296 SOIL REMEDIATION PROJECT – RESUBMITTAL NO. 5-02b-001b, 30% DESIGN PACKAGE

AREVA Federal Services LLC (AFS) is pleased to provide the following as required by Contract C036502A00, Exhibit I, Submittal Register:

- C036502A00-5-02b-001b, 30% Design Package

For questions of a technical nature, please feel free to contact Mr. Bob Watkins, Project Manager, at 509-371-1885. For questions of a contractual nature, please contact me at 509-371-1874 or elizabeth.smith@areva.com.

Sincerely,

Elizabeth W. Smith, C.P.M
Contract Administrator
AREVA Federal Services LLC
Richland Office

KUR-1782F-RPT-005

300-296 Soil Remediation Project

30% Design Report

Revision: **0**

Issue Date: **August 25, 2014**

Prepared for:

AREVA Federal Services LLC
Richland, Washington 99354

Prepared by:

KURION
Isolating Waste from the Environment

Kurion, Inc.
1355 Columbia Park Trail
Richland, Washington 99352

Approved By:

Keith Quigley
Project Manager

Approved By:

Wade Singleton
Project Engineer

Report Title: **30% Design Report**

Project Title: 300-296 Soil Remediation Project

Status: ☐ **In-Process** ☒ **Final**

Contains assumptions and/or inputs which require verification: ☒ **Yes** ☐ **No**

Report History

Revision #	Reason for Revision	Approvals/Date
0	Initial Issue	Originator: CW Sigitter 8/25/14 Checker: [signature] 8-25-14 PM: [signature] 8/25/14 Other:

Table of Contents

Appendices

Attachments

The following attachments are provided on the CD copy of this deliverable:

- Attachment A: Specifications (to be developed as part of the 60% Design Package)
- Attachment B: Calculations
  - KUR-1782F-CALC-C001, *324 Building Structural Stability Evaluation (30% Design)*
  - KUR-1782F-CALC-C002, *324 Building B-Cell Foundation Design (30% Design)*
  - KUR-1782F-CALC-C003, *A, C, and D-Cell Floor Structural Analysis (30% Design)*
  - KUR-1782F-CALC-M001, *30% Design Scoping Calculation*
- Attachment C: Proof-of-Principle Testing
  - KUR-1782P-TPL-001, *Soil/Chemical Binder and Waste Bag Test Plan*
  - KUR-1782P-TPL-002, *Floor Saw Cutting Test Plan*
  - KUR-1782P-TPL-003, *Remote Excavator Arm (REA) Test Plan*
  - KUR-1782P-TPL-004, *Chemical Grout Curtain Test Plan*
- Attachment D: KUR-1782M-PLN-001, *Mockup and Testing Plan*
- Attachment E: A-300-296-00131, *Debris Tracking Within REC*, Rev. B

Figures

Tables

Acronyms

Acronym	Definition
^{90}Sr	Strontium-90
^{137}Cs	Cesium-137
ALARA	As Low As Reasonably Achievable
AFS	AREVA Federal Services LLC
CCTV	Closed Circuit Television
CDF	Controlled Density Fill
CDR	Conceptual Design Report
CHA	Cask Handling Area
CSI	Construction Specification Institute
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
ERDF	Environmental Restoration Disposal Facility
ESP	Electrostatic Precipitation
FE&C	Federal Engineers and Constructors
GC	Grout Container
HEPA	High Efficiency Particulate Air
HMI	Human Machine Interface
HPU	Hydraulic Power Unit
IWCP	Integrated Work Control Program
LLVCS	Local Lighting and Vision Control Station
LVATC	Lighting and Vision Air Traffic Control
MCC	Motor Control Center
MSM	Master-Slave Manipulators
MSPA	Monolith Special Packaging Authorization
PLC	Programmable Logic Controller
PoP	Proof of Principle
PTZ	Pan, Tilt, Zoom
REA	Remote Excavator Arm
REC	Radiochemical Engineering Complex
RLVCS	Remote Lighting and Vision Control Station
TSD	Transportation Safety Document
WAC	Waste Acceptance Criteria
WCH	Washington Closure Hanford, LLC

Terms and Definitions

Term	Definition
Binder	Low viscosity sodium silicate solution pumped from external storage vessels, primarily used for dust control within the B-Cell excavation area, and not intended for structural support applications.
Chemical Grout	Low viscosity aqueous solution pumped from external storage vessels, intended to provide structural strength support.
Curtain Wall	Array of in-situ solidified pillars, intended to control the amount of soil "sloughing" into the B-Cell excavation pit.
Epoxy Grout	Polymer used to fill in the space between the Through Supports and bore holes for Remote Excavator Arm mounting and stabilization, or to secure steel dowels/pins into B-Cell wall for load path transfer to new foundation.
Fixative Spray	Liquid spray used to coat and seal the top surface of the waste prior to placement in A-, C-, and D-Cells.
Particulate Grout	Cementitious material currently present on B-Cell floor, or material used to fill in voids between the soil sacks for monolith preparation.

1.0 Introduction

1.1 Background

The 324 Building is a non-reactor, Hazard Category 2, Nuclear Facility located in the 300 Area of the U.S. Department of Energy (DOE) Hanford Site, located near Richland, Washington. The building is undergoing deactivation, decommissioning, decontamination, and demolition by Washington Closure Hanford (WCH) under the River Corridor Closure Contract. During the Cold War Era, the facility was used for chemical and radionuclide processing associated with nuclear weapons production.

Historical records indicate that in October 1986, approximately 516 L of a concentrated liquid waste stream containing cesium-137 (^{137}Cs) and strontium-90 (^{90}Sr) was spilled onto the floor of B-Cell. It is estimated that this spill contained approximately 1.3 million curies of radioactivity. Some fraction of the spill was recovered; however, an unknown quantity was released into the soil beneath the 324 Building through an undetected breach in B-Cell floor sump. Unknown quantities of water were used immediately after the spill, and again at other times following the spill, to wash items contained in B-Cell. Some portion of this water, and any entrained contaminants, was likely also released to the subsurface through the undetected breach in the floor sump. When B-Cell was later taken out of service, wastes being removed from B-Cell were placed in grout containers (GCs) and stabilized using a particulate grout. In the course of grouting activities, grout was spilled on the floor of B-Cell, eventually filling the sump. B-Cell is located in the Radiochemical Engineering Complex (REC) of the 324 Building (Figure 1).

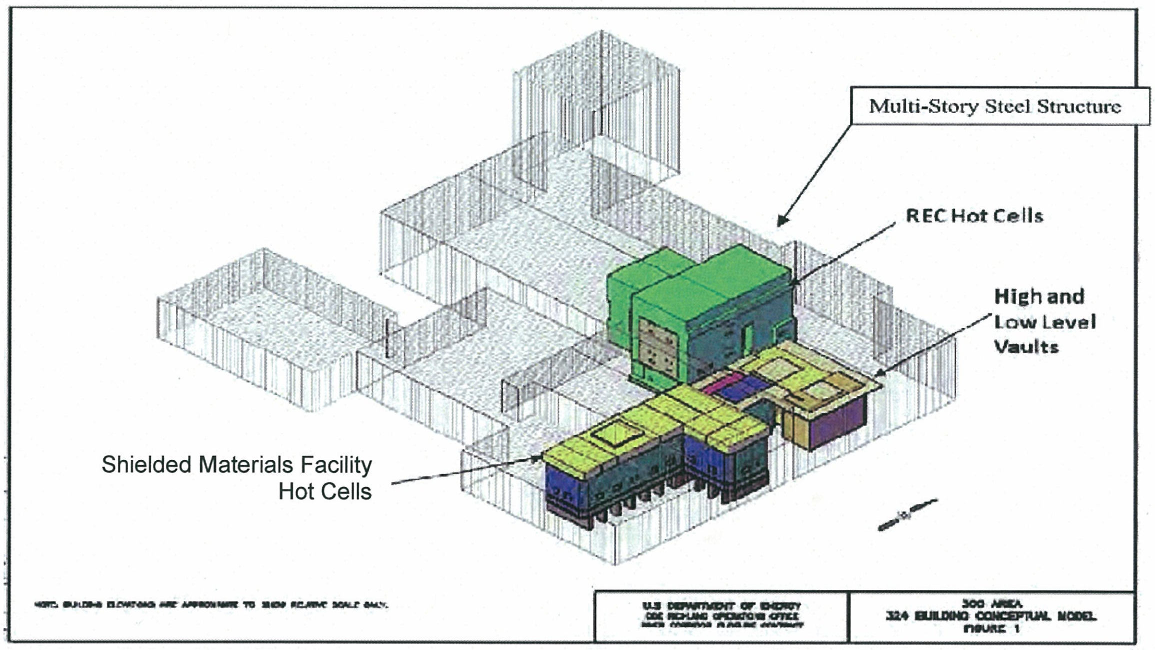

Figure 1 – Overview of REC Hot Cells Inside 324 Building

The breach in the B-Cell floor sump was not discovered until after WCH began the 324 Building deactivation and stabilization process. To assess for related impacts to the soils beneath B-Cell, a pit was excavated on the north side of the building (Figure 2), and Geoprobe®[1] technology was used to drive eight closed-end steel access tubes horizontally, in a fan-shaped pattern, into the soils under B-Cell. Measurements made inside these tubes identified exposure rates of up to 10,400 R/hr and temperatures as high as 142 degrees Fahrenheit (PNNL-21214). The highest exposure rates were found in soils beneath the felt expansion joint between B-Cell interior walls and the floor. Based on the spatial distribution of measured exposure rates, the current interpretation is that the leak from the B-Cell sump spread along the expansion joint, entering underlying soils at locations where the joint seal could be breached.

In January of 2014, WCH contracted AREVA Federal Services LLC (AFS), to remove the B-Cell floor and highly contaminated underlying soils. The project objective is to remove and isolate the contaminated soil to reduce radiation levels to allow open-air excavation for the remaining contaminated soils.

Figure 2 – The Geoprobe Excavation Area

[1] Geoprobe is a registered trademark of Kejr, Inc., Salina, Kansas.

1.2 Purpose

This report is intended to provide a project status based on the 30% Design. The 30% Design Package is based on the requirements of Contract C036502A00, Exhibit D, Scope of Work (SOW).

Prior to issuing this 30% Design Report, report KUR-1782F-RPT-002, *Conceptual Design Report* (CDR) was submitted. This report documented not only the design approach, but any additional changes introduced from the original proposal based on the facility assessment activities (KUR-1782F-RPT-001, *Assessment Report*) and workshops with WCH.

This report supersedes the Conceptual Design Report and adds details of the design approach, additional design elements, and supporting analysis.

1.3 Project Scope

The scope of this project is to design, test, and implement a process capable of removing and isolating contaminated soil below B-Cell. This remediation effort has been divided into two removal zones identified as the primary and secondary removal zones respectively.

Based on current assumptions and estimates, the primary phase of this cleanup effort will remove roughly 5,525 ft^3 of highly contaminated materials. B-Cell debris, particulate grout, and the floor slab and liner comprise about 750 ft^3 of the total. The remaining 4,775 ft^3 will be contaminated soil.

In the event it is discovered that contamination levels are above the expected levels at completion of primary excavation, a secondary removal zone has been identified. The secondary zone volume is composed of 1,700 ft^3 of sand and cobble soil. Figure 3 provides a rough depiction of the distribution of contaminated materials.

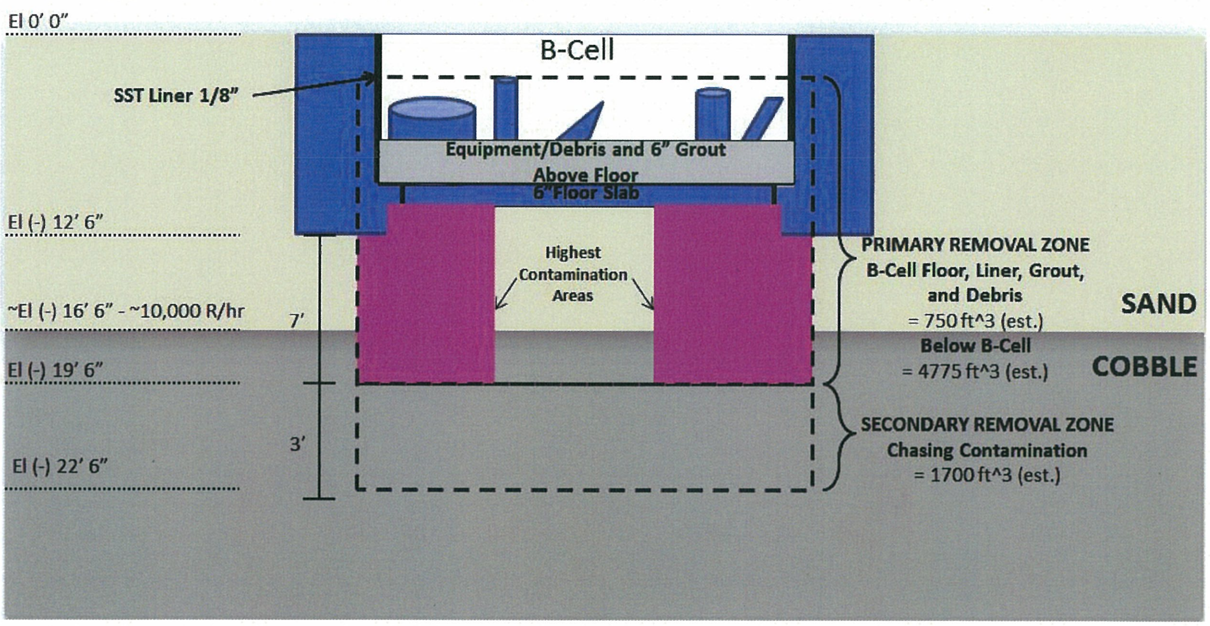

Figure 3 – Sketch of Anticipated Contamination Area

1.4 30% Design Package Organization

This report forms the narrative portion of the 30% Design Package. To simplify the package, documents that are issued and controlled individually are not found within this report. They are included in the package by reference only and provided as attachments on the CD copy of this deliverable. An outline of the design package is provided below.

1. Narrative
2. Appendices
    a. Appendix A: Preliminary Lists
        i. Major Design Issues
        ii. Drawings
        iii. Specifications
        iv. Calculations
        v. Integrated Work Control Program
        vi. Material Safety Data Sheets
        vii. Miscellaneous Documents/Reports
        viii. Remediation Equipment List
    b. Appendix B: ALARA Forms
    c. Appendix C: Project Schedule
    d. Appendix D: Project Risk Register
    e. Appendix E: Draft Hazard Identification Form
    f. Appendix F: Drawings
    g. Appendix G: Recovery and Backup Matrix
    h. Appendix H: AREVA 30% Design Review Meeting
3. Attachments
    a. Attachment A: Specifications (to be developed as part of the 60% Design Package)

       Currently, it is expected that specifications for this project will utilize various formats dependent on the scope of the activity the specification will support.

       In the case of mechanical equipment, such as pumps, compressors, etc., the specification may be a relatively simple equipment data sheet that specifies the utility requirements as well as the relevant performance characteristics.

       For construction-type applications, the specification may either be defined on a drawing within the general notes or a Construction Specification Institute (CSI) construction specification.

       Regardless of the format, the initial drafts of the specifications for the project will be developed as part of the 60% Design Package. Examples of the specifications for equipment data sheets and the CSI master spec format are included in Attachment A.
    b. Attachment B: Calculations
        i. KUR-1782F-CALC-C001, *324 Building Structural Stability Evaluation (30% Design)*

ii. KUR-1782F-CALC-C002, *324 Building B-Cell Foundation Design (30% Design)*

iii. KUR-1782F-CALC-C003, *A, C, and D-Cell Floor Structural Analysis (30% Design)*

iv. KUR-1782F-CALC-M001, *30% Design Scoping Calculation*

c. Attachment C: Proof-of-Principle Testing

i. KUR-1782P-TPL-001, *Soil/Chemical Binder and Waste Bag Test Plan*
ii. KUR-1782P-TPL-002, *Floor Saw Cutting Test Plan*
iii. KUR-1782P-TPL-003, *Remote Excavator Arm (REA) Test Plan*
iv. KUR-1782P-TPL-004, *Chemical Grout Curtain Test Plan*

d. Attachment D: KUR-1782M-PLN-001, *Mockup & Testing Plan*

e. Attachment E: A-300-296-00131, *Debris Tracking Within REC*, Rev. B

2.0 Process Description

2.1 Facility Preparation

2.1.1 Debris Removal/Relocation

Assessment report KUR-1782F-RPT-001 identifies current equipment and debris inventories within the REC by individual cell. Evaluation of the REC debris removal options is currently underway. Information within KUR-1782F-RPT-001 is being evaluated to determine the available space within A-Cell. Available space required to clear the debris from the other cells and Airlock is compared to the available space within A-Cell.

The total space available within A-Cell is approximately 2,817 ft^3. About 711 ft^3 of existing debris is currently in A-Cell, leaving approximately 2,106 ft^3 of space available for additional debris.

The total volume of debris expected to reside in A-Cell is approximately 2,338 ft^3. Odd shaped debris (i.e., B-Cell floor concrete and size-reduced equipment) used a 15% packing factor for stacking inefficiencies. Identification, packaging, and shipment of selected debris to the Environmental Restoration Disposal Facility (ERDF) is an option to dispose of debris that may not fit in A-Cell.

When an item is moved from its original location to A-Cell, it may be transferred directly via the cranes or placed in a container, such as a waste sack, to facilitate the process of gathering, stacking, and moving the various debris items. The use of sacks will be limited to prevent void spaces from developing prior to application of final particulate grout.

All debris items identified for packaging and shipment to ERDF, such as cell duct sprayers, will be approved by WCH prior to packaging, and will be placed within U.S. Department of Transportation (DOT) Type A (or appropriate) containers as needed. The final selection of waste packaging options will be based on actual dose rate readings taken during remediation activities. This will ensure an adequate disposal path of these debris items prior to placement of soil within the REC cells.

The radioactive material inventory was documented in May 2010 (0300X-CA-N0115, *Revised Radiological Inventory for the 324 Building REC Cells, Airlock and Pipe Trench*). The calculation estimated the radioactivity within each of the REC A-, B-, C-, and D-Cells, as well as the Airlock. Because the leak in B-Cell was discovered after this evaluation, the calculated B-Cell radiological inventory is presumed to be inaccurate.

Despite potentially inaccurate values, the radiological inventories listed in 0300X-CA-N0115 were used to estimate the final A-Cell monolith results. The conclusion is that the A-Cell monolith inventory will be a conservative comparison to the limits identified in WCH-191, *Environmental Restoration Disposal Facility Waste Acceptance Criteria* (WAC). The allowable concentration limits are established in pCi/g and total Ci per constituent, as well as transuranic limits.

Further investigation will be performed to obtain better results for the B-Cell inventory and also to verify that the soil beneath B-Cell can be stacked within the C- and D-Cell monoliths in compliance with the ERDF WAC (WCH-191).

A-Cell

The interior dimensions of the A-Cell monolith identified for debris are 9.25 ft wide by 21 ft long by 14.5 ft high with an approximate volume of 2,817 ft^3. A 2-ft thick layer of grout is expected to cover the debris centered on the monolith cut line, which is anticipated to be at a height of 16.5 ft. Debris currently in A-Cell will remain with the exception of two Duct Sprayers which are expected to be packaged and transported to ERDF. The current total radiological activity within A-Cell prior to loading additional debris is estimated as 1,690 Ci (0300X-CA-N0115).

Almost all of the currently listed debris from the REC is expected to fit within the A-Cell monolith. Table 1 lists the debris items and their origination. The volume associated with odd-shaped debris items (B-Cell floor concrete and size-reduced equipment) includes a factor to compensate for dimensional variations and stacking inefficiencies. From the table, the total weight of the debris within A-Cell is approximately 124,665 lb, and the approximate volume of the debris is 2,338 ft^3.

Table 1 – A-Cell Final Inventory Estimate

Debris Item	Approx. Weight (lb)	Approx. Volume (ft3)	Cell Origination
GC-166	2,000	69.33	A-Cell
GC-167	2,000	69.33	A-Cell
GC-168	2,000	69.33	A-Cell
GC-169	2,000	69.33	A-Cell
GC-170	2,000	69.33	A-Cell
GC-171	2,000	69.33	A-Cell
GC-172	2,000	69.33	A-Cell
GC-173	2,000	69.33	A-Cell
B-Cell Non-Testable HEPA[2] Filters	150	7.29	A-Cell
Light Bar	20	0.75	A-Cell
Power Hawk Tray	100	4.17	A-Cell
Box #1	500	10.50	A-Cell
Box #2	10	3.40	A-Cell
30 Gal Drum	30	5.25	A-Cell
B-Cell ESP[3] Filter Frame	250	19.18	A-Cell
B-Cell ESP Filter 1	150	7.29	A-Cell
B-Cell ESP Filter 2	150	7.29	A-Cell
B-Cell ESP Filter 3	150	7.29	A-Cell

Table 1 – A-Cell Final Inventory Estimate

Debris Item	Approx. Weight (lb)	Approx. Volume (ft3)	Cell Origination
B-Cell ESP Filter 4	150	7.29	A-Cell
Shop Vacuum	10	5.63	A-Cell
24-Pin Fuel Storage Container	500	15.00	A-Cell
Work Tray #1	500	25.00	A-Cell
Work Tray #2	20	10.00	A-Cell
10-Gal Drum	10	4.50	A-Cell
Crawler	150	16.00	A-Cell
Clamshell	50	0.88	A-Cell
D-Cell Dust Stops	30	0.33	A-Cell
A-Cell Debris Summary	**18,930**	**711**	–
Floor Grout	41,250	316.25	B-Cell
Stainless Steel Liner	2,800	5.73	B-Cell
Concrete Floor	39,522	303.00	B-Cell
Carbon Steel Spreader Bar	250	0.50	B-Cell
Block of Steel	4,000	9.00	B-Cell
GC Lids (8 each)	1,200	2.00	B-Cell
SST Screen and Frame	200	2.67	B-Cell
2 ft x 2 ft x 1/4-in. Mild Steel Plate and Angle	200	0.50	B-Cell
10-in. Schedule 40 SST Pipe, Ends Capped	150	2.41	B-Cell
Camera Unit on Frame	200	0.13	B-Cell
SA Robotics Skid	4,000	96.00	B-Cell
Zirmul Refractory Bricks, clam shell	215	0.50	B-Cell
Bigalow Scraper	200	12.00	B-Cell
R07 Probe Shielded Container	100	0.44	B-Cell
4 Sections of Airlock Tracks	1,800	16.00	B-Cell
Turntable	1,000	160.00	B-Cell
3-Ton Crane Winch Motor Stand	500	48.00	B-Cell
3-Way Spreader Bar for Grout Container	290	0.08	B-Cell
Cybernetix Robot/Stand	500	168.00	B-Cell
Step Ladder	10	13.50	B-Cell
Camera Counter Balance Bar	100	6.00	B-Cell
HEPA Vacuum	100	2.00	B-Cell
B-Cell Debris Summary	**98,587**	**1,165**	–
Dust Stop Filters in Frame	75	12.50	C-Cell
Dust Stop Filters in Frame	75	12.50	C-Cell

Table 1 – A-Cell Final Inventory Estimate

Debris Item	Approx. Weight (lb)	Approx. Volume (ft3)	Cell Origination
10-ft Aluminum Ladder	20	5.00	C-Cell
Platform Ladder	70	141.17	C-Cell
4-ft Aluminum Ladder	10	2.00	C-Cell
6 ft Aluminum Step Ladder	15	3.00	C-Cell
6-ft Engineered Container	120	2.08	C-Cell
GC 3-Way Spreader Bar	290	4.50	C-Cell
50-ft Cybernetix Power Cable	400	4.50	C-Cell
50-ft Cybernetix Hydraulic Cable	400	4.50	C-Cell
5-ft Grab Tool, Aluminum	5	0.03	C-Cell
KSI Arm	700	6.00	C-Cell
Cover Block Lifting Fixtures	140	0.50	C-Cell
Camera Unit on Frame	50	2.50	C-Cell
Winch Motor	50	0.69	C-Cell
Rock Stop Filters (2 each)	240	4.00	C-Cell
A-Cell Counter Balance Spreader Bar	500	1.00	C-Cell
SST Spent Fuel Cask Alignment Basket	200	12.50	C-Cell
Manipulator Boot	5	0.01	C-Cell
10-ft Aluminum Extension Ladder	20	5.00	C-Cell
C-Cell Debris Summary	**3,385**	**224**	**–**
Steel Box	400	10.00	D-Cell
Steel/Lead Lid	143	0.21	D-Cell
Dust Stop Filter and Frame	75	12.50	D-Cell
D-Cell Debris Summary	**618**	**23**	**–**
Counter Balance	2,000	15.63	Airlock
Dust Stop Filter and Frame (4 each)	300	50.00	Airlock
Miscellaneous Rigging on Walls and Floor	100	2.22	Airlock
Working Camera (crane rail camera)	50	5.00	Airlock
Pan/Tilt Camera	50	5.00	Airlock
Pan/Tilt Camera (not working)	50	5.00	Airlock
Remote Camera/Medium Pressure Decontamination Sprayer	100	5.00	Airlock
4-ft Ladder	5	2.00	Airlock
Small Clamshell	15	1.5	Airlock
Port-a-Band Saw	10	1.74	Airlock
Plastic on Floor	50	27.00	Airlock

Table 1 – A-Cell Final Inventory Estimate

Debris Item	Approx. Weight (lb)	Approx. Volume (ft3)	Cell Origination
Miscellaneous Tools, Hooks, Paint Cans on Work Tray	100	3.41	Airlock
100-ft of Air Hose	30	4.50	Airlock
Long Reach Tools (several)	5	0.17	Airlock
55 Gallon Drum	50	11.11	Airlock
25-ft Garden Hose	10	1.67	Airlock
Miscellaneous Pipes, Conduit, Power Cords, Buckets	50	64.00	Airlock
Aluminum Saw Horses (2 each)	100	10.17	Airlock
Lead Blanket	70	0.16	Airlock
Airlock Debris Summary	**3,145**	**215**	**–**
A-Cell Total Debris Estimate[1]	124,665	2,338	–

Notes:
1) Values updated to reflect current conditions. Previous revision listed the A-Cell Final values as 125,218 lb and 2,372 ft3 which is used in 30% Design Package calculations.
2) HEPA – high-efficiency particulate air
3) ESP – electrostatic precipitation

B-Cell

All B-Cell debris items will be placed within A-Cell, except for one Duct Sprayer, which may be packaged and transported to ERDF. The particulate grout, stainless-steel liner, and concrete floor will be cut into pieces, placed in waste sacks, and moved directly into A-Cell by the cranes.

Since the previous activity calculations did not account for the leak within B-Cell, the results are assumed to be inaccurate. Further investigation is necessary to determine a path forward for proper estimation of subsequent activities. The previous radiological inventory at the floor, sump, and trench was estimated to be 8,480 Ci (0300X-CA-N0115), but this value is expected to change as the project progresses.

C-Cell

The majority of debris within C-Cell is expected to go to A-Cell. One Duct Sprayer is expected to be packaged and transported to ERDF. The total radiological inventory estimated in C-Cell is 2.39 Ci (0300X-CA-N0115).

D-Cell

The majority of debris within D-Cell is expected to go to A-Cell. Two Duct Sprayers are expected to be packaged and transported to ERDF. The total radiological inventory estimated in D-Cell is 135 Ci (0300X-CA-N0115).

Airlock

The majority of debris within the Airlock is expected to go to A-Cell. One Duct Sprayer and one Televator are expected to be packaged and transported to ERDF. Due to its size, the Televator is expected to be size-reduced prior to transport. The total radiological inventory estimated in the Airlock is 10.3 Ci (0300X-CA-N0115).

ERDF

There are a few relatively large sized items identified for direct transport to ERDF to ensure adequate space within the final A-Cell monolith. It is highly desirable for the B-Cell debris to be placed within the monolith to take advantage of the shielding provided by the thick concrete cell walls. Table 2 provides the list of items identified for transport to ERDF. The radiological activity of these items is unknown and will be calculated and measured during packaging operations.

Table 2 – Debris Items to ERDF

Debris Item	Approx. Weight (lb)	Approx. Volume (ft^3)	Cell Origination
Duct Sprayer (2 each)	1,200	432	A-Cell
Duct Sprayer	600	216	B-Cell
Duct Sprayer	600	216	C-Cell
Duct Sprayer (2 each)	1,200	432	D-Cell
Duct Sprayer	600	216	Airlock
Televator	400	320	Airlock
ERDF Summary	**4,600**	**1,832**	**–**

Available waste packaging for on-site shipment to ERDF is expected to consist of DOT Type A packaging, as previously mentioned. The level of packaging will be driven by the radiological contents and all imposed requirements will be satisfied. Particulate grout can be added to containers to increase shielding or to provide stabilization as necessary.

Criteria to be considered for proper waste packaging determination include the following:

- Container size and weight for passing through the Airlock door
- Degree of size reduction required to meet packaging size constraints
- Pre-bag debris item(s) within cell or bag in Airlock
- Grouting location (if used).

2.1.2 Equipment Installation

It should be noted that the disposition/disposal/storage plan for all new equipment installed within the REC will be finalized as the design matures.

Brokk®[2] Install

A small commercial Brokk excavator (Model 160) may be used primarily to support debris removal, size reduction, and waste packaging operations in the Airlock on an as-needed basis (Figure 4). Its secondary function is to serve as a backup to the primary equipment operating in B-Cell, with the possibility of performing both size reduction activities in A-, C-, and D-Cells, and demobilization of

[2] Brokk is a registered trademark of Brokk AB Corporation, Skelleftea, Sweden.

equipment at the end of the project. Shears will be used for size reduction; the process of how this will be accomplished will be discussed in further detail as the design matures. Initial debris removal and relocation will be attempted through the use of existing REC cranes and Master-Slave Manipulators (MSMs). The Brokk is intended to be installed only if required.

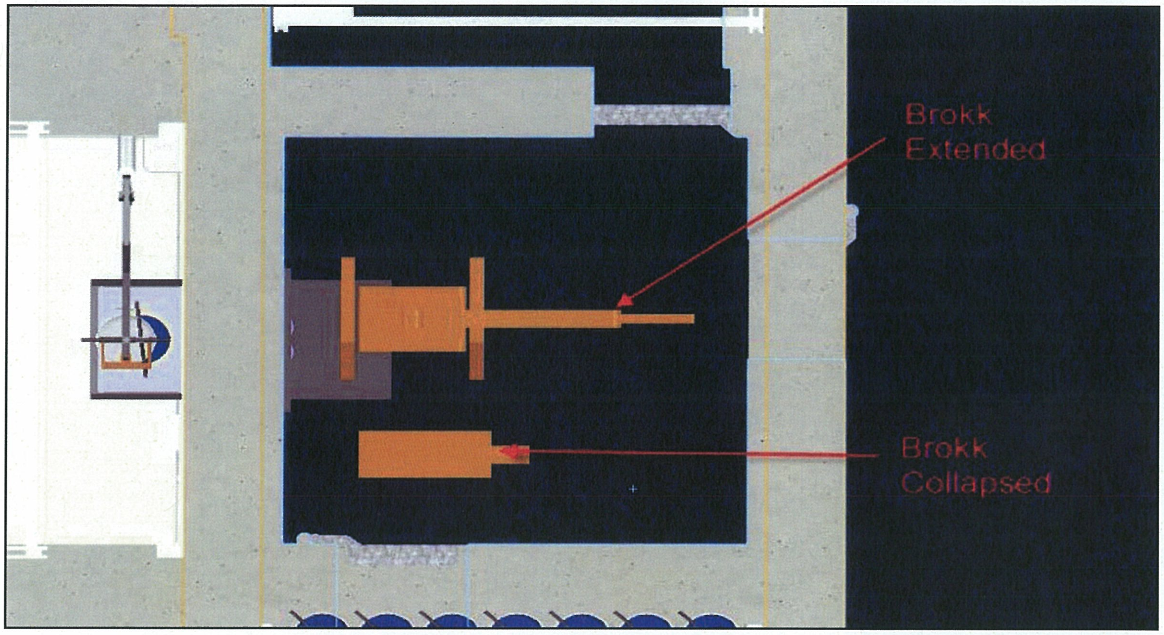

Figure 4 – Brokk Footprint in the Airlock

The goal is to avoid or delay the introduction of the Brokk into the Airlock for as long as possible, since once the Brokk is contaminated, it will not be easy to remove or repair. With the current set of intended tools, it is possible that all functions anticipating the use of a Brokk can be performed by other installed equipment. Although the Brokk may never be installed into the REC, it has capabilities that will enable it to provide important recovery options and flexibility to successfully support completion of the project.

The Brokk will be equipped with a remote tool changer, hammer, bucket, and shear, which will be staged in the Cask Handling Area (CHA). If required, the Brokk will be driven into the Airlock using pendant controls. Figure 5 shows a Brokk in a remote environment. Utilities and control cabling will be installed through existing pass-through penetrations to the CHA. The onboard and area cameras will provide the vision systems required for proper Brokk operation.

Figure 5 – Example of Brokk 160 Working Remotely in a Cell

Remote Excavator Arm Through Support Installation

There will be four Remote Excavator Arm (REA) mounting locations with two penetrations each, as shown in Figure 6. These are located just above the 0-ft elevation on the north and south walls of B-Cell. There will be a total of eight bores, each with an approximate 12 in. diameter. Each support location has wall-mounted interferences that must be removed sufficiently to allow mounting of the outer anchor plate and coring tool. On three locations (southeast, southwest, northwest) these are small, unused electrical panels. On the northeastern corner, a small transfer containment exists within a small room.

The lower bore hole is very close to some embedded process piping in the B-Cell walls. Based on the final location, if there is any concern with cutting into this pipe, it is proposed that the process pipes are filled with epoxy grout to seal them prior to boring. This will prevent any cutting fluid from traveling to uncontrolled locations within the 324 Building.

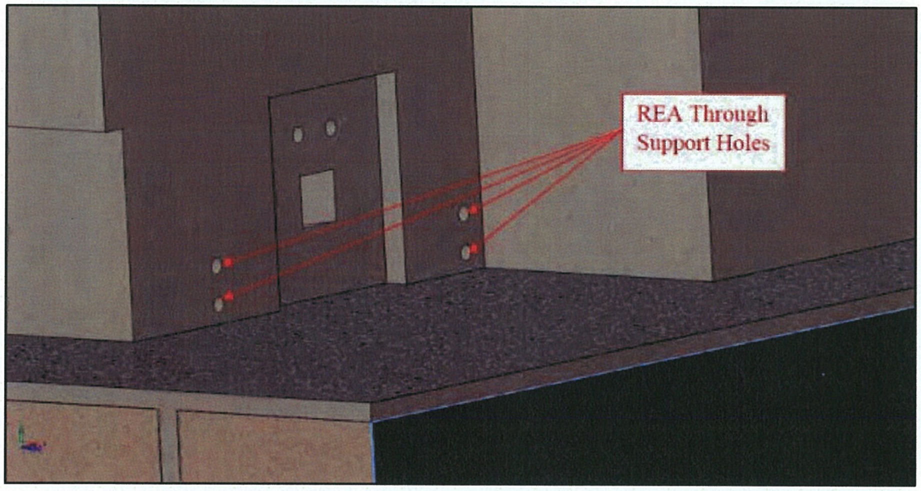

Figure 6 – REA Through Support Penetrations

The first step in boring the holes is to install an anchor plate at each location. This plate is mounted on four bolts thaPage 13t thread into concrete anchors placed within the concrete (Figure 7). These anchors are similar to Hilti®[3] undercut anchors of approximately 20 mm in diameter. Shims will be used behind the anchor plates to level the anchor plates vertically (Figure 8).

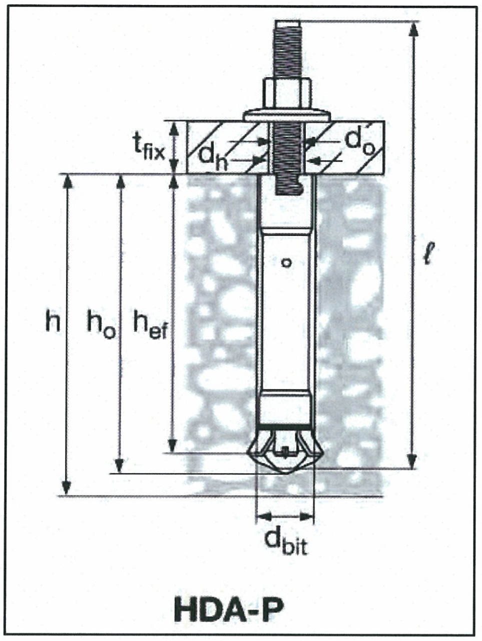

Figure 7 – Hilti Undercut Anchor

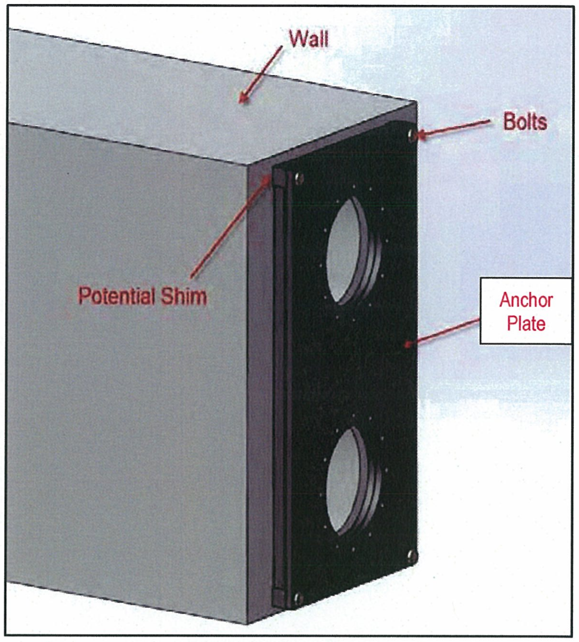

Figure 8 – Anchor Plate with Shims

The anchor plate is used to determine hole locations for the core drill. Figure 9 shows an example of a core drilling apparatus. Once set up, a new coring bit will be installed and cooling water supplied for core boring. The area directly below the core can be controlled to collect and store the volume of water recovered. At the end of the coring campaign this water can be stored or treated in drums as necessary. It is expected that little to no contamination will be present in the water.

Figure 9 – Example of Wall Coring

[3] Hilti is a registered trademark of Hilti Aktiengesellschaft Corporation, Schaan, Liechtenstein.

One issue related to the core drilling evolution, is whether the core drill should be stopped before the liner is penetrated and the partial core removed, or if the core should be drilled completely through the wall and liner at one time. Both methods of core removal are described below in more detail. It should be noted that regardless of the method selected, the air pressure inside the cell is lower than that in the surrounding rooms, so airflow will always be into the cell during Through Support installation.

If the REA holes are cored completely through the wall, the following method is used to remove the core.

- The Through Support hole is wet bored to within 3 to 4 in. of penetrating the interior B-Cell wall. The cooling water is then turned off and the final 3 to 4 in. of the hole is dry bored to minimize the potential for generating contaminated water.
- Initially, the core will be pushed partially into the cell and rigged for handling with an in cell crane. The Through Support is partially installed from the gallery side of B-Cell.
- The Through Support is pushed from behind while the crane is used to support the core as it exits the B-Cell wall into the cell.
- The Through Support will push the core entirely out of the wall, where it will hang suspended from the crane. The crane can then take this core to the Airlock for packaging and shipment. Note that these cores should not have significant contamination, other than the outer skin of the liner.
- The REA Through Support installation is then completed as shown in Figure 10.

If a partial core drilling method is used to bore the REA Through Support holes, the following occurs.

- The REA Through Support holes are wet bored to within a few inches of the interior cell wall surface.
- The core drill is removed and the core broken. The broken core is removed from the hole into the gallery and disposed of in accordance with approved procedures. The cored piece of concrete (wall piece) should be clean (no contamination).
- The core drill is reinstalled and the final few inches of wall are dry bored and the remaining wall pieces are pushed into the cell using the Through Supports.
- The REA Through Support installation is then completed as shown in Figure 10.

As the design matures, the method for core removal will be further evaluated and a final selection made. This issue is included in the design issues list.

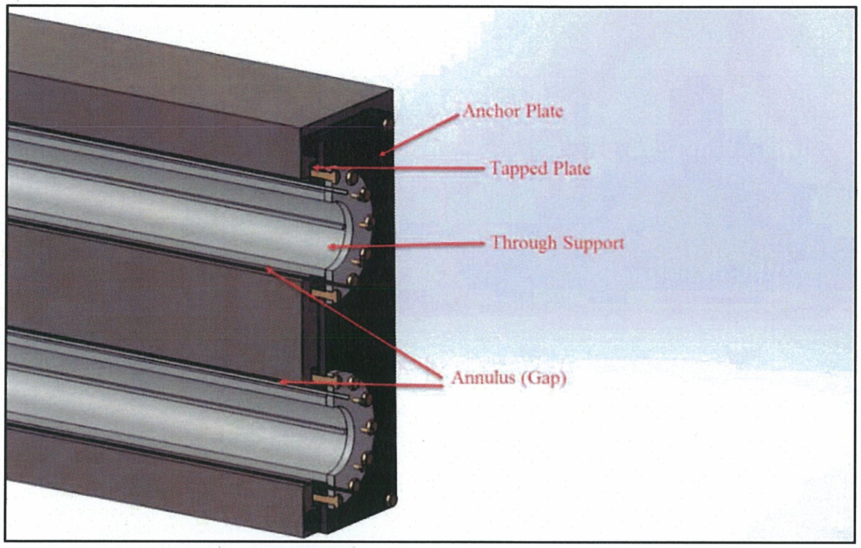

Figure 10 – Cross Section of Through Support Tubes Attached Fixture

Once the Through Support is fully engaged, it is secured to the anchor plate by its flange. The Through Support outside diameter is 10 in. and provides 1 in. of clearance all around the bore, allowing some misalignment of the Through Support with the bore. The attachment of the Through Support to the anchor plate will align the Through Support horizontally.

Each Through Support has an inflatable seal near its end that is inflated from outside the cell. This feature seals the annulus or gap between the concentric Through Support and bore hole. Once the Through Support is installed, the inflatable seal in the tube annuluses can now be inflated, sealing the gap (Figure 11).

Once the rear seal is inflated, the annulus is filled with epoxy grout using another penetration in the Through Support to completely fill the annular space between the inflated seal and outer flange (Figure 12). This material will exit the annulus and enter into the space behind the anchor plate. Any gaps can be sealed around the anchor plate to ensure that this space is also filled. In terms of potential loads encountered by the bolts on the end of the flange, the anchor plate itself will be designed for the full load anticipated, and additionally supported by the epoxy grout application.

Once the epoxy grout is set, the Through Supports are now sealed and supported by the wall, providing precise alignment relative to the outer fixture. This should ensure easy connections inside the cell. Figure 13 provides a cross-sectional view of the REA mounting.

In addition to the Through Support installation method described above, an optional method to provide additional assurance of proper alignment is to install a dummy REA post with the same mounting interface dimensions as the actual REA. Figure 14 shows the dummy post installation.

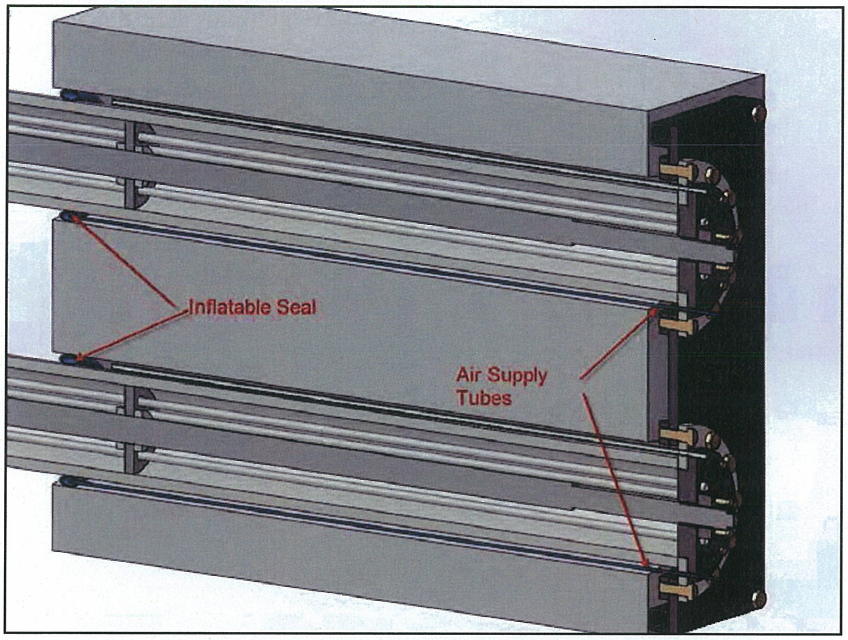

Figure 11 – Installation of Inflatable Seal

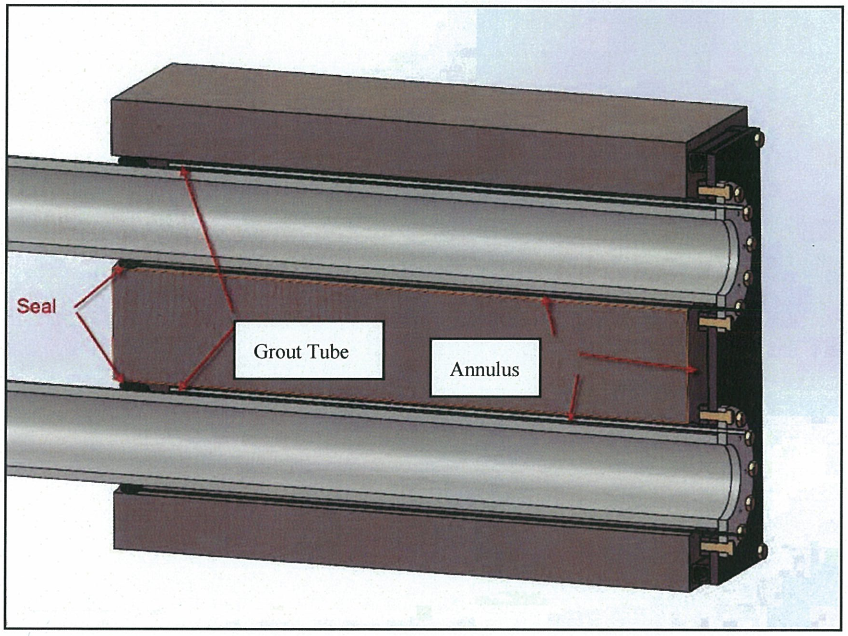

Figure 12 – Epoxy Grout Injection Site

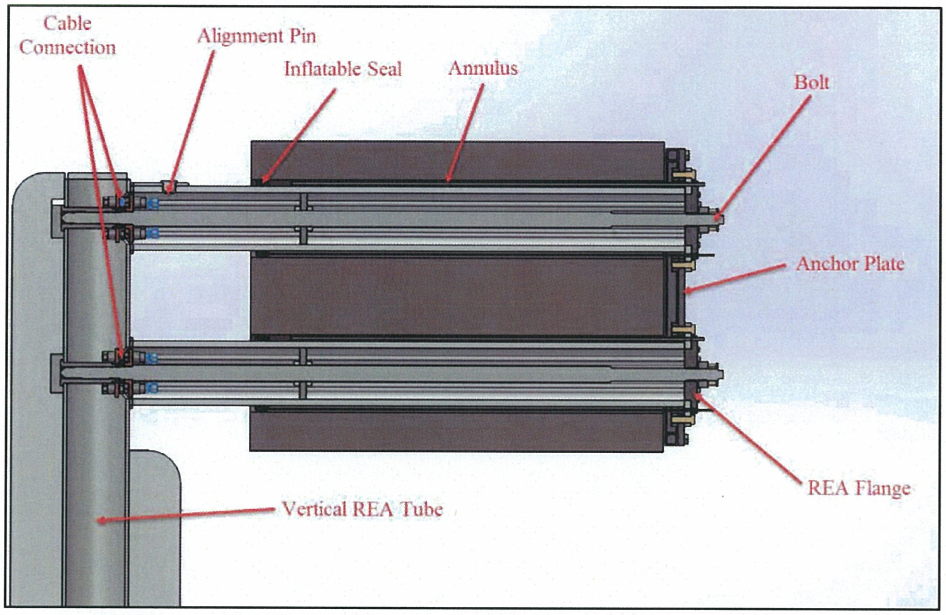

Figure 13 – Cross Section of REA Mounting

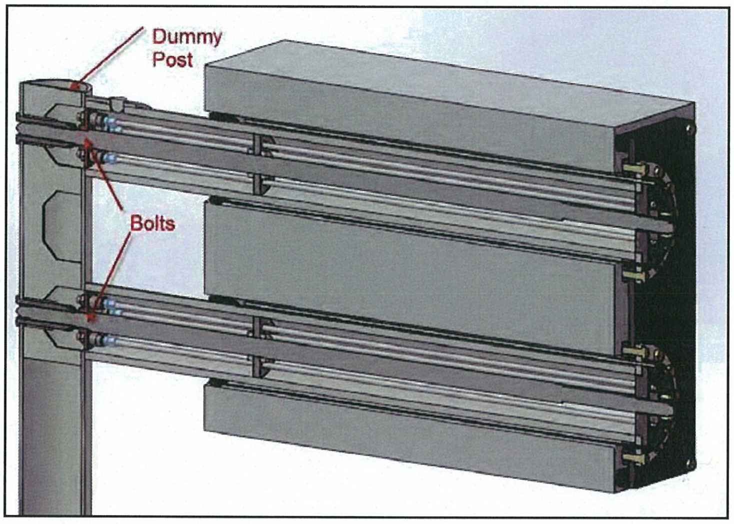

Figure 14 – Dummy Post Installation

Once the epoxy grout is set, the tubes are ready to be used. The REA bolts with remote utility plates (Figure 15 and Figure 16) are inserted into the Through Support tube and mounted with a thick end cap (Figure 17 and Figure 18). REA bolts with remote utility plates can be fully replaced at any time if a failure is encountered.

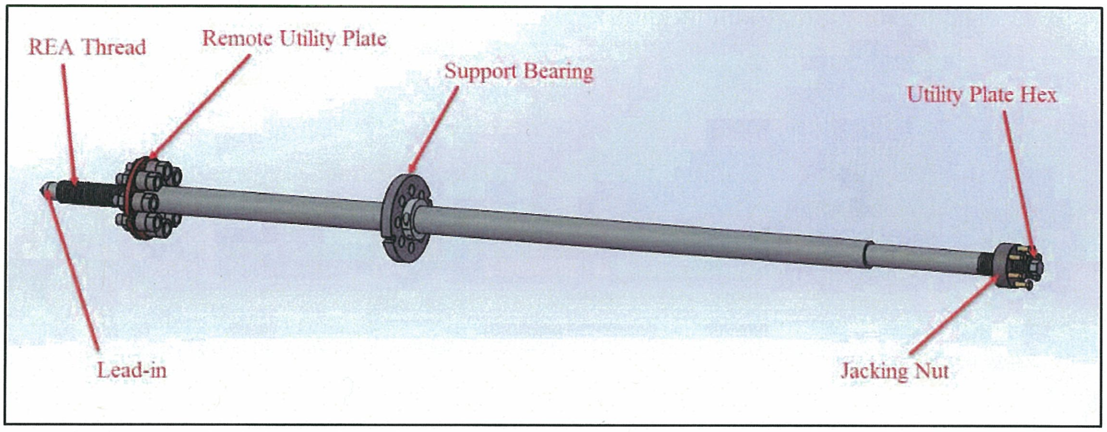

Figure 15 – REA Bolt Assembly (without hydraulic lines)

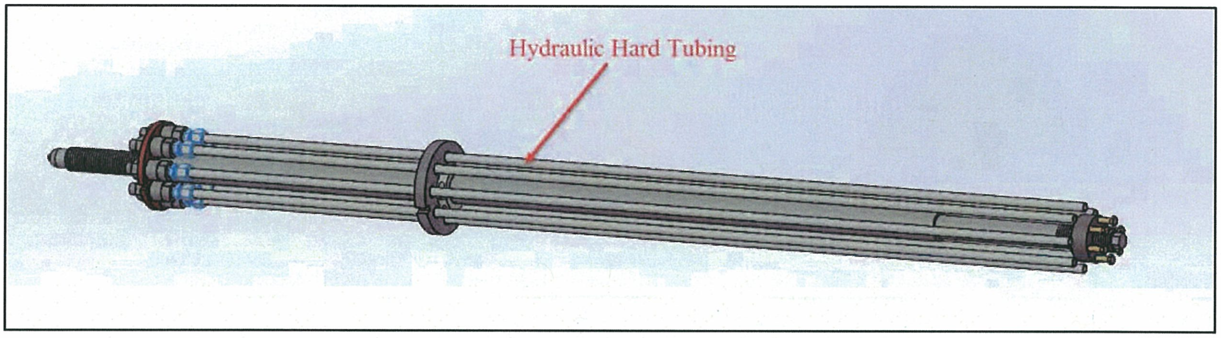

Figure 16 – REA Bolt Assembly (with hydraulic lines)

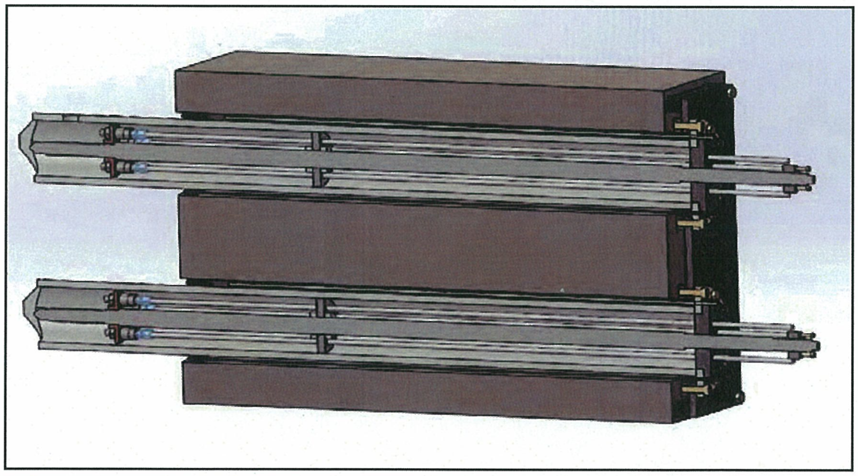

Figure 17 – Cross Section of REA Bolt Assembly Installed into Through Supports

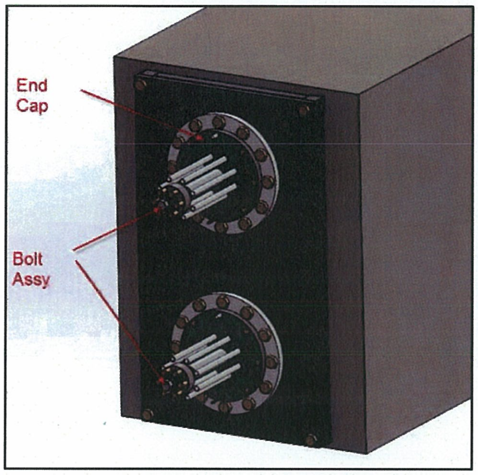

Figure 18 – End View of REA Bolt Installed into Wall

2.1.3 Remote Excavator Arm Installation

The REA, tools with hangers (Figure 19), empty waste containers, and Transfer Barrier will be placed into the Airlock using the reverse boom hoist. The Airlock door will be closed, and the B-Cell door opened. The REA will then be picked up with the B-Cell crane and placed in front of the REA mounting. The REA can then be secured to the Through Supports from outside of the cell (Figure 20).

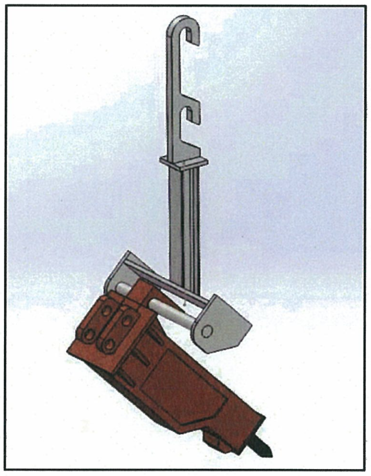

Figure 19 – Tool Holder

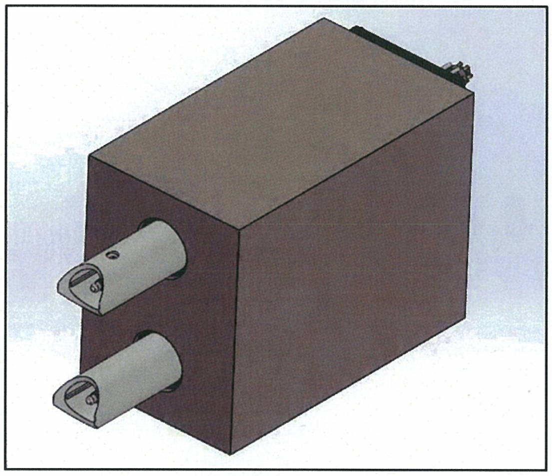

Figure 20 – View of Through Supports in Wall without REA Installed

To begin mounting the REA, the bolts are in their back position, allowing them to slide manually into the tube, ensuring clearance for the REA. As the crane lifts the REA toward the Through Supports, the initial connection will be made using the alignment pin on the upper hanger of the REA (Figure 21 and Figure 22).

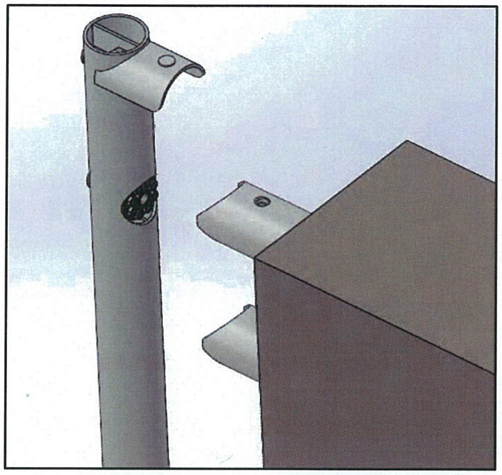

Figure 21 – REA Approaching Through Supports

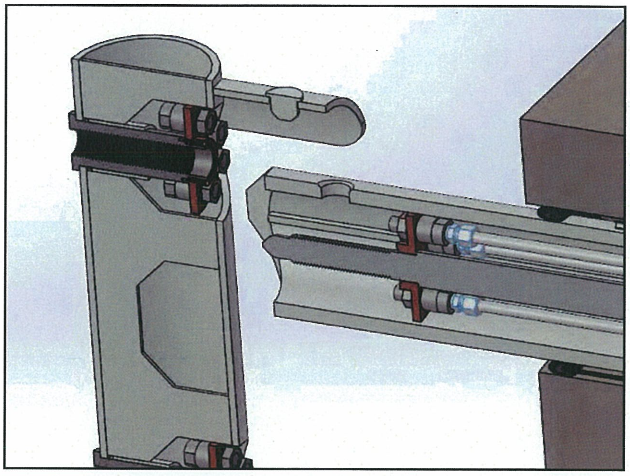

Figure 22 – Cross Section View of REA and Through Support Details

A location pin on the REA aligns with a hole on the top Through Support (Figure 23). This is a rough alignment. The curvature of the ends of the Through Supports against the cylinder of the vertical post provide the initial alignment of the REA to the Through Supports (Figure 24).

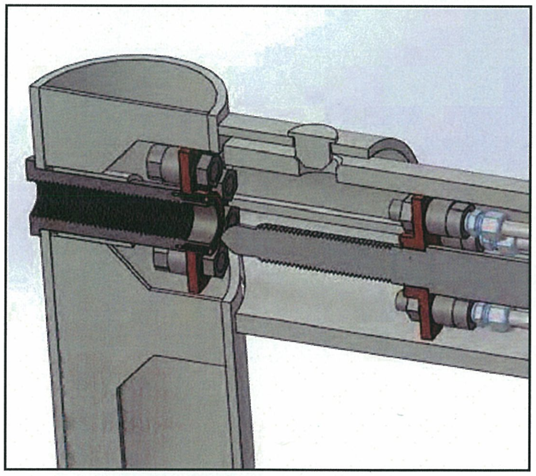

Figure 23 – Initial Pin Alignment of the REA

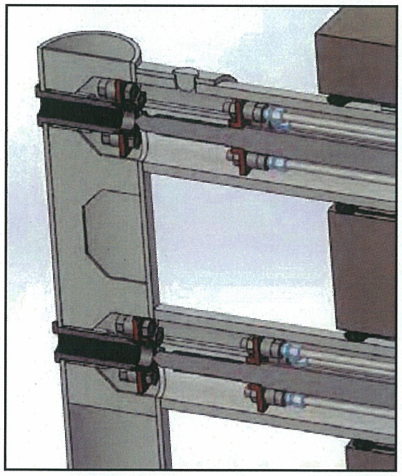

Figure 24 – Overall Cross Section View of REA on Through Supports Prior to Bolting

The REA is now hanging on the Through Supports, and the upper pin will keep it in place until the bolt is engaged. The bolt end has a hemispherical lead-in, a design used commercially to avoid cross threading while allowing for some angular alignment (Figure 25).

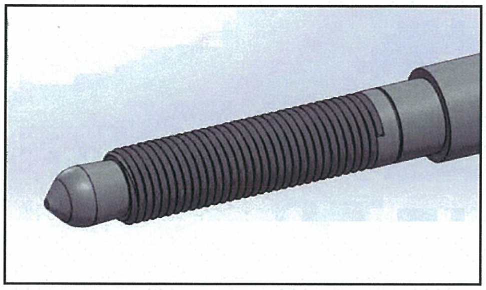

Figure 25 – Detail of REA Bolt with Hemispherical Lead-in

As the bolt engages, it steps through progressively tighter alignment features prior to the utility plate engagement (Figure 26).

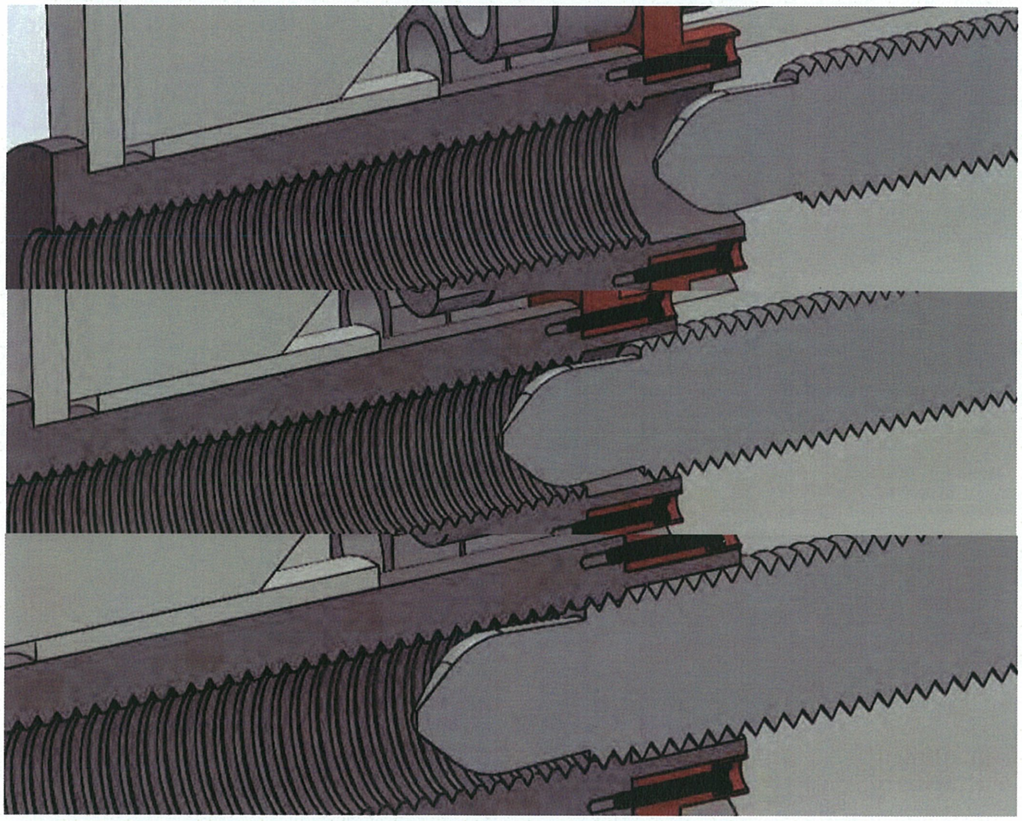

Figure 26 – Sequence Showing Increase Alignment of Bolt with REA

The bolt is then tightened with a small hex at the end of the bolt (Figure 27). As the screw is engaged, the shoulder on the threaded internal bolt forces the bolt utility plate toward the REA utility plate (Figure 28).

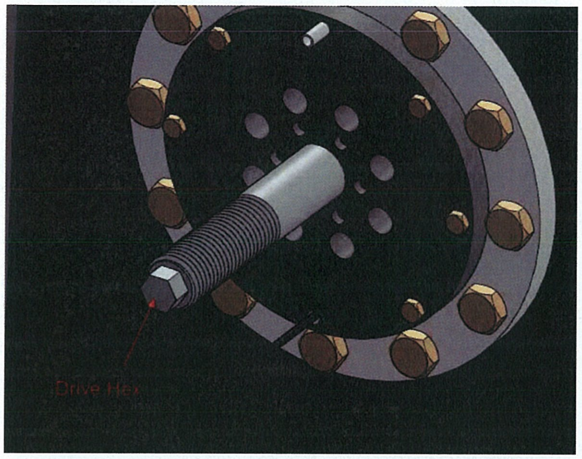

Figure 27 – Initial Engagement Hex Drive

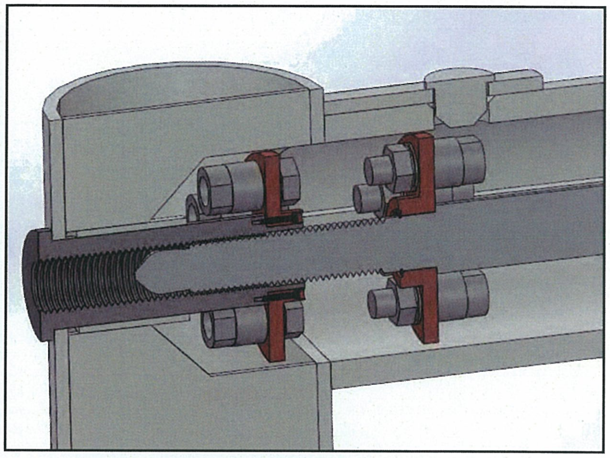

Figure 28 – View of REA Utility Plates Starting to Engage

The REA bolt utility plate is free to allow bolt rotation but constrained axially. A set of keyways in the Through Support keep the utility plate from rotating (Figure 29).

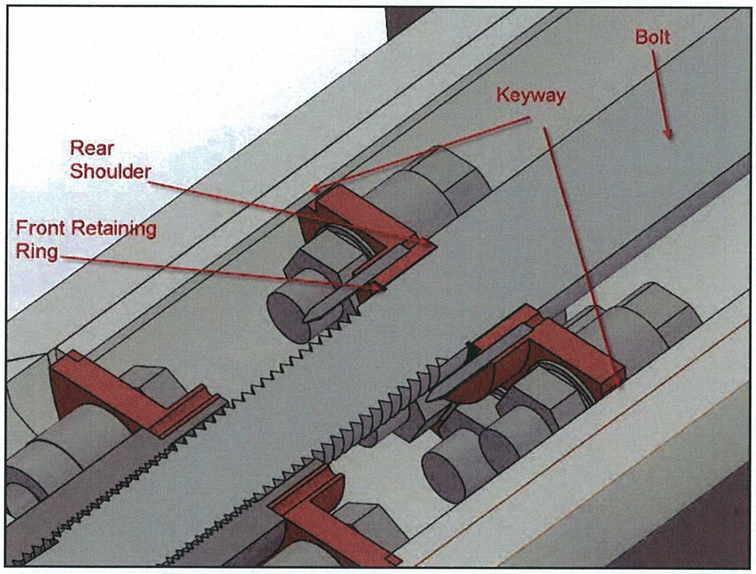

Figure 29 – Cross Section of Utility Plate Feature

The REA utility plate is fixed to the shaft with two shoulder bolts. The shoulder bolts have a loose fit to allow some movement but keep the alignment of the utility plate and hold it on the shaft. The design of this connection is such that as the tool plates get closer, increasingly tighter alignment features dictate that these will be very closely aligned before final hydraulic connections. As the utility plates get close, a set of precise alignment pins engage just prior to the engagement of the connectors (Figure 30).

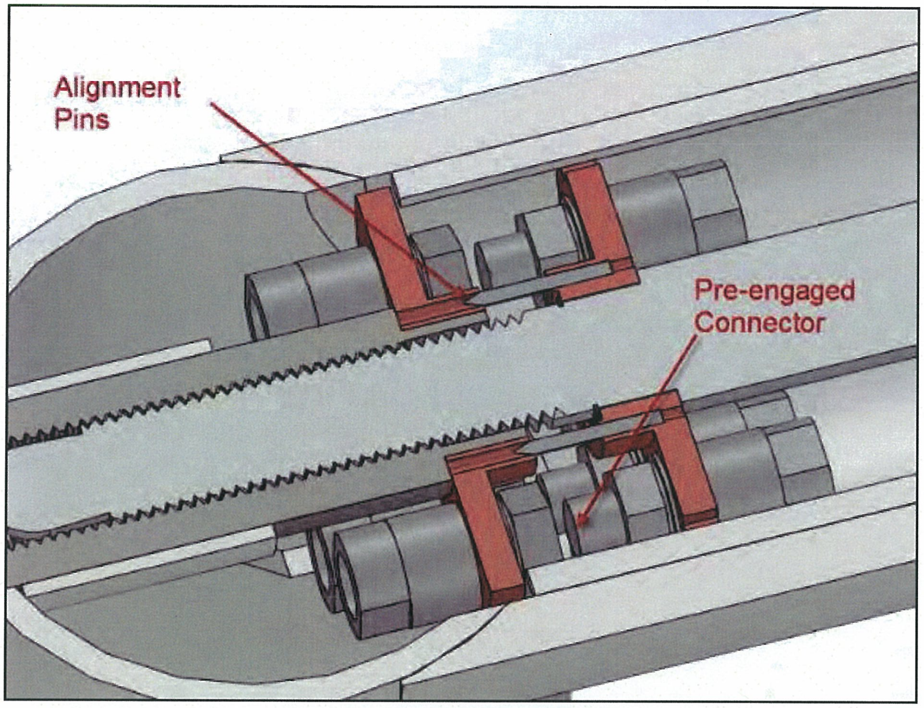

Figure 30 – Alignment Pins

The utility plates are precisely aligned at this point and the screw is fully installed until the connectors are engaged and the utility plates are compressed together (Figure 31).

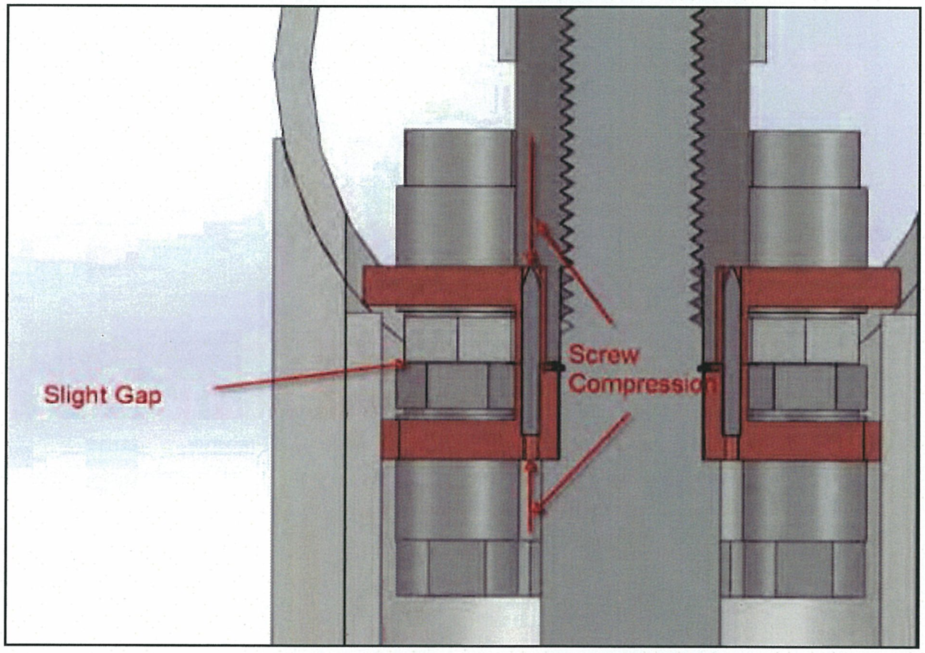

Figure 31 – View Showing Fully Engaged and Torqued Utility Plates

The utility plates are now fully connected. The connectors used for hydraulic supply are no-leak quick connectors, designed for this exact purpose. They are large, roughly 2 in. in diameter, and very robust (Figure 32). The electrical connection is also similar in nature. Both the top and bottom Through Supports have connections which are essentially identical in design, although having slightly different end connectors.

Figure 32 – Details of Hydraulic No-Leak Quick Connect Fittings

At this point the utility plates are secured, but the REA is not. The REA post needs to be tensioned to the Through Supports with a high force to ensure it is fully secured. This force is greater than that required on the utility plate, which is why the REA post is secured independently.

To tension the REA, a different method is used. Since the design makes use of one large bolt, the torque on a normal hex nut would be too large to tension with a normal tool. Therefore, a jacking nut is used with six smaller bolts (Figure 33).

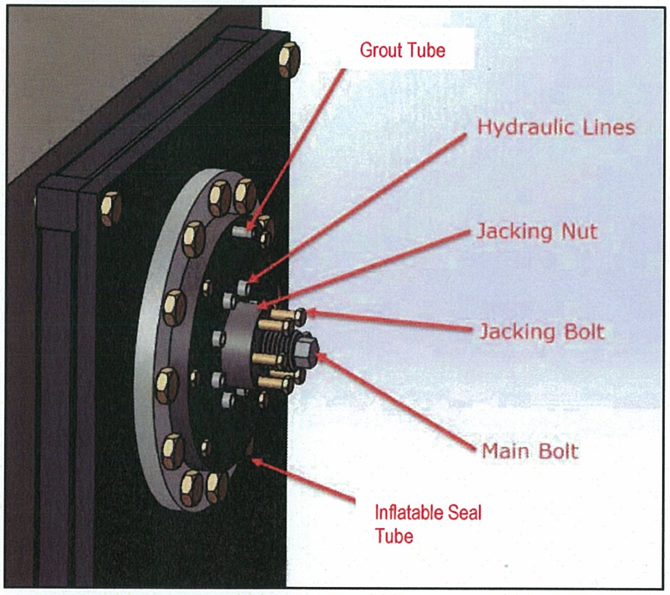

Figure 33 – End View of Jacking Nut

A jacking nut with the six smaller bolts is threaded onto the main bolt over the hex that was used to tension the utility plate. It is secured hand tight against the plate and each bolt lines up with a bolt socket in the plate, which will keep the jacking nut from rotating (Figure 34).

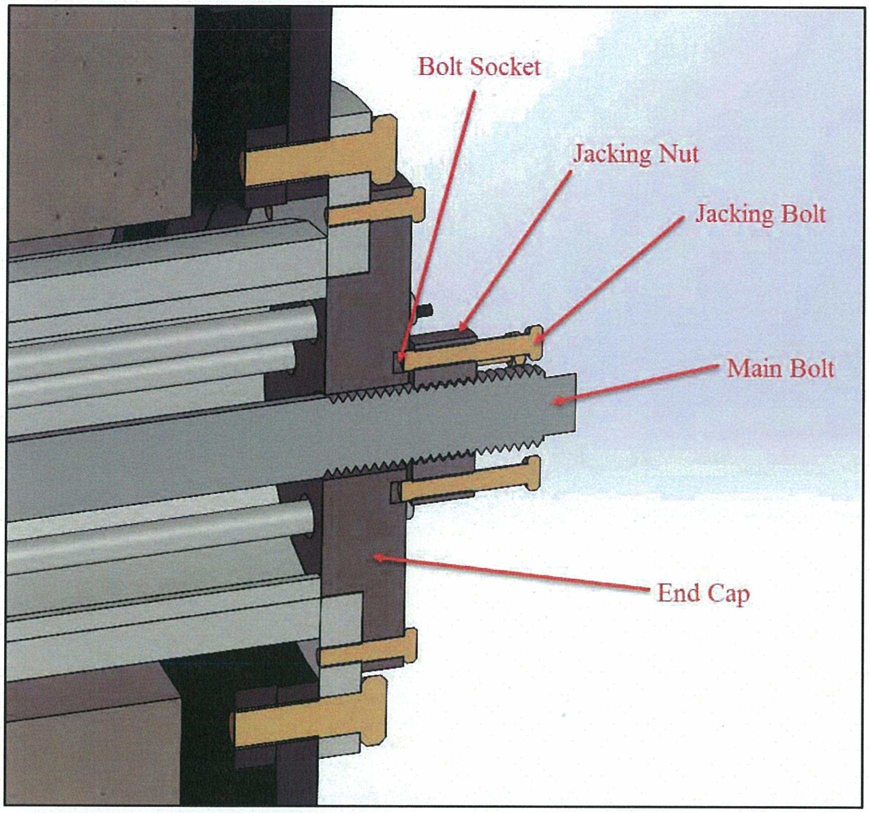

Figure 34 – Cross Section View of Jacking Nut

To tension the REA bolt assembly, the six smaller bolts are torqued and behave as jacking bolts pushing the jacking nut against the threads of the main bolt, thus tensioning the main bolt. This method allows very high forces to be created to secure the REA without affecting the utility plate (Figure 35). It should be noted that the utility plates are compressed against two hard shoulders and cannot separate; there are no spring forces present within the Through Support.

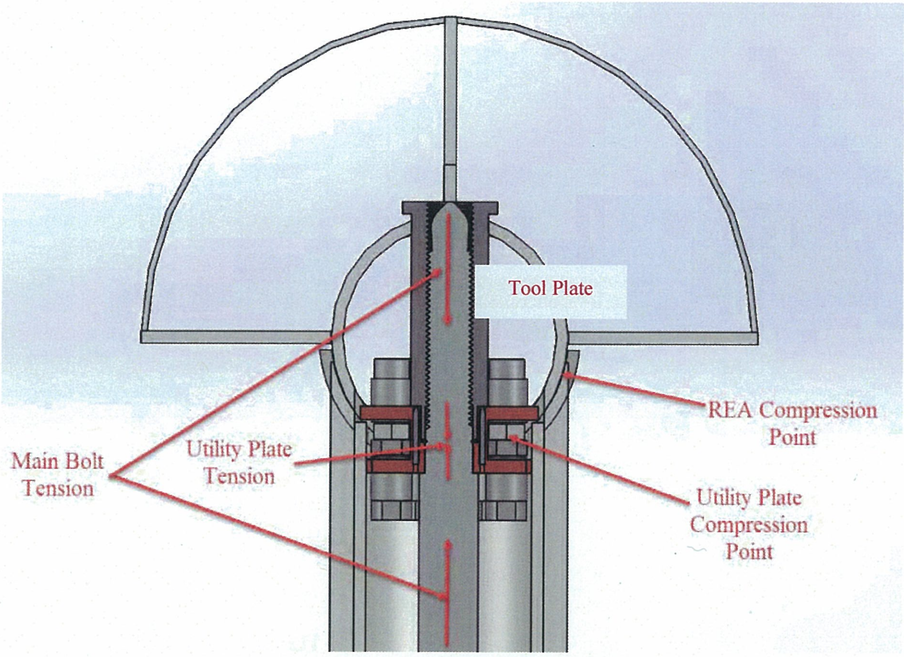

Figure 35 – Cross Section View of REA Secured to Through Support

This is repeated on the bottom Through Support and the REA is fully connected (Figure 36 and Figure 37). To remove the REA, the six jacking bolts and each of the utility plate hexes are loosened.

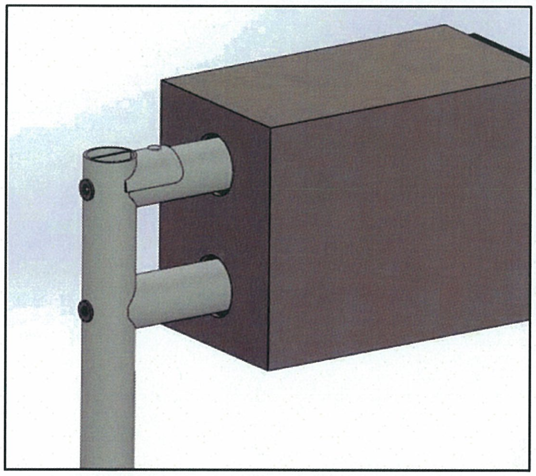

Figure 36 – Overview of REA Mounted to Through Supports

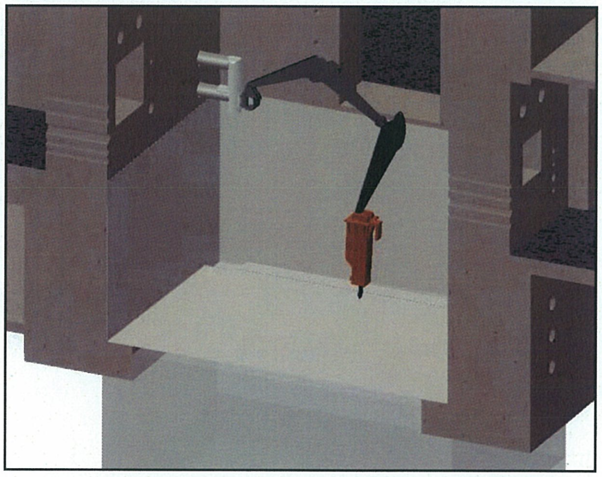

Figure 37 – Upper REA with Hammer for Removal of B-Cell Grout

2.2 Remediation

2.2.1 Grout/Fixed Debris Removal

Using the Upper REA and a hammer tool, the B-Cell debris, fixed in place by a layer of grout, will be chipped loose and lifted out (Figure 38). The hammer should be capable of quickly separating the cold joint interface between the grout layer and stainless-steel liner.

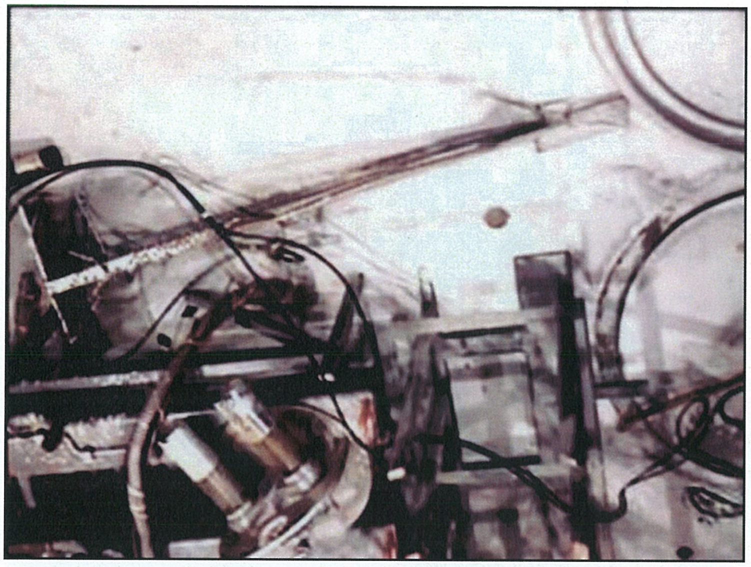

Figure 38 – Fixed Debris in B-Cell

In order to remove all the existing particulate grout, it will be necessary to relocate the Upper REA to other corners of the cell. This can be done by attaching the crane to the REA lifting eye, disconnecting the REA, and then moving it to a new location. Once all of the grout has been rubbleized, a waste container is installed. The crane then lifts the inner waste sack into B-Cell, where the Upper REA, with bucket attachment, can pick up any small debris and transfer it to the sack.

Once filled, the inner waste sack will be placed in the outer waste container located inside the Transfer Barrier. The waste container is then moved under the fixative spray which coats the entire top surface of the waste (Figure 39) for dust control. The waste sack is then transferred to the Airlock, where it is lifted with the A-Cell crane, and then, either taken to A-Cell or sent for further packaging in preparation for removal and direct disposal to ERDF. This process will be repeated until the small debris is removed.

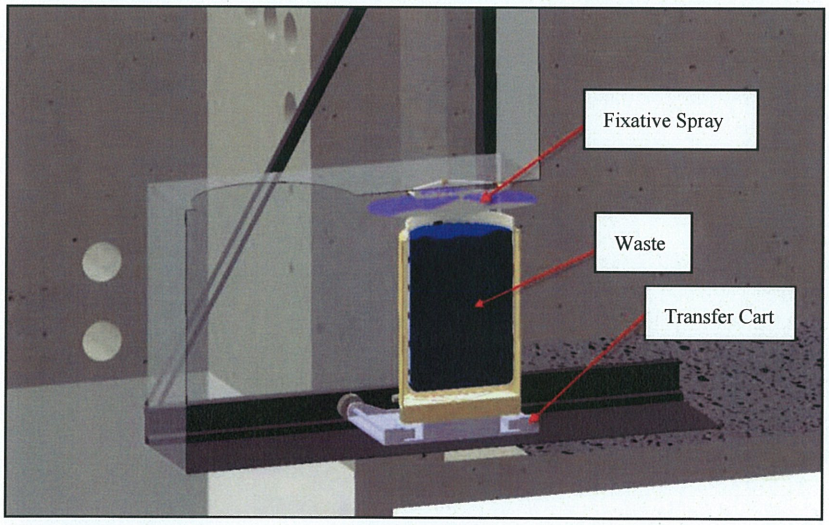

Figure 39 – Cross Section of Waste Transfer and Application of Fixatives

The larger debris is reduced in size, using both the shear and hammer tools, and then either packaged for placement in another cell or shipped out of the building as packaged waste. Some of the items anticipated to be too large and robust for size reduction will be sprayed with fixative spray using the MSMs. These larger items will be moved to the Airlock directly, and placed on plastic sheets, awaiting either placement in A-Cell or packing and shipping activities for out-of-building disposal.

Remaining Equipment Installation

After the debris is removed, the Lower REA is installed into the cell. The Lower REA installation would follow the same procedure as described in Section 2.1.3. The preferred installation location for the Upper REA is in either of the eastern locations, whereas the Lower REA initially is installed in the western penetrations. This allows the Lower REA to access and work on the floor and soil while the Upper REA handles and manipulates waste containers (Figure 40).

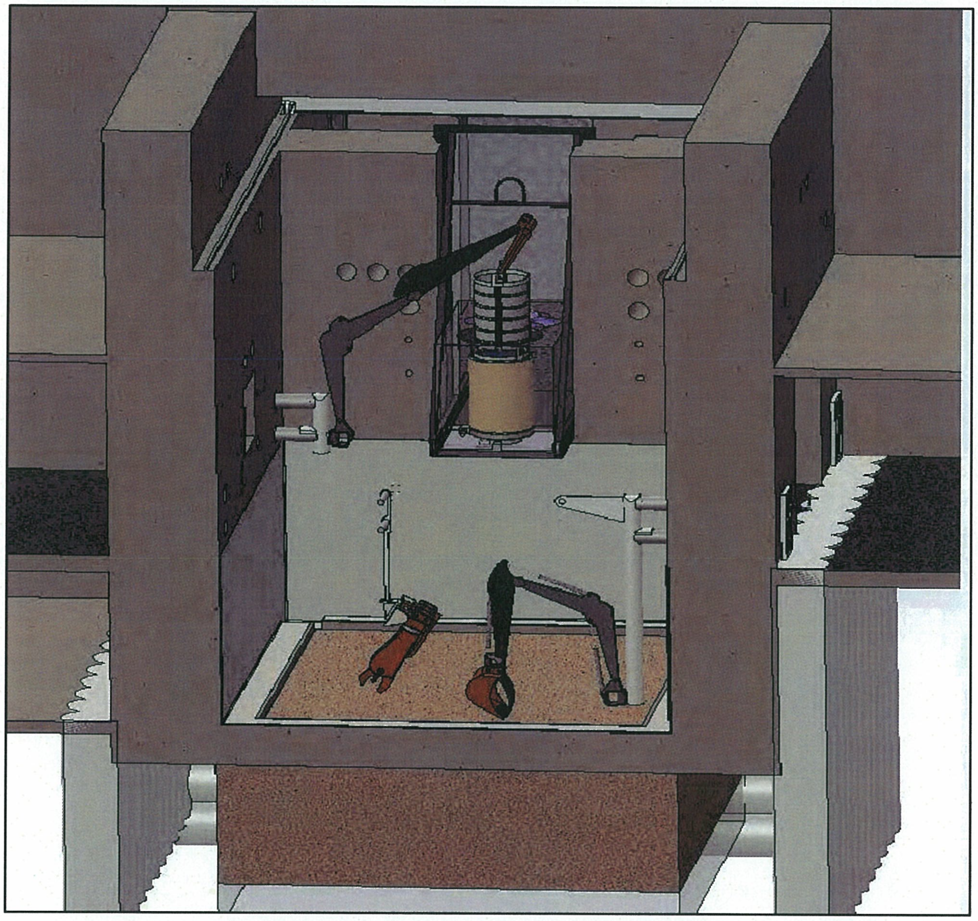

Figure 40 – Initial Equipment Configuration

2.2.2 Floor Removal

A remotely operated concrete cutting saw, equipped with a 30-in. diamond-encrusted blade, is used to segment and size-reduce the stainless-steel clad concrete floor (Figure 41). The track-mounted saw is attached to a lifting fixture that is positioned using the B-Cell crane or one of the REAs. The fixture is positioned, such that one end of the frame bears against the wall. The saw cuts from the wall towards the center of the cell. The frame is long enough that it allows the saw to cut over halfway across the cell. When a cut is completed, the saw is picked up and placed in the next position. The process is repeated until a series of parallel cuts are made extending from all four walls. The resulting blocks are loaded into sacks or containers by the REA for movement through the Transfer Barrier. Refer to Section 4.3 for more information on the saw.

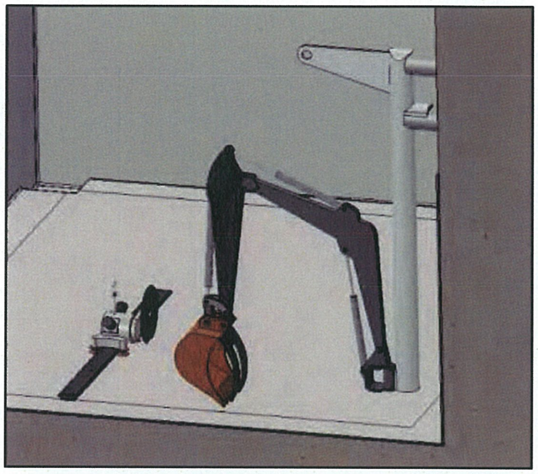

Figure 41 – Saw Placement on Floor

2.2.3 Soil Removal

Installing a new waste sack with a crane into the Transfer Barrier is the first step of soil removal and packaging. The Transfer Barrier moves the sack to B-Cell where the Upper REA lifts the inner sack down into B-Cell near the floor.

The next step in the soil removal process is the application of binder to the soil. The Lower REA moves the binder hoses near the mixing location where a measured amount of binder, determined during Proof-of-Principle (PoP) testing, is pumped onto the soil (Figure 42). The bucket of the REA is then used to uniformly mix the binder with the soil. Once a sufficient amount of soil and binder is combined, the Lower REA lifts the mixture into the waiting waste sack. Care is taken to load the sack as cleanly as possible.

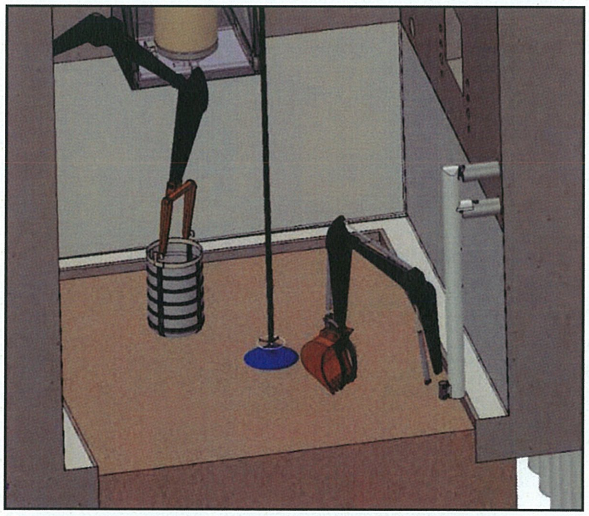

Figure 42 – Binder Applied to Soil Surface

If operations are suspended for an extended period of time, the binder hoses are cleaned out to prevent the binder from setting up in the hoses.

When the inner sack is full, it is lifted into the outer sack that is located in the Transfer Barrier. The transfer cart then moves the sack to the center of the Transfer Barrier where it is sprayed with a quick drying fixative spray over the top surface of the waste and sack. While the fixative spray dries, a gamma scanner using a collimated detector in the Transfer Barrier determines the dose level of the waste, and the weight of each sack is recorded.

Waste Loading

The waste sack is then moved to the Airlock side of the Transfer Barrier, and lifted with the A/D crane. Immediately after the filled sack is removed, the A-Cell crane is used to place a new empty waste sack into the Transfer Barrier.

The filled waste sack is then lifted into D-Cell, and lowered down the open hatch into the waste stand in C-Cell. Once released by the A/D crane, the C-Cell crane is then used to position the waste sack within C-Cell.

Mockup testing will finalize this waste loading approach; however, the current intended design covers the C-Cell with a layer of waste sacks. The sacks are initially spread out on the floor in an upright position. Additional binder may be applied during collection of the soil to create a more fluid mixture for the next layer of waste.

The waste sacks may have an external strap on the outside, which will allow the C-Cell crane to tip over the sacks following the placement of the initial layer, dumping waste out on top of this first array of sacks. The purpose for dumping the sacks is to help fill any void spaces within the lower level of waste sacks. Following this, a subsequent combination of spilled sacks and un-spilled sacks will fill C-Cell until the crane can no longer lift sacks above the waste level.

It is possible to make shorter waste sacks that can be used to fill the last level of waste in the cell, maximizing C-Cell debris loading. When no more waste can be loaded into the cell, a particulate grout hose will be installed into a penetration in D-Cell and fed down the hatch. A fluid mixture of particulate grout will be pumped into the upper void of C-Cell until it is entirely filled. The hatch can then be replaced.

One concern of the waste placement within the cell and the final grouting evolution is the potential for any uncontained soil/binder mix to seep from the cell through small gaps around the various cell penetrations. However, the anticipated soil/binder mix is not expected to be fully saturated; therefore, the potential for the soil/binder mix to seep from the penetrations is expected to be very low. Subsequent to the placement of the waste sacks in the cell, any cell void spaces will be filled with particulate grout to create a monolith of the cell.

The specific type of particulate grout used for filling the voids has not been selected at this stage of the design. Depending on the material selected, there may be potential for material to seep from openings as small as 2 mm. This would then require the cells to be sealed in some way to mitigate the seepage issue. As the design matures, various options will be explored to determine the most efficient and cost effective way to ensure the cells are sealed. In conjunction, associated techniques for testing seals and materials intended to be used will also be determined.

The waste loading process continues with the filling of D-Cell. The procedure is essentially the same as C-Cell, except that care needs to be taken when maneuvering around the D-Cell door, which must remain open during loading. If D-Cell is filled and more waste needs to be stored, then additional waste can be taken to A-Cell. To start this process, a dam must be installed in A-Cell. Waste sacks can then be lifted over the dam and spilled over the debris into A-Cell.

During the filling process, the MSM in the C- and D-Cell walls can remain in place or be removed at any point. If the MSM is removed, the penetrations through the wall will require sealing.

During excavation, the soil will transition from sand to cobble. At the point when it is no longer practical to mix the binder with the soil directly, the cobble will be placed in the waste sacks and directly sprayed with binder. The cobble should have large void spaces that allow binder to flow in and through it easily.

2.3 Backfill and Equipment Disposition

After the desired excavation depth has been reached, and the radiological surveys confirm the desired contamination levels have been met as deemed necessary by WCH, REA excavation will terminate. In preparation for final demolition, via monolith cutting, the excavation within B-Cell will be backfilled. Use of controlled density fill (CDF) is preferred, as it can be placed remotely and does not require the use of compaction equipment that is normally required for soil backfilling. The use of CDF is preferred to particulate grout or concrete as it facilitates additional excavation if required for final remediation activities.

Applicable American Society for Testing and Materials standards for use of CDF will be implemented, and the placement of such will be controlled to minimize present voids and create practical layer uniformity. The specified CDF will be low strength in order to be excavated as required.

The equipment remaining in the cells after the excavation activities will include manipulators, cell cranes, transfer barrier, and the REAs. Final disposition of the equipment will be determined as the design matures.

2.4 End State/Transportation

As previously described, the majority of existing cell debris will be placed within A-Cell. Contaminated soil will be stabilized with binder, transferred to A-, C-, and D-Cells (high, pyro, and mechanical) and grouted in place. A wire saw will be used to cut the cells into segments, or monoliths. The monoliths will be lifted using an overhead gantry crane, or jacking equipment, and then placed on multi-wheeled trailers that will be rolled to ERDF.

The original design for the dismantling of the REC did not consider the additional weight in A-, C-, and D-Cells that will result from debris relocation and B-Cell sub-grade excavation. In preparation for the final end state, the monoliths must be evaluated further to ensure that safe and proper transportation to the disposal facility can be accomplished. As stated in the CDR (KUR-1782F-RPT-002), modifications to the cells must be performed with minimal impact to the end-state configuration. A floor analysis of A-, C-, and D-Cells (see Section 5.2 of this report) will be used to ensure that the demands placed on the cell floors will not exceed their structural capacities.

The previous design approach for segmenting and removing the REC monoliths had considered the cells to be filled with 30 pcf particulate grout. Current loading, by 115 pcf soil loads, will significantly increase the final loads supported by the segmented monoliths. Therefore, as part of an end-state analysis, structural evaluation of the monoliths will be performed to ensure the integrity is maintained during lifting and transportation activities. This analysis will be performed based on an assumed final dismantled configuration of the REC.

Prior to segmentation of the monoliths, the site around the REC is to be excavated to near bottom of B-Cell, to the (-)10.0-ft elevation. A flat area for placement of the wire saw equipment will be established on the north and west sides of B-Cell. In addition to other preparation, consideration should be made for the following:

- Interferences with crane foundation(s)
- The effect that B-Cell excavation has on soil capacities in the area proposed for cast-in-place gantry crane foundations
- Increased dose rates relative to exposure of the exhaust duct.

The current configuration of monoliths and locations of cuts are depicted in Figure 43. The following sections outline the current remediation plan as they relate to the end state demolition of the REC.

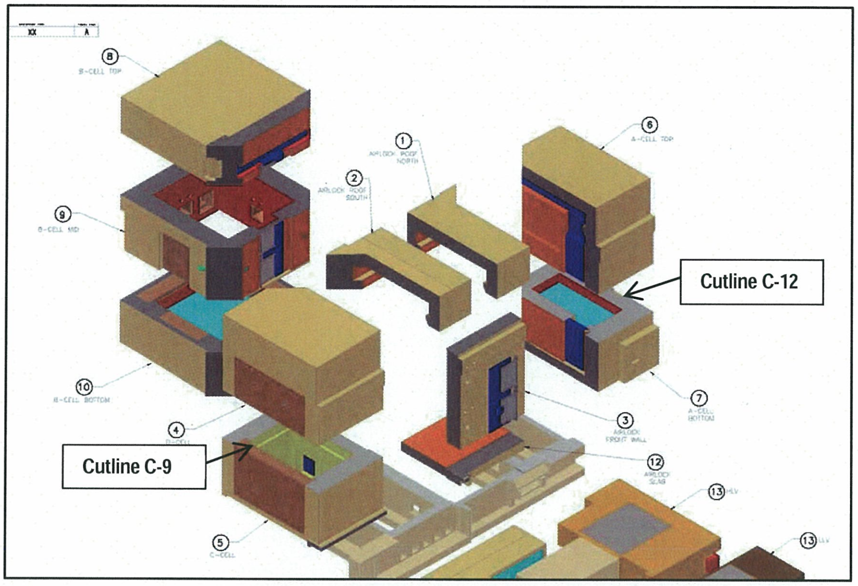

Figure 43 – REC Exploded Cut Plan

2.4.1 Transportation

The monoliths will be lifted with an overhead gantry crane and placed on multi-wheeled trailers that will be rolled to ERDF. The gantry crane will be supported on cast-in-place concrete runways. The trailers will load on the east side of the REC.

2.4.2 Lifting

Grout caps installed for shielding are likely to shrink as they cure, thus potentially creating a small gap around the perimeter between the cap and cell wall. This "break" in shielding may be addressed by installing steel plates to act as a second barrier.

Current demolition plans call for post-installed lifting pipes (trunnions) and grout anchors that extend through the cell walls of M-4, -5, -6, and -7 into the grouted area of the cells. Since this area is to be filled with contaminated debris, drilling the holes for these elements into the contaminated zone may be problematic.

2.4.3 Ground Transportation

The monoliths will be transported in compliance with DOE/RL-2001-36, *Hanford Site-wide Transportation Safety Document* (TSD). Due to the thermal characteristics of the radiological inventory, the Monolith Special Packaging Authorization (MSPA) is not adequate as the transportation safety basis. In accordance with the TSD, other options are available, such as a One-Time Request for Shipment. Alternative paths will be investigated and discussed with the appropriate U.S. Department of Energy, Richland Operations Office staff. Preparation and approval of the shipping authorizations are performed by WCH.

Monoliths may be placed in oversized steel tubs that support, stabilize and evenly transfer loads on the multi-wheeled trailers for transport to ERDF. Additional shielding will be added after the monoliths are secured to the frames of the packaging as needed. The shielding may be steel plates and grout.

2.4.4 Waste Immobilization

The binder currently planned for dust control and treatment of excavated soil has been defined for clarity in the Terms and Definitions section of this document on page viii. This material is not intended for structural applications. In order to achieve project objectives and specific performance and transportation objectives for the treated soil, the binder mixture may change during design and PoP testing.

Testing is planned to provide preliminary information on the performance of the binder when mixed with sand and gravel-cobble dominated sediments, across a range of set times and viscosities. The testing will be conducted on a sand matrix at a laboratory/bench scale. Testing is intended to provide preliminary or qualitative information on the following performance criteria:

- Readily achievable range of set times under anticipated conditions
- Readily achievable range of flowability (viscosity) of treated soil under anticipated conditions
- Compressive strength, cohesion of treated soil once binder is set
- Friability
- Flammability.

The information generated by the PoP testing will support a preliminary assessment of the suitability of the binder formulations.

2.4.5 Heat Generation

A scoping analysis of the radiological inventory estimated in the soil beneath B-Cell resulted in a thermal output of over 850 watts. The maximum waste heat currently allowed in the MSPA is 100 watts per monolith. Hence, there is no method of dividing the soil to meet the 100-watt limit with the limited number of monoliths. As a result, an alternative transportation authorization will be pursued.

2.5 Work Management

2.5.1 Mockup Facility Construction

The Mockup Facility will be located south of Horn Rapids Road, slightly east of the AREVA Facility. See drawings KUR-1782M-DWG-C001 and -C002 for a map of the facility location. Mockup design and construction will be managed per the International Building Code and other generally accepted construction building practices, along with all requirements prescribed by the City of Richland to meet Benton County codes. Personnel assigned to this project will be current in any required training that is relevant for construction of the Mockup Facility.

The Mockup Facility will provide support for the following functions:

1. Validation/proof of remediation design
2. Process/procedure development
3. Operations personnel training

4. Upset conditions trouble shooting
5. Readiness/Startup Operations

Based on the functions identified above, the mockup must accommodate the installation of applicable remediation and support equipment to prove the means and methods for remediation. The Mockup Facility will also be utilized to complete any training and qualification steps needed to perform the 324 Building remediation. All installed equipment will be validated and inspected for quality assurance and quality control prior to use by personnel for training and qualification.

2.5.2 Operations Training

An operations control room will provide environmental protection for employees outside the Mockup Facility and house the physical controls and monitors utilized by operators for operating installed remote equipment. Operation of the REAs, cranes, cameras, and other equipment will be by employees who have sufficient skills and training to operate such equipment. During training and operations at the Mockup Facility, all feedback will be documented in implementing procedures, as well as within the draft Integrated Work Control Program (IWCP) work packages. The developed procedures and IWCP work packages will be used for the actual remedial work to be performed in the 324 Building. Training and lessons learned from the Mockup Facility training and testing will be flowed into procedures and work packages and used to plan, perform, and control the work activities scheduled.

2.5.3 324 Building Modifications

Facility modifications of the 324 Building will be comprised of electrical modifications and installation of remediation equipment such as REAs, camera, lighting, Transfer Barrier and other miscellaneous equipment to perform remediation. The installation of the structural support in the facility basement is safety significant work, and will be handled by an individual IWCP work package with a construction traveler to support the documentation of the installation in accordance with the approved quality assurance program. Installation of all equipment will be managed to and performed within the WCH IWCP.

2.5.4 324 Building Training

Prior to equipment installation or relocation, personnel assigned to the job will receive proper classroom training, facility orientation and have applicable on-the-job training. On-the-job evaluation signoffs will be completed prior to work operations. Even though mockup of the 324 Building training encompasses the specific 324 Building training requirements, personnel will receive documented training in accordance with existing cell and facility operations procedures and the specific 324 Building training requirements. Coordination of all remediation (300-296 Area) work activities within 324 Building facilities will be in concert with the facility manager, operations and maintenance personnel throughout the project.

2.5.5 Operations

All operation work activities will be managed under strict conduct of operation principles and performed within the WCH IWCP. Verification of training completion will be an everyday part of preparedness for 324 Building operations including procedure revisions and any additional training required prior to the conduct of a work activity. Mobilization, facility upgrades, equipment installation, waste debris removal, B-Cell floor removal, soil remediation, structural stabilization and CDF backfill will all be performed in accordance with the baseline schedule.

2.6 Radiation and Contamination Control

2.6.1 Preliminary Dose Assessment

The remediation work is required to be performed remotely due to the radiation levels in the cells as well as the soil under B-Cell. The remote design of the equipment, the shielding provided by the REC cell structures, and the negative ventilation in the cells provide the primary as low as reasonably achievable (ALARA) mechanisms for this project.

The primary dose to personnel expected during this project is from Airlock entries necessary to perform waste load-outs and to perform maintenance on the REC cranes. There is not a good predictor for crane maintenance, and waste load-outs are a natural result of this maintenance. For planning purposes, it is assumed that there will be one Airlock entry per month for crane repair during operation, and one Airlock entry for waste load-out after every third entry for repair. Assuming a 6-month operating window, this will result in six repair entries and two load out entries. Dose estimates for Airlock entries have historically averaged 100 mrem per hour per person.

In addition, several Airlock entries are planned for waste load-outs prior to initial staging of project equipment. These entries will be for the express purpose of debris and equipment removal in preparation for project operations. The primary method for waste loading will be remote crane operation; however, manned entries are still planned for each load-out. Six such load outs are planned at 250 mrem each using the same estimating parameters as above for a total of eight load out entries and 2,000 person-mrem.

As reflected in Table 3 and Table 4, the total estimated dose for these entries is 11,900 person-rem.

Table 3 – Crane Repair per Entry (based on 100 mrem per hour per person)

Item	Duration	People	Dose Estimate
RCT Survey	30 minutes	1	50 mrem
Craft	4 hours	4	1600 mrem
Total per Repair	4.5 hours	5	1650 person-mrem
6 Total Repairs Assumed			9,900 person-mrem

Table 4 – Waste Load-Out per Entry (based on 100 mrem per hour per person)

Item	Duration	People	Dose Estimate
RCT Survey	30 minutes	1	50 mrem
Operations	1 hour	2	200 mrem
Total per Entry	1.5 hours	3	250 person-mrem
8 Total Entries Assumed			2000 person-mrem

The majority of the operation of the remote equipment will be performed from a trailer located outside the 324 Building. There are provisions to operate equipment from the 324 Building galleries using cameras, crane pendants and manipulators, while looking through the REC windows. Dose rate at the B-Cell windows are approximately 1 mrem/hour. Assuming that approximately 10% of the work, or about 100 hours, will be performed this way, the total estimated dose would be 100 person-mrem.

There are manipulators installed in the cells and the Airlock. The manipulators in A-, C-, and D-Cells may need to be removed prior to grouting activities. The facility has performed a radiological work screening for this activity and estimated approximately 140 person-mrem to remove these 12 manipulators.

The manipulators in B-Cell and the Airlock may need removal for replacement or repair during operation due to mechanical failure. Operable manipulators are required for successful completion of the work scope. Historical data has shown that hot spots on the manipulators up to 2,000 mrem per hour can exist. These hot spots will require local shielding during repair operations or while the manipulator is in storage. General dose rates on the manipulator average less than 10 mrem per hour. A manipulator repair is expected to take an average of 10 person-hours for a total estimated exposure of 100 person-mrem per repair, which is likely high based on historical experience.

There is a potential that the floors for C- and A-Cell will need to be reinforced. This may need to be done from the ventilation space under the cells, which is a high radiation, high contamination area. The manned entries to perform this work are estimated to take 20 hours if required. Each person will be limited to 250 mrem. This is a total of 5,000 person-mrem for the effort. Note that this is only if the work is determined to be necessary. It should also be noted that this estimate is a place holder only. A full work planning effort, including a full ALARA estimate, will be performed should access to this area be required for any significant work scope.

A grout curtain will be installed under the B-Cell foundation. Part of that effort will be done by drilling through the floor in the south corridor of Room 18. There is a general area dose rate of 2 mrem per hour in Room 18. The estimated time to perform the drilling and inject the grout is 50 person-hours (over 2 working days) for a total dose of 100 person-mrem. There will be extensive work in the west corridor of Room 18 for installing a grout curtain and support for the B-Cell foundation. Although the dose rate in this area is generally less than 0.5 mrem per hour, the extensive man hours expected will potentially result in 50 to 60 person-mrem. Total for the Room 18 work is estimated to be 160 mrem.

If all projected and potential work scope is performed as described above, the total dose estimate for the project would be approximately 17,400 person-mrem. The major contributors to this are the Airlock entries for crane repair and waste load outs. Prior to any work in the Airlock, full mock up training will be performed to ensure that work crews are well trained on the task in order to minimize time spent in the area. Local shielding will be used where possible to shield hot spots. Remote handling and loading of waste will be used to the maximum extent possible to minimize the number and duration of waste load-out entries.

2.7 Hazards Identification

Identification and mitigation of hazards early in a project results in safer, successful operations. The design team has implemented WCH procedure ENG-1-3.2, *Design Hazard Identification*, and has begun to identify hazards associated with this work and to develop engineered and administrative controls to mitigate these hazards.

This effort was kicked off during the conceptual design phase through distribution of the proposed process flow diagram and draft versions of the hazard identification scoping and checklist documents to project personnel from various disciplines selected by the Project Manager. The documents were reviewed and a meeting was subsequently held to discuss the process and the documents themselves.

For the 30% Design, an additional meeting was held to review and discuss the previous drafts of the hazard identification forms. Changes were discussed and noted for revision of the draft forms. In addition, the Hazards/Operability Design Safety Review form was drafted. Copies of the forms are included in Appendix E along with a copy of the attendance roster for the meeting.

As the project proceeds, the attached documents will be revised and additional documents will be prepared. All other updates will be made at the 60%, and 90% Design Reviews.

3.0 Facility Systems and Modifications

3.1 Cranes

The REC has five cranes in an overlapping mounting that allows transfers from the central Airlock to each of the cells. The fundamental design of the REC and crane operational space is well designed for flexible handling in the REC, which has been proven during decades of operation. Conceptually, there is nothing wrong with the design of the REC; however, an issue exists with the continued reliability of that system. Based on history and the previously completed assessment results, the following issues are expected:

- Increased usage will increase repair issues
- Increased loads will increase repair issues
- Unconventional usage (e.g., side loading) will increase repair issues.

The use of the existing cranes for this project is a project risk. Based on the age and history of this equipment, it is safe to assume that some operational issues with this equipment are inevitable. On the other hand, the cranes are currently working and are the ideal material handling method within the cells.

The decision basis to use the cranes is subtle and requires a balance of potential risks. The following key decisions have been made regarding the use of the existing cranes:

- Limit usage as much as possible including number and size of lifts
- Have backup for all critical functions
- Use ALARA to evaluate any repairs.

Based on the successful crane evaluation, the existing cranes will be used with little to no preventative maintenance being done. It is preferred to deal with failures as they occur rather than to expose workers to dose performing maintenance that may not be required. The cranes will be used for up-front activities, such as cell debris removal and optimized installation, as well as for other soil remediation operations.

In addition, the design of the REAs has changed to use a larger, Upper REA, which allows waste sacks to be handled by the REA in and out of the Transfer Barrier with ease. This avoids hundreds of lifts using the B-Cell crane. This change in B-Cell material handling makes it no longer necessary to replace the B-Cell crane in the event that failure should occur. The B-Cell crane rail concerns have also been largely addressed by the work done to verify the condition and dynamic loading of the rails. Therefore, the B-Cell crane and rails are considered usable for this project.

The A/D crane is planned as the primary method to move waste into the C- and D-Cells. Although many other types of new equipment were considered, the geometry of the REC and difficulty of installation made these options less desirable. The A/D crane is the oldest crane (c1966), but it is also the crane with some of the lowest historical repairs.

Previously, the A-Cell crane was believed to have approximately 26 ft. of cable that would limit its travel through the Airlock and make it unable to enter D-Cell. An evaluation of the A-Cell crane was completed to determine the actual travel limits. The evaluation included crane travel operation as well as collecting historical vendor data on the supply cable length. Vendor data collected indicated that at least 50 ft. of supply cable is available for crane travel. In addition, the crane travel operation validated that the crane is capable of travelling past the crane operator imposed travel limit. Based on the evaluation results, it is believed the A-Cell crane can be used as a backup and recovery option for the A/D crane; however, to entirely validate this, additional evaluation of the A/D and A-Cell crane supply cable interface is needed.

3.2 Master-Slave Manipulators

The manipulators in the cells are generally in working condition, but are all old and have minor repair/maintenance issues. The MSM is only a support tool for this project, but will be important for activities such as cable connections, hose management, small tool handling, and other smaller applications.

The strategy is to use MSMs in the Airlock and B-Cell. The other MSMs may remain in place, however, if a key MSM has a major failure that is not easily repairable, then it will be replaced with another working MSM and the broken MSM disposed of. There are 16 MSMs in the facility. Given the infrequent use of each MSM combined with the total number of machines available, it is expected that no new MSMs will be needed.

Two new MSMs will be purchased for the Mockup Facility to replicate operations and train operators. These can also serve as backups if necessary. If repairs are needed, the manufacturer of the MSMs is available to come on site and repair in place.

3.3 Facility Systems

3.3.1 Electrical

During the assessment phase of the project, it was determined that adequate electrical power is available in the facility to meet the needs of this project. Facility electrical distribution is provided through two separate switchgear: the main switchgear for normal power operations, and the secondary back-up power switchgear. These two switchgear feed the entire building and all the associated loads through motor control centers (MCCs) and power panels. There have been many load-reducing modifications to the electrical system in the past, mainly the deactivation and removal of electrical equipment and panels that were connected to the MCCs. Several MCCs also have been removed. Removing these loads from the power system has left more than sufficient electrical capacity for powering this project's remediation equipment.

The project will utilize the existing building power distribution system with minor modifications and repairs to provide the required electrical power for B-Cell remediation equipment. Temporary power to equipment will be supplied via cord and plug devices to limit building modifications. Some temporary power is currently being used inside the building and expanding the use of temporary power will provide local power for new equipment and miscellaneous loads. Additional new circuits and outlets will be fed from existing local power sources in the facility, as required.

Six 480V, three-phase welding receptacles are located outside the cells in the gallery area (Room 131) surrounding the cells. Five 480V, three-phase welding receptacles are located outside the Airlock around the CHA (Room 137). All of these welding receptacles are active, or can be made active with minimal repair such as replacing pulled fusing or replacing wiring. Welding receptacle capacities range from 20 amps to 100 amps and will provide the bulk of the required power for the B-Cell remediation equipment.

Power for 120/240V loads is presently provided by panels "B1", "C", "D", and "O". Currently, there is limited temporary power in use inside the building for outlets and lighting. Additional temporary power is planned to be provided by portable power centers. These portable power centers will connect to the existing welding receptacles and convert 480V three-phase power to 120/240V single-phase power. The power centers will be located close to the loads they will serve and will provide a number of convenience receptacles for dedicated as well as miscellaneous loads.

3.3.2 Ventilation

The principle work accomplished during the preparation and remediation phases will be performed in B-Cell. Other areas of concern are the Airlock, A-, C-, and D-Cells.

B-Cell currently has a transition frame weldment in place, as noted by Item 3 on H-3-70478, "B-Cell Exhaust Frame Assembly." This transition frame was in place when the particulate grout was poured on the B-Cell floor. The grout did not flow into the ductwork, but photos indicate that the grout surrounds the base of the transition frame (Figure 44).

Figure 44 – View of Grout Level near B-Cell Exhaust

Installation of HEPA filters on the B-Cell transition frame is necessary to prevent plugging the A-Frame HEPA filters. The A-Frame HEPA filters are partially loaded with radiological contaminants. It is important, from an ALARA standpoint, to not plug these HEPA filters. Doing so would require activation of a bypass filter.

Prior to removal of the layer of particulate grout, a potentially dusty operation, the B-Cell transition frame will be partially blocked. Once the grout is sufficiently removed, the transition frame can be removed along with the seal. A new transition frame will be installed, followed by a HEPA filter assembly. The HEPA filter airflow path will be altered with a snorkel to reduce the amount of dust that will flow directly to the HEPA filters.

The ventilation of the other REC areas have their own challenges. The exhaust inlet at the west end of A-Cell has a pipe sleeve penetration that was installed for fixative application. Photos show that the inlet is mostly blocked with other debris. Installation of new filtration at that location may not be possible without extensive relocation of debris. A device may be fabricated to block the sprayer attachment penetration.

The A-Cell east-end exhaust inlet is believed to be in a state that will allow installation of a new filter assembly, if the hose reel assembly can be removed. Research relative to the A-Cell exhaust inlets (Figure 45), transition frames, and fixative hose reels is being performed to deduce the logical and necessary method to provide adequate filtration and ventilation.

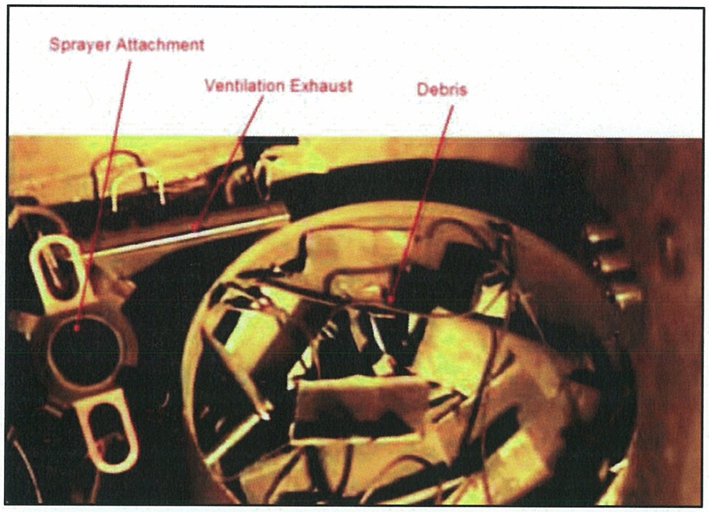

Figure 45 – A-Cell Exhaust

An evaluation will be performed to determine if HEPA pre-filters will be needed for the A-, C-, and D-Cells to reduce the possibility of plugging the A-Frame HEPA filters. The current design of the exhaust inlets and transitions is being researched to determine the feasibility of upgrade to non-testable HEPA filters and the potential for adding snorkels to them.

4.0 New Equipment

4.1 Remote Excavator Arms

The REAs are designed around current industry-proven, reliable, and readily available excavator equipment. Standard components will be adapted to fixed anchorages, and updated to incorporate commercial remote tool connectors (Oil Quick®[4]) that allow all B-Cell excavation activities to be performed remotely. There are currently two designs for the REAs: an Upper and Lower version. These are similar although the upper vertical tube is shorter in length and uses a slightly larger excavator.

4.1.1 Excavator Components

The backbone of the REAs will consist of the "boom and stick" and related hydraulics from a John Deere®[5] 35G mini-excavator (Lower REA) or John Deere 50G mini-excavator (Upper REA), Figure 46. Because of its wide use and acceptance in the construction industry, many excavator attachment manufacturers have developed tools suitable to use with this class of excavator. The boom and stick for the Lower REA will be mounted to an anchorage that places its base near the floor level in B-Cell. Provisions for swinging the boom and stick left and right will be incorporated into the anchorage. When the boom is equipped with the optional long-reach stick and bucket, it is capable of excavations in excess of 13 ft deep while operating inside the cell.

[4] Oil Quick is a registered trademark of Oil Quick AB Corporation, Hudiksvall, Sweden.
[5] John Deere is a registered trademark of Deere & Company, Moline, Illinois.

Figure 46 – Illustration of the Bucket and Stick of the John Deere 35G

Up to four units can be installed in B-Cell at one time providing access to the entire excavation and allowing each to share tooling options. One or more identical spares will also be procured allowing rapid replacement of an REA in the event of failure during operations. The current approach is to install one Upper REA and one Lower REA simultaneously.

4.1.2 Oil Quick - Automatic Hydraulic Coupler

The REAs will be equipped with Oil Quick automatic hydraulic couplers (Figure 47). This will allow tool changes to be performed remotely, including disconnection and connection of the hydraulic circuits. These are commercial devices that are proven to perform remote tool replacement in dirty, dusty environments.

Figure 47 – Example of Oil Quick Coupler

4.1.3 Hydraulic Power Unit

The Hydraulic Power Unit (HPU) provides the local hydraulic services required for REA operations (Figure 48). The HPU is equipped with supply and return hoses of adequate length to allow the HPU to be located outside of B-Cell and away from the control station.

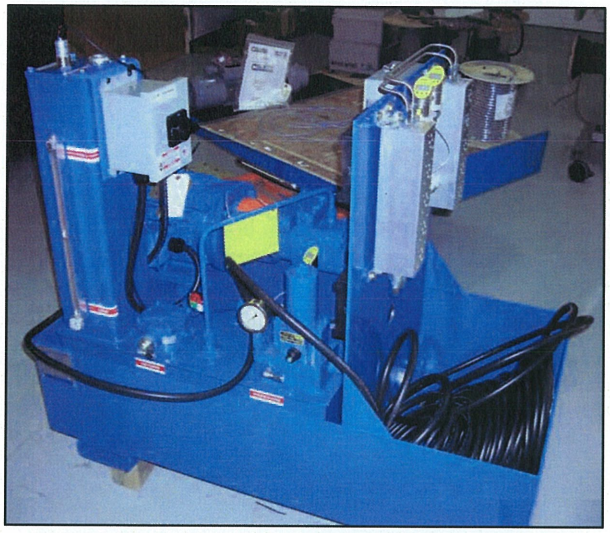

Figure 48 – Typical Hydraulic Power Unit

4.1.4 Tools

The REAs are based on existing standard equipment. As such, many work-proven tools and attachments sized for the REA are readily available as off-the-shelf components at reasonable cost. These tools have extensive histories of durability, serviceability, and are supported by manufacturers with ample spare parts. All of the tools will be fitted with an Oil Quick coupler that allows remote connection of the tool and hydraulics from the control station. All of the tools will be stored in the B-Cell on special hangers that will allow each tool to be shared by all of the REAs. The Upper and Lower REAs will use the same set of tools.

4.1.5 Buckets

The REAs will deploy two types of buckets. One bucket type is equipped with an integral powered thumb (Figure 49). The other type is a standard bucket with a "stick-mounted" thumb that will be used for general excavation and backfill activities (Figure 50).

Figure 49 – Example Bucket with Powered Thumb for REA

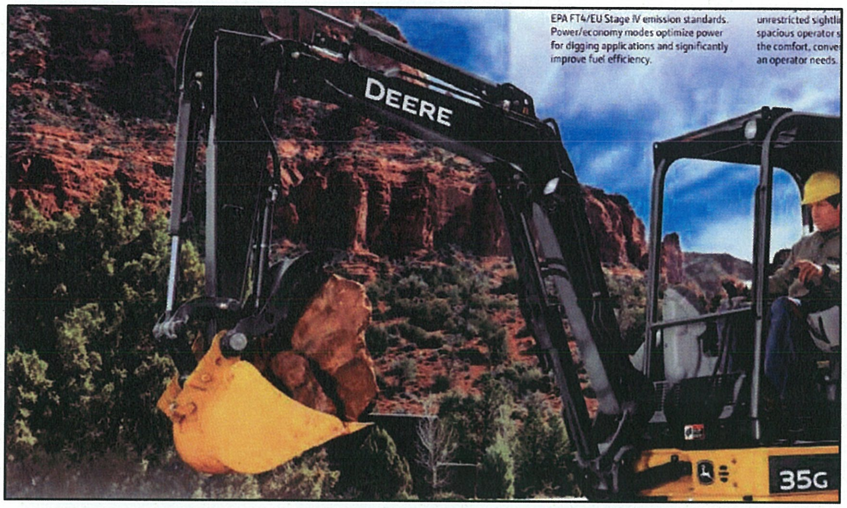

Figure 50 – Example of "Stick-Mounted" Thumb

The powered thumb allows operators to grasp and manipulate items in the excavation, including large cobbles, floor components, and other debris. Operation of the thumb is controlled remotely from the control station. Integration of the thumb into the bucket, as opposed to the more common "stick-mounted" thumb where the stick serves as the excavator's second member, allows the operator to grasp an object and then maintain that grasp while performing bucket curl and stick movements without thumb adjustment by the operator. The powered thumb can also be used to control the flow of debris into waste sacks by allowing the material to flow out of the bucket between the bucket and the thumb. The rate of flow is controlled by adjusting the gap between the bucket and the thumb, similar to that of a clamshell bucket.

4.1.6 Shear

An industry standard hydraulically operated shear, shown in Figure 51, will be used by the REAs to perform size reduction activities in B-Cell. Size reduction activities may apply to the equipment and materials currently inside B-Cell, as well as to the size reduction of the excavation equipment at project termination. The shear will have the capacity to sever an 8-in. I-beam, a 2-in. diameter solid bar, a 1.5-in. square bar, and an 8-in. Schedule 40 pipe, as well as the ability to pierce steel plate up to 3/8-in. thick. In addition to the shearing actuation, the shear tool will be equipped with a rotary actuator, which will allow operators to properly line up the shear for the cut.

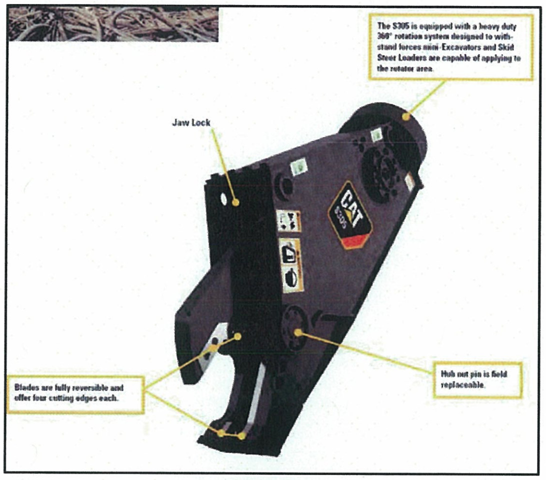

Figure 51 – Shear for Deployment in the B-Cell

4.1.7 Hammer

To free the encased debris, perform size reduction activities, and rubbleize the 3 to 12-in particulate grout layer, an industry standard, hydraulic hammer (Figure 52) will be deployed. The hammer will be equipped with a moil point shaped like a sharpened pencil that can pierce and crack concrete and very large cobbles. If required, the hammer can be fitted with a broad chisel point, and used either to cut sheet metal or to size-reduce structural components.

Figure 52 – Hydraulic Hammer for B-Cell Operations

4.1.8 Tool Holder

A number of tool holders will be mounted to the interior walls of B-Cell to allow storage and retrieval of the various tools used by the REAs. The tool holders will allow multiple tools to be staged in B-Cell, and interchanged for use on the REAs. The details for the tool holder design will be developed as part of the 60% Design Package.

4.2 Transfer Barrier

The Transfer Barrier (Figure 53) is a relatively simple device that allows waste sacks to be moved between the Airlock and B-Cell. The Transfer Barrier fits into B-Cell doorway, extending from the floor to the crane path. This roughly seals the B-Cell door. There is a large airflow from the Airlock to B-Cell when the door is open. The Transfer Barrier focuses this flow at the crane door opening and through the waste transfer path from the Airlock to B-Cell, minimizing the transfer of outward contamination.

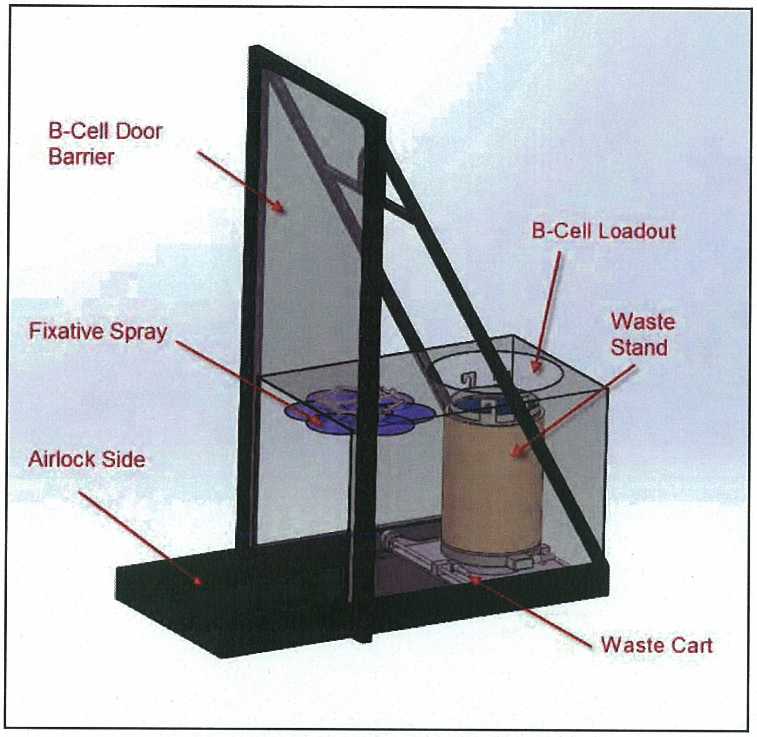

Figure 53 – Transfer Barrier Details

The Transfer Barrier is essentially a short tunnel on which a cart travels back and forth. This cart rides on a set of rails with redundant drives. The cart includes a turntable that allows the waste sack to be rotated. The rotation will aid in the connection/disconnection of the sack from the cranes, and facilitate dose rate surveys that will be performed using a collimated gamma detector attached to the Transfer Barrier. The Transfer Barrier cart also contains the equipment required to weigh the loaded soil sacks. The Transfer Barrier design also includes features to minimize the potential for contamination between B-Cell and the Airlock. These features include various shields to prevent contaminated soil binder mix from entering the internal barrier components.

In the center of the Transfer Barrier is a spray location that allows a fixative spray to be applied to the top surface of the waste container. This spray area can be removed from the Transfer Barrier if it becomes clogged or damaged, and replaced separately from the Transfer Barrier.

The utilities for the Transfer Barrier are routed through an Airlock penetration and connected using the Airlock MSMs. When not located within the B-Cell doorway, the Transfer Barrier fits in the northwest corner of the Airlock, and allows all doors to open and close. The design for the Transfer Barrier is currently in progress, and drawings are located in Appendix F. The details for the Transfer Barrier design will be developed as part of the 60% Design Package.

4.3 Saw

A concrete wall saw will be used to size-reduce the floor of B-Cell. The saw is another industry-proven tool (Figure 54) that is readily available and supported by the manufacturer for part replacement and services. However, modifications to the saw are required. Such alterations are dependent on saw delivery and PoP testing.

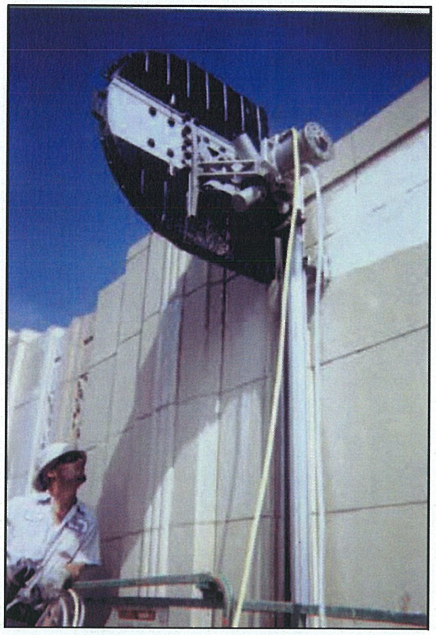

Figure 54 – Track Mounted, Remotely Controlled Wall-Saw

The saw will be mounted to a sturdy deployment frame that will be remotely positioned using the B-Cell crane and/or the REAs. Out of the box, the saw is designed to be remotely controlled from distances up to 100 ft away from the cutting operations. The operator pendant allows for remote selection of cutting direction, cutting speed, and depth of cut. The saw is equipped with water-cooled motors and dry cut blades capable of cutting a 6 in. to 10 in. thick concrete floor, stainless-steel cladding, and embedded structural shapes all at one time.

The saws were originally designed with a water circuit that cooled the cutting and drive motors, thus providing cooling and lubrication to the blade in conjunction with dust suppression during cutting operations. Due to the concern that the addition of water into B-Cell could drive contaminants deeper into the soil, the saw will be modified to return the cooling water outside the cell after circulating through the motors. This means that all of the concrete cutting operations will be performed dry. This will result in shorter blade life, slower cutting speeds, and dustier cutting conditions. Blade changes will be performed using existing MSMs inside B-Cell. A dedicated dust collection system will be fitted to the blade guard of the saw to control and collect dust.

The deployment frame will be simply designed as seen in Figure 55 and will be stiff enough to support the saw and its track while being lifted and positioned by the B-Cell crane or one of the REAs. It will be designed with enough weight such that it will not move during cutting operations and will be designed to bear against one of the walls to resist cutting forces of the saw and to maintain a straight cut. The length of the frame will allow the saw to cut from the foundation footer to a sufficient distance past the middle of the floor. Once the floor is totally sectioned, the REAs equipped with buckets will be used to lift and handle the sectioned pieces of the floor.

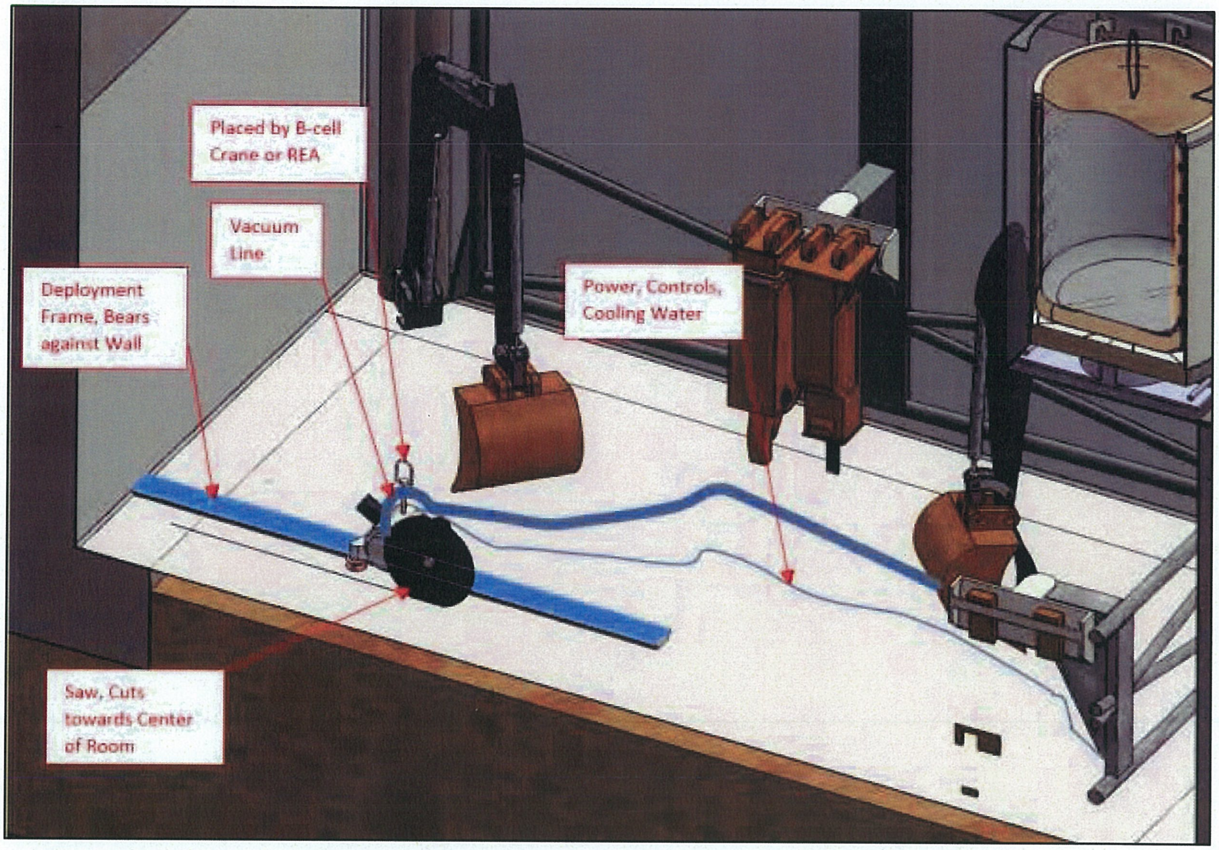

Figure 55 – Saw Positioned in B-Cell Cutting Floor

4.4 Brokk

The remediation design is based on the use of the REAs as the primary tool for performing the remediation, excavation, and demolition operations. However, in the event the REAs cannot reach an area to properly excavate, the use of a Brokk was suggested in the technical proposal as an REA backup.

In addition to potentially performing excavation operations, the Brokk can also perform other demolition activities, such as scrap size reduction and particulate grout layer demolition.

While the Brokk is a useful tool for performing a variety of tasks, it will only be implemented if other methods are proven ineffective. The reason is that once the Brokk is introduced to the cell area, it becomes a large piece of contaminated equipment that is not easily decontaminated or removed.

4.5 Waste Sacks

The primary function of the waste sacks (Figure 56) will be to collect and move the loose debris and soil from B-Cell to the final storage location. The sack is designed as a circular container, and will be constructed of a strong, flexible, leak-proof fabric reinforced with strong circumferential webbing straps and a rigid bottom intended to help it maintain its shape. The top of the waste sack will incorporate a rigid ring. The ring will support the sack in the Transfer Barrier, and include features for a lifting bail connection, intended to hold the sack open during loading operations.

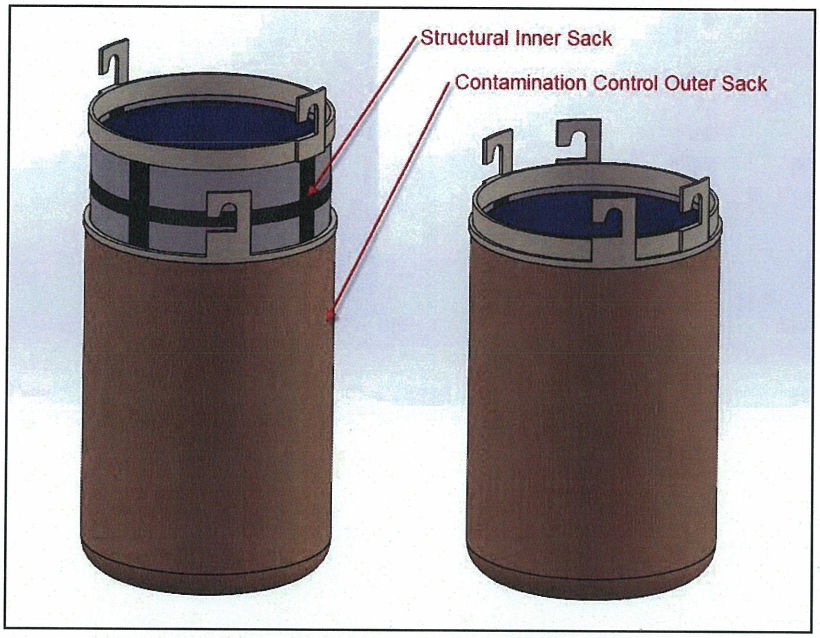

Figure 56 – Waste Sack Configuration

In B-Cell, the new waste sack will be picked out of the Transfer Barrier (Figure 57), moved into position, and supported during loading by a bail lifted by the REA or B-Cell crane; however, it should be noted that the primary method for lifting the sacks is the Upper REA. The crane can provide support and be used if necessary. When the waste sack is filled, either the REA or crane places it back in the Transfer Barrier where the bail is disconnected. The sack is moved through the Transfer Barrier and positioned under a crane in the Airlock. There it is picked up and moved into either A-, C-, or D-Cell where it is placed, bean-bag style, or dumped by the crane. A new waste sack is placed into the Transfer Barrier in the Airlock using a crane.

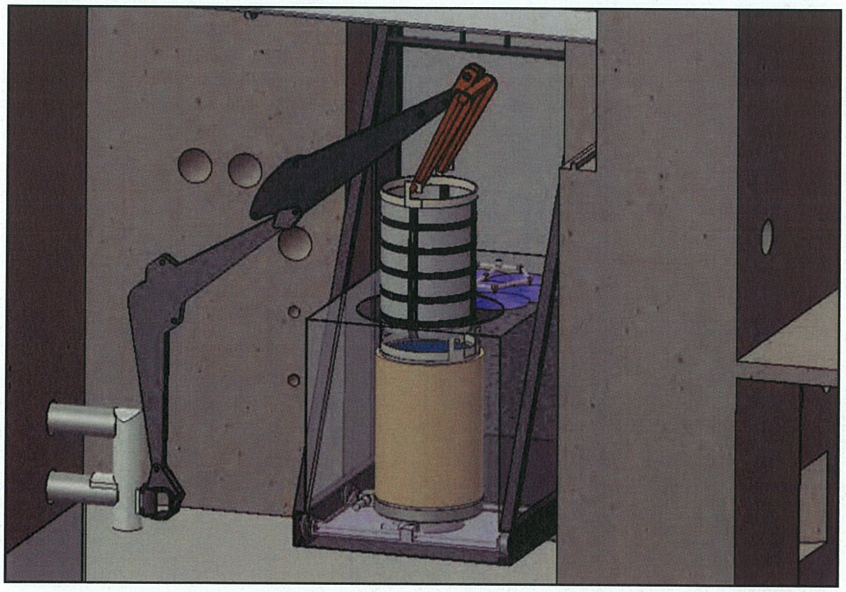

Figure 57 – Placement of the Waste Sack in the Transfer Barrier

4.6 Binder Delivery

A chemical binder will be applied and mechanically mixed with remediated soil prior to placement in waste sacks. The binder will be directly applied to the soil/cobble via a binder hose installed into B-Cell through an existing penetration (Figure 58). The hose is installed and suspended high in the cell to allow positioning of the hose in B-Cell. The hose will be gravity fed with no loops or U-bends that might inhibit binder flow. A gripping ring is attached to the working end of the hose so that the REA can grip and position the hose without crushing it.

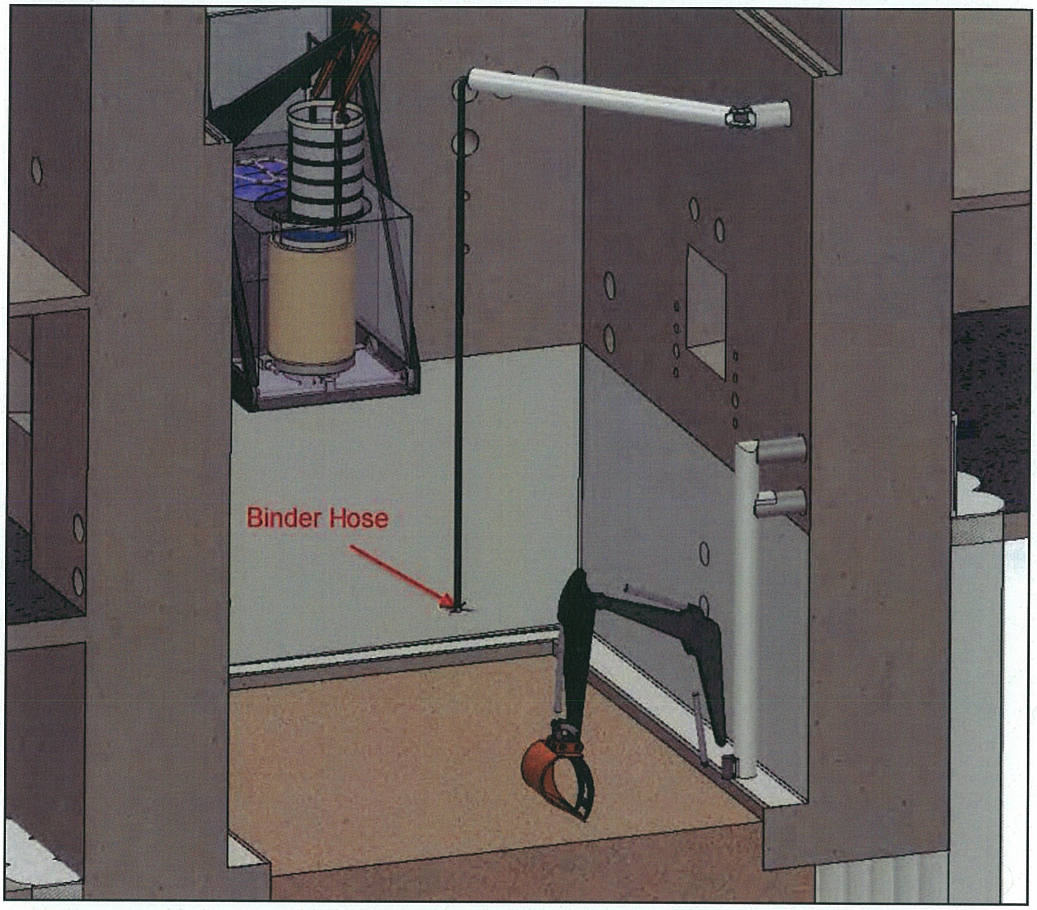

Figure 58 – Binder Hose in B-Cell

The proposed binder is comprised of a combination of sodium silicate and an aqueous setting agent. Both of these materials are provided in a liquid form. The individual solutions are supplied in drums, diluted and mixed with water in poly tanks and pumped through a static mixer. The pumps transport the mixed binder through a hose into the B-Cell gallery and then into the cell as described previously.

The reaction time for varying compositions of the chemical binder components will be established. Binder setting up in the hose is a potential issue, but one that can be predicted. Prior to reaching the set time, a new delivery of binder must be made or the binder will react and plug the hose. In the event that a new binder delivery is not needed, a clean-out device, such as a sponge ball or "pig," will be pushed through the delivery hose with a compressed gas, cleaning out the delivery hose. The sponge ball exits the hose into B-Cell, and must subsequently be managed as a waste.

4.7 Control System

The control station implements an electronic and hydraulic control system for REA control and actuation. The REA Control System is designed to provide the expected system functionality while offering robust and flexible equipment control to achieve the necessary REA operations (Figure 59).

Figure 59 – Illustration of a Typical Remote Control Station

4.7.1 System Architecture

Programmable Logic Controller Control

The control station incorporates programmable logic controllers (PLCs) to provide adequate system control. The PLC provides for a flexible means of manipulation, allowing for a best fit control solution for the REAs, and includes custom operator interface with touchscreen, joystick and button controls.

Closed-Circuit Television System

A closed-circuit television (CCTV) camera system provides visual feedback to the operators to enable remote system control. The CCTV camera system will be operator controlled from the remote human-machine interface (HMI) station. This method of control allows the operator to select and manage desired camera views for operations, while controlling the cameras with associated control features such as pan, tilt, zoom (PTZ), focus, and lights. In addition, the CCTV camera system provides recording capabilities, allowing for the collection of operational records.

Visual coverage of operations is made possible by the CCTV through adequate camera coverage defined by range, resolution and positional location selection for each cell working space. This visual coverage accounts for all required operations, and provides a visual means of collision prevention of the employed tools during the operational phases of the project.

Remote Excavator Arm Joint Control

The control system implements proportional hydraulic directional control valves for all REA operations. The proportional hydraulic directional control valve allows for variable speed control over the hydraulic axes. The stack for these axes includes a counterbalance valve for proper axis position holding and a pressure-reducing valve intended for maximum joint force protection.

Safety Provisions

The control system includes an emergency stop system that removes all motive power from the equipment once tripped. This emergency stop system does not remove power from the controller and monitoring equipment, but rather allows for operational feedback during the emergency stop condition. Once the stop is tripped, the control system must be physically re-engaged to become fully functional again.

Equipment design of the REA provides electrical disconnect switches at electrical service input points to allow for proper equipment isolation. The REA electrical system is designed and assembled to the appropriate electrical standards to ensure equipment safety, and allows the electrical, hydraulic, and mechanical components fail to a safe state upon the loss of services. This loss of service design includes:

- Counterbalance valves for hydraulic actuator position holding
- Spring return hydraulic valves that ensure valves return to "safe state" when unpowered.

Operator Interfaces

The control station is climate controlled, provides remote control operability for REA functionality and is designed to encompass the needs of the equipment operations, operator ergonomics, equipment operability monitoring and safety. The control station will be formatted to mimic the control on the original excavator, providing operators a familiar operation console (Figure 60).

Figure 60 – Example of Remote Operation using Commercial Excavator Seat and Controls

Modes of Operation

The Normal Operations mode is the primary mode in which all designed day-to-day operations are performed. The hardware and operator interface design considers the actual operation process in order to provide expected operational controls for the necessary equipment tasks thereby enabling a predictable approach to the equipment operations. All normal operations are performed remotely, and will be conducted based on the visual feedback provided to the operators through the CCTV camera systems.

Off-Normal Operations allow for operator control during any abnormal operations that may occur during times of recovery or troubleshooting. This mode of operation allows for additional system control and detailed monitoring of system feedback. Due to the nature of the control, and the potential loss of equipment interlocks, all off-normal operations require a manager log-in for operations.

4.7.2 Control Philosophy

Remote Excavator Arm Control

The REAs are manually operated and initiated by the operator. The manual operations may vary in type; however, all will require operator initiation and attention. No automatic operations of the excavator will be supplied.

The provided excavator control is of the individual joint, open control loop type. The excavator does offer variable speed control for each joint, with an overall adjustable maximum speed for operator configuration.

Tool Control

The tools are manually operated and initiated by the operator. The manual operations may vary by tool and by type (latched, push, hold, swing), but all control will require operator initiation and attention. No automatic operations of the tools will be provided.

Hydraulic Power Unit Control

The HPU is automatically controlled by the control system during normal operations. The control system automatically turns on the hydraulic services upon a hydraulic service demand, and automatically controls the HPU cooling system.

The HPU also has basic manual controls, for flexible control during off normal on-off-auto operations. Local manual control for the HPU is provided to allow for recovery in case of a control system failure.

Equipment Power-up

The initial service connection and power-up of the local electrical service disconnect occurs during the installation and setup of the local equipment. Upon the application of electrical services, the control system powers up in an equipment motive safe state.

With the electrical services provided, the start-up of the equipment control will require operator initiation, or emergency stop system reset, and alarm reset at operator interface. This operator initiation of the system ensures that operator personnel are aware of the equipment status and state prior to control.

Equipment Shutdown

The control system allows for the equipment to be shut down in a motive-safe state by the triggering of the emergency stop circuit. The design of the control system is such that the equipment fails in a safe state upon the removal of motive power by emergency stop circuit or removal of electrical services.

This non-powered fail-safe design allows for a hard equipment shutdown, such as an electrical disconnect and isolation, and when coupled with the equipment power-up design provides for robust equipment startup and shut-down operations.

System Alarms and Annunciation

All alarms for the control system will require operator acknowledgement and manual reset via touchscreen. All alarms will remain active and non-resettable while the existing alarm condition is active. The control system alarm state will be visually displayed on the HMI touchscreen, and status of the system alarms provided.

Commissioning, Installation, and Maintenance

The control system design will consider equipment commissioning, installation and maintenance activities. This design includes:

- Properly located conductor connections to provide efficient equipment installation
- Proper equipment segregation and assembly designation to allow for efficient equipment installation, commissioning and maintenance
- Design of equipment operator interface (control and monitoring) considers commissioning, installation and maintenance activities.

Interlocks

The control system will provide equipment interlocks as necessary (when considering desired control options and equipment feedback) to improve equipment health and operations. The control system interlocks will be segregated into three primary levels, which are detailed below.

- Equipment Enable Interlock–An interlock that is required for healthy operations for all operations (e.g., emergency stop).
- Equipment Normal Operations Interlock–An interlock that is required for Normal Operations, but is potentially not required for Off-Normal Operations (e.g., hydraulic level low).
- Equipment Operation Specific Interlock–An interlock that is required for a specific sub operation (e.g., during initial deployment operations the forearm extension axis is locked out).

Recovery

The control system will provide the Off-Normal Operations Mode for recovery operations, and the equipment recovery through the control system operator interface points will be the first mode of equipment recovery if possible. If the equipment cannot be recovered through the operator interface points, the operator will then move to a hydraulic or manual mechanical recovery means. An example of this would be if the main enclosure, or electrical panel holding the PLC and system drive, has incurred a major failure, but the manipulator requires an axis to be moved. The specific means to accommodate and troubleshoot such failures along with instructions are to be detailed at a later date in the Operations and Maintenance Manual.

Control Management Login

All control system Off-Normal Operations require a login and password to enable operations. The provision of this login is to prevent equipment operations in this mode, as this mode provides a level of equipment control that may bypass interlocks and be cumbersome to operate.

Remote Control Station Design

The Remote Control Station is ergonomically designed, taking into consideration the spatial needs and limitations of a seated operator when locating and mounting the control hardware required for remote equipment operation.

4.8 Vision and Lighting

The vision and lighting design efforts for this 30% Design Report were focused on developing the in-cell vision and lighting system layout. The in-cell vision and lighting are critical components to the successful operation of the remote systems and remediation of the soil from beneath B-Cell.

For remote operations, the primary operator feedback is visual from inside the cell. The locations of the cell windows are limited and provide restricted views into each of the cells and Airlock. To enhance the in-cell viewing of the operations, cameras and lights will be strategically positioned in multiple locations of the REC to ensure operators have proper views of the work activity, promoting the safe and successful performance of work.

Utilizing the CDRs Remediation Process Flow Diagram (KUR-1782F-RPT-002), locations for the vision system and control of each system were selected. The following criteria were used to select camera and operator station locations:

1. Locate camera controls at existing crane controls.
2. Locate camera controls at useable window locations.
3. Camera controls are to be shared for windows on the same gallery level.
4. Camera PTZ light configurations are to be minimized.
5. Develop control logic to maximize flexible control of cameras from multiple locations.
6. Remote Control Room layout to integrate with REA operator seat.

4.8.1 Lighting and Vision Control Stations

To ensure successful field operations, three varieties of lighting and vision control stations will be used.

- Local Lighting and Vision Control Station (LLVCS), as shown in Figure 61. An operator station outfitted with monitor(s), camera, pan and tilt, and light controls near the REC cell window utilizes the LLVCS. Primarily used for crane operations.
- Remote Lighting and Vision Control Station (RLVCS), as shown in Figure 62. Lighting and vision operator controls including monitor(s), camera, pan and tilt, and light controls will be located in a room/trailer exterior to the REC, which is the primary control location for B-Cell REA operations. This RLVCS is integrated with the equipment remote control station to provide one central remote control location.
- Lighting and Vision Air Traffic Control (LVATC). A supervisor station outfitted with monitor(s), camera, pan and tilt, and light controls in a room/trailer exterior to the REC. Primarily utilized for oversight of all REC operations.

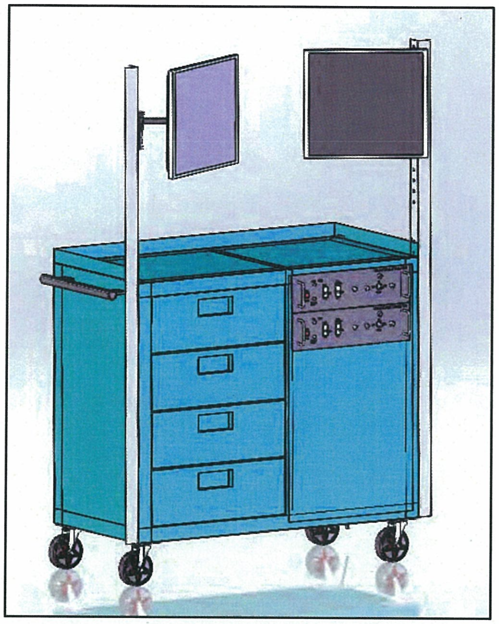

Figure 61 – Local Lighting and Vision Control Station

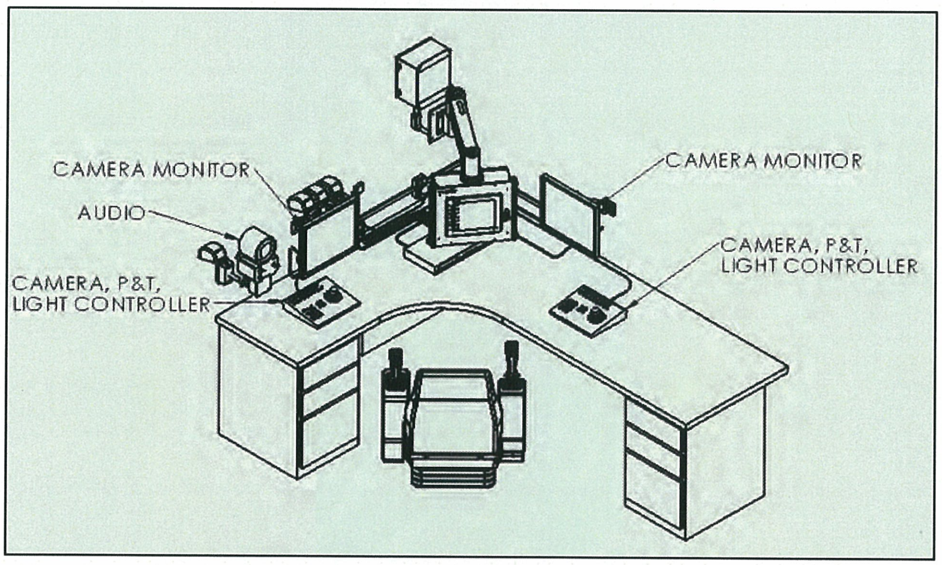

Figure 62 – Remote Control Station with RLVCS

Local lighting and vision control stations for each camera system are provided for the following locations:

- Cask handling area (at Airlock door)
- C-Cell gallery
- B-Cell gallery
- A-Cell (upper floor)

Each of the local lighting and vision control stations will provide one or two monitors on a portable cart. The cart will be outfitted with a set of controls to allow the operator to utilize the PTZ functions of the vision system for the particular cameras the control station is connected to. The local lighting and vision control station will have a wheeled cart to allow positioning of the control station near whichever window necessary to assist the operator in performing the task at hand.

Two RLVCSs and one LVATC will be provided in the remote control room/trailer. Each RLVCS and LVATC will be equipped with a set of controls to allow the operator to utilize the PTZ functions of the vision system for the particular cameras the control station is connected to.

The current design of the vision system is on the one-line diagram drawing, KUR-1782F-DWG-I-REC-9000-000, *Vision and lighting System One Line Diagram.* The drawing provides a general location of each of the suggested local lighting and vision control stations, camera locations and remote control room. Additionally, a schedule is included in the drawing to define the bulleted items below:

- The cell location of the work activity observed (LVATC observes all interacting activities)
- Camera identification
- Camera location
- Camera specific sleeve location
- Suggested equipment (camera configuration to meet the need).

The local and remote lighting and vision control stations will include the ability to manipulate the PTZ and integral lights of various cameras within the REC cells and Airlock. Matrices are provided in drawing KUR-1782F-DWG-I-REC-9000-000 to define what cameras are able to be controlled from each control station. The logic used to determine which stations control each of the cameras is as follows:

1. The RLVCS:
    a. Provides two monitors and camera controls for viewing the operations of two different REA installations (i.e., northwest corner and southwest corner of B-Cell).
    b. Provides a minimum of two dedicated views of REA installation under control of the RLVCS.
2. The LLVCS:
    a. Provides monitor(s) and camera controls for the cell near the LLVCS.
    b. Controls cameras independent from the cameras controlled by the RLVCS(s) or LVATC.
3. The LVATC:
    a. Provides operations oversight for all cells.
    b. Has access to at least one camera in each operating space.
    c. Is independent of any dedicated camera being used for operating equipment such as cranes, REA, etc.
4. All cameras are connected to recording media (preference is centralized recording system of all cameras).

4.9 Camera and Lights

Design efforts have been focused on minimizing camera and light configurations in order to reduce the complexity of the vision and lighting systems. Minimizing the configurations:

- Reduces spare parts required
- Provides interchangeability on cameras and lights
- Minimizes operator training
- Maximizes the number of locations a camera and light can be deployed.

Design efforts focused on developing cameras and lights that were able to be deployed thru a nominal 4-in. sleeve. Plug and sleeve details from drawing H-3-20271, "Step Plug & Sleeve Hot Pilot Cells and Hot Met. Cells," were utilized as design constraints for the light and camera systems design. Interface control diagrams were generated to assist in the design effort of the cameras (Figure 63 and Figure 64.

4" SPLIT PLUG MOUNT-3AXIS PAN AND TILT CAMERA AND LIGHTS ASSEMBLY

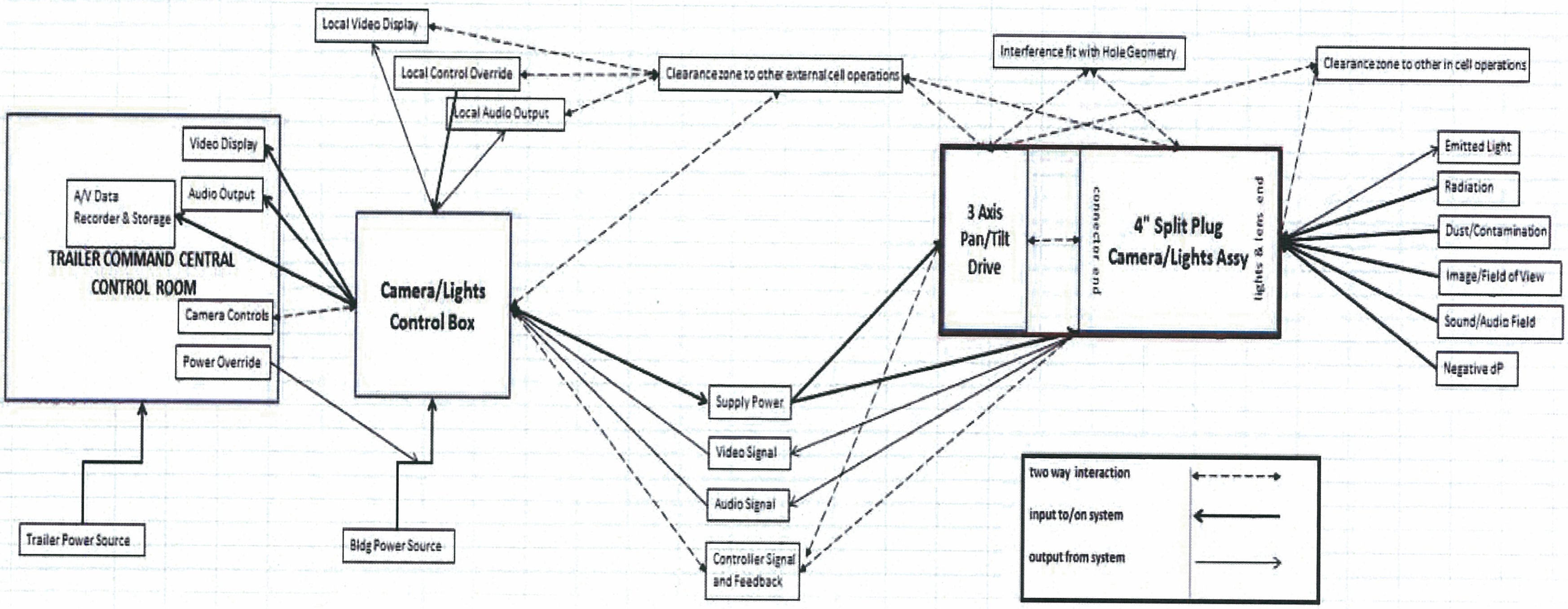

Figure 63 – Interface Control Diagram for 3 Axis Pan and Tilt

4" SPLIT PLUG MOUNT-FIXED CRANE VIEW CAMERA AND LIGHTS ASSEMBLY

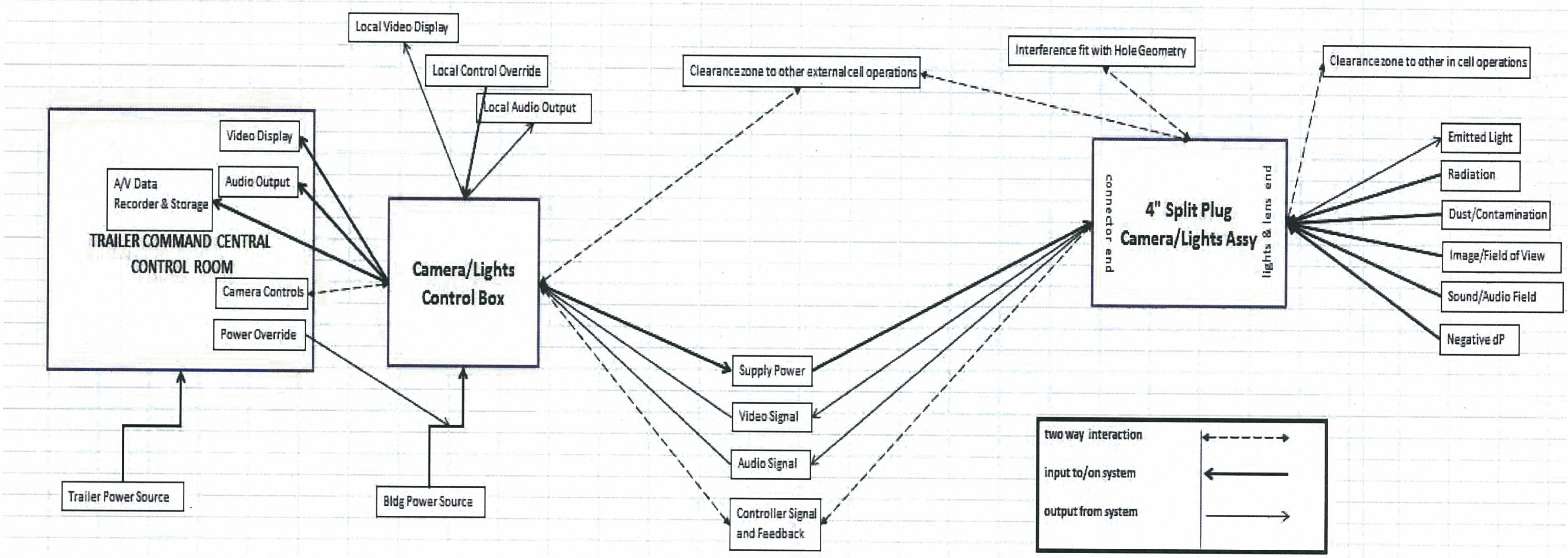

Figure 64 – Interface Control Diagram for Fixed Crane View

Two separate camera light configurations are provided in the design to fulfill the viewing needs of the operators.

1. Through Wall Camera (KUR-1782F-DWG-I-REC-9100-000 and Figure 65)
2. Crane Deployed Camera (KUR-1782F-DWG-I-REC-9600-000)
3. Through Wall Light (KUR-1782F-DWG-I-REC-9200-000 and Figure 66)
4. Cell Window Light Array (KUR-1782F-DWG-I-REC-9290-000)

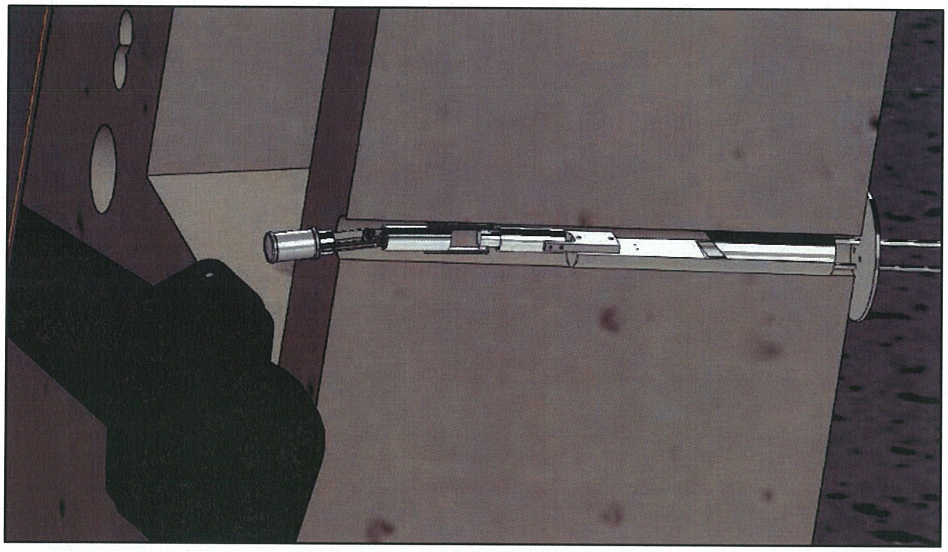

Figure 65 – Through Wall Camera

The same camera and light designs are easily integrated into different mounts to allow deployment through larger diameter sleeves as needed. Split plug designs and step plug designs are being considered for use in the through wall light and camera systems. Further refinement of the design is needed to determine which plug design will be the best for deployment in the REC and will be included as part of the 60% Design Package.

The cameras and lights will be deployed via the sleeves in the REC cell wall according to the schedule on drawing KUR-1782F-DWG-I-REC-9000-000. Sleeve positions will be selected to provide the best operations view for the operator of the REAs. The sleeve locations will be chosen to provide the operator with two different angles of each of the REA positions. LVATC cameras will be deployed in sleeves allowing the best overall view of each cell operating area.

The through wall lights (Figure 66) will be deployed in sleeves to provide the best illumination of the work area, while not blinding the camera viewing the work area.

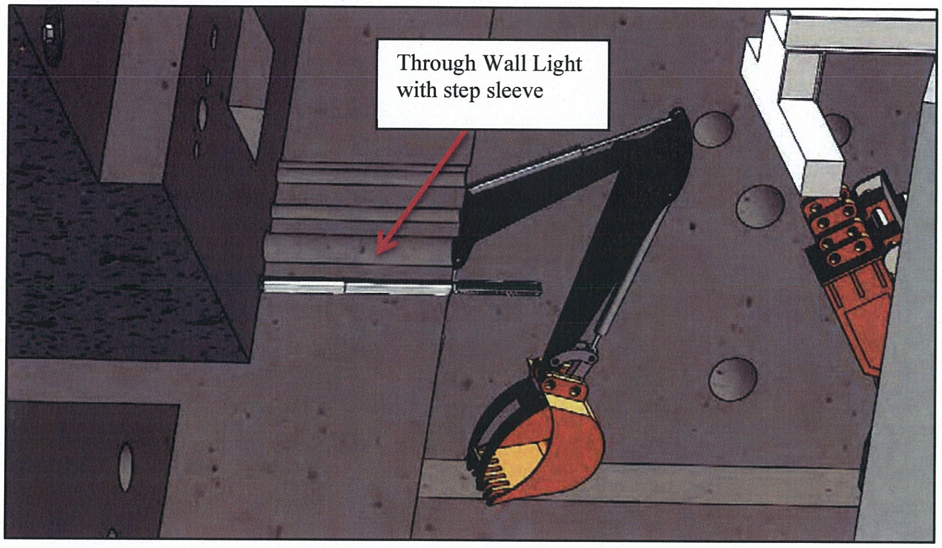

Figure 66 – Through Wall Light

5.0 Building and Soil Stabilization

In order to perform the necessary excavation of soil below B-Cell, the REC structure and supporting soil will require stabilization. Two forms of stabilization are considered herein: structural and non-structural. Structural stabilization involves analysis of the REC and design of a foundation system to ensure structural integrity is maintained throughout the soil remediation project. Non-structural stabilization involves placing a curtain wall around the perimeter of the REC at varying depths and orientations. In the context of this section, building stabilization is a form of structural stabilization and soil stabilization is in the form of non-structural stabilization.

5.1 Building Stabilization

Remedial excavation of the soils beneath B-Cell is expected to extend to areas underlying the foundations that support the B-Cell walls. Structural analysis and design are required to ensure REC stability.

5.1.1 Radiochemical Engineering Complex Cells Structural Analysis

Structural analysis of the REC will be performed using SAP2000®[6] software. An REC structural model is in development, as documented in KUR-1782F-CALC-C001 (Attachment B) and shown in Figure 67. The SAP2000 model will be used to evaluate the following:

- Current load paths/stresses for the REC concrete superstructure
- Change in load paths/stresses during:
  - Soil removal

[6] SAP2000 is a registered trademark of Computers & Structures, Inc., Walnut Creek, California.

  - Debris relocation to A-Cell
  - Addition of excavated material to D- and C-Cells
- Structural demands on the new B-Cell foundation
- Stability of the REC with the addition of the new B-Cell foundation.

The SAP2000 model considers not only the various section thickness of the walls and foundations of the REC, but also incorporates the different concrete densities as well (Figure 67).

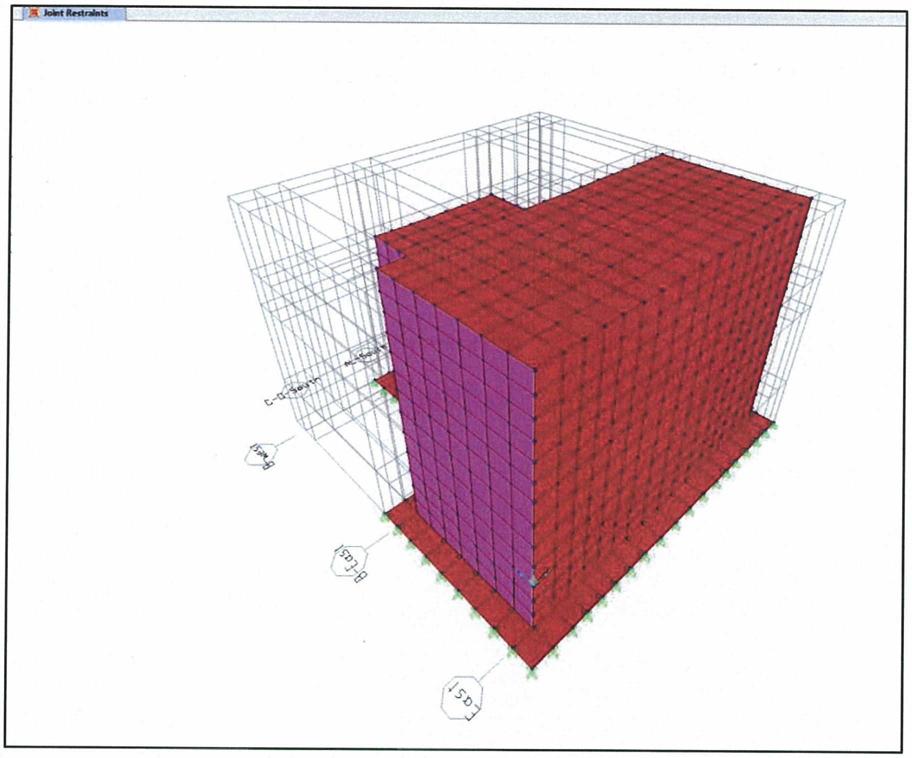

Figure 67 – Preliminary SAP2000 Model of the REC Concrete Superstructure

Careful consideration of the geotechnical properties of the supporting soil is of utmost importance for performing an accurate structural stability evaluation of the REC. KUR-1782F-RPT-001, *Assessment Report*, provides information relative to geotechnical properties of the soil in proximity to and below the 324 Building hot cells. Such information is used for evaluation of facility stability and structural retrofit design. Geotechnical engineering consultation will be utilized to ensure thorough understanding of how soil removal will affect the load carrying capacity of the remaining soil.

5.1.2 New B-Cell Foundation

In order to execute complete soil remediation, excavation will be performed under the existing B-Cell floor. Excavation will remove soil under the existing foundations supporting B-Cell walls. Soil removal is expected to impact the overall stability of the REC structure and possibly other portions of the 324 Building. At this time, it is anticipated that a new structural foundation will be installed and attached to the REC. The west wall of B-Cell is the initial location for structural reinforcement and is accessible at the (-)10-ft elevation, in Room 18. During the design stages, structural analyses of the REC will be performed and the location, size, and number of foundations will be determined. Careful consideration will be given to the geotechnical properties of the soils supporting the REC and newly installed foundation(s). Relocation of cell debris and excavated soil will be considered as part of the REC structural analysis. The results of the REC structural analysis and subsequent foundation design will also provide information regarding load carrying capacity of cell floors.

The 30% Design deliverable is based on descriptions provided in the CDR (KUR-1782F-RPT-002). To ensure that the structure maintains its safety function, the reinforced concrete foundation(s) will be designed to have sufficient capacity such that the support, provided by soil removed from under the existing B-Cell footing, can be replaced without impact to the structural integrity of the REC.

Figure 68 and Figure 69 provide respective plan and section views of the new B-Cell foundation.

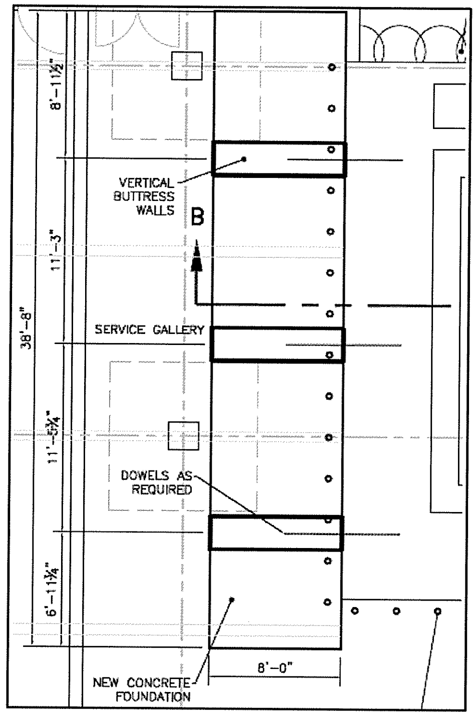

Figure 68 – New B-Cell Foundation (Plan View)

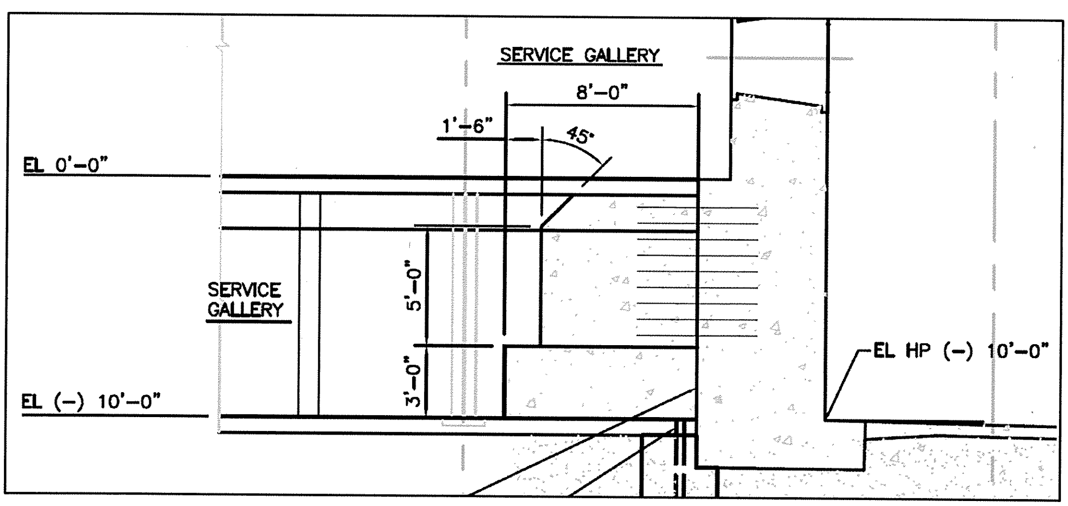

Figure 69 – New B-Cell Foundation (Section View)

Installing steel dowels or pins into the accessible face of the B-Cell west wall will create a continuous load path from the REC to the new foundation. The dowels will be fixed using epoxy, depending on the number and capacity required. To provide the highest shear transfer in accordance with ACI 318, *Building Code Requirements for Structural Concrete and Commentary*, the existing wall surface will be roughened prior to the placement of new concrete.

For ease of construction of the conceptually designed foundation, interferences from the structural steel supporting the concrete slab at 0-ft elevation were considered for placement of concrete buttress walls. The buttress will transfer the REC load to the new foundation. Design of the new B-Cell foundation(s), which includes reinforcement selection and final sizing, will be performed as the design matures and REC structural stability evaluation results are produced.

It is anticipated that the foundation will be placed by directly pumping concrete into the assembled forms inside the 324 Building. All concrete will be poured monolithically, and placed such that its full design strength can be achieved prior to loads being applied as a result of remediation activities.

Structural analysis of the REC and geotechnical analysis of the soil will provide input to final foundation design.

Structural Foundation Support

Currently, the installation of a curtain wall around the perimeter of the B-Cell is the method for soil stabilization; however, this method of stabilization is only intended for the purpose of excavated soil volume control. In essence, the curtain wall prevents the surrounding soil from sloughing into the excavation pit. The new B-Cell foundation will need to be placed either on stable soil or an installed alternative deep foundation system.

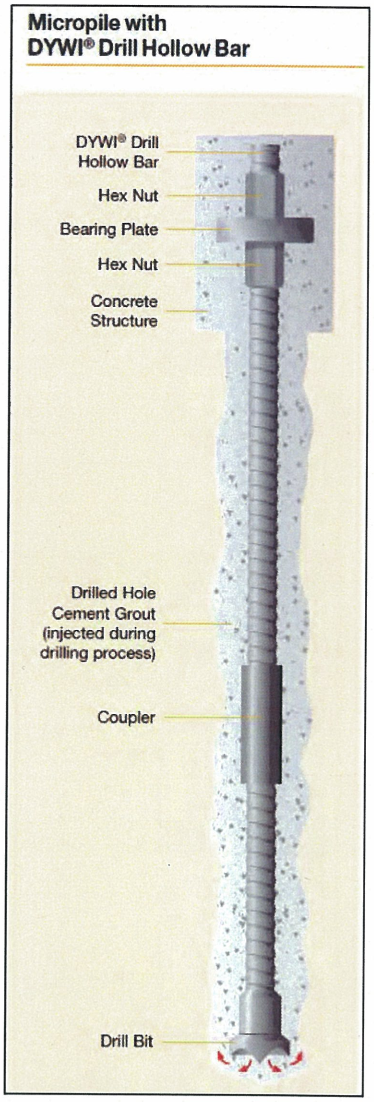

Figure 70 – Preliminary Micropile System

In preparation for the construction of a new concrete foundation, the load-carrying capacity of the soil requires evaluation as described in Section 5.1.1. A scoping calculation has been performed (KUR-1782F-CALC-C002; Attachment B). Results indicate that the proposed curtain wall has limited load-carrying capacity; therefore, a deep foundation system is required to be installed prior to the new B-Cell foundation. Figure 70 displays an example of a trademarked[7] micro-pile system that can be installed with the same drill unit used to install the curtain walls. The size, spacing, and drilled depth of the micropiles will be determined by the bearing capacity required for the new B-Cell foundation.

The deep foundation design will be further advanced in the 60% Design Report.

[7] DYWI® is a registered trademark of DYWIDAG-Systems International, New York.

5.2 Cell Floors Structural Evaluation

In the CDR (KUR-1782F-RPT-002), the structural capacity of the three cells where debris or soil will be placed (A-, C-, and D-Cell) was provided based on original design values. As a 30% Design deliverable, preliminary structural analyses of A-, C-, and D-Cell were performed, each classifying the addition of soil as a live load. A SAP2000 model was generated for all cell floors; each floor model considers the location of the sump as a reduced thickness section. Additionally, for serviceability considerations, a reinforcement layout was considered for the development of transformed section properties intended for a more accurate determination of slab displacement. Moment and shear demands were evaluated and compared to capacities based on ACI 318 code.

Based on the current analysis, the following loads can be placed on the hot cell floors:

- A-Cell–124,665 lb (total weight to be relocated), uniformly distributed
- C-Cell–115 pcf (soil unit weight) 7-ft high on floor
- D-Cell–115 pcf (soil unit weight) from floor to ceiling.

Additional analysis beyond 30% Design will address the following:

- Current stress state for hot cell floors
- Change in hot cell floor load paths/stresses resulting from excavation
- Review of concrete details for accurate determination of capacities
- More accurate soil densities and/or bag weights
- Additional load configurations
- Additional weight from grouting/end state activities.

Hot cell floor structural evaluations for the REC are contained in KUR-1782F-CALC-C003 (Attachment B).

5.2.1 A-Cell Floor Assessment

Prior to excavation, debris currently located in the other cells and the adjoining Airlock will be placed in A-Cell. According to Table 1, the total estimated weight of debris that is placed in A-Cell is 124,665 lb.

The A-Cell high bay cell floor is a structural two-way slab approximately 18 in. thick with a length of 21 ft and width of 9.25 ft. Reinforcing consists of #5 bar (5/8-in. diameter) spaced at 12 in., top and bottom, running in the longitudinal (east/west) direction, and #9 bar (1.125-in. diameter.) spaced at 7 in., top and bottom, running in the lateral (north/south) direction (Figure 71). Figure 72 shows the SAP2000 model used to represent A-Cell floor.

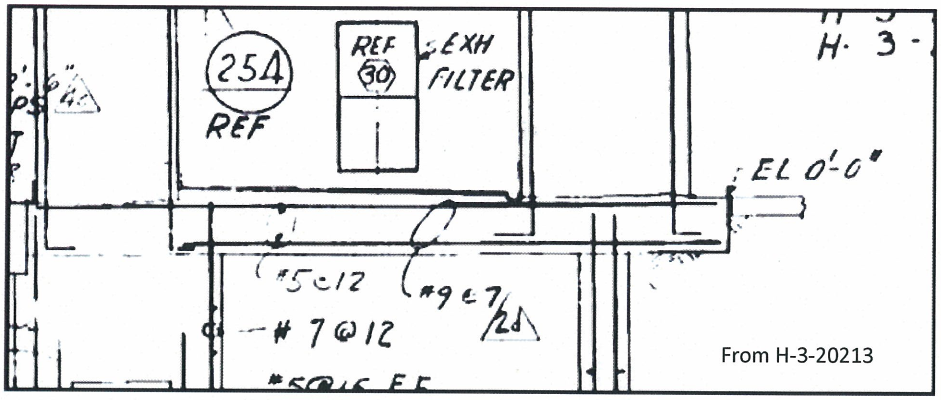

Figure 71 – A-Cell Floor Section (North – South Span)

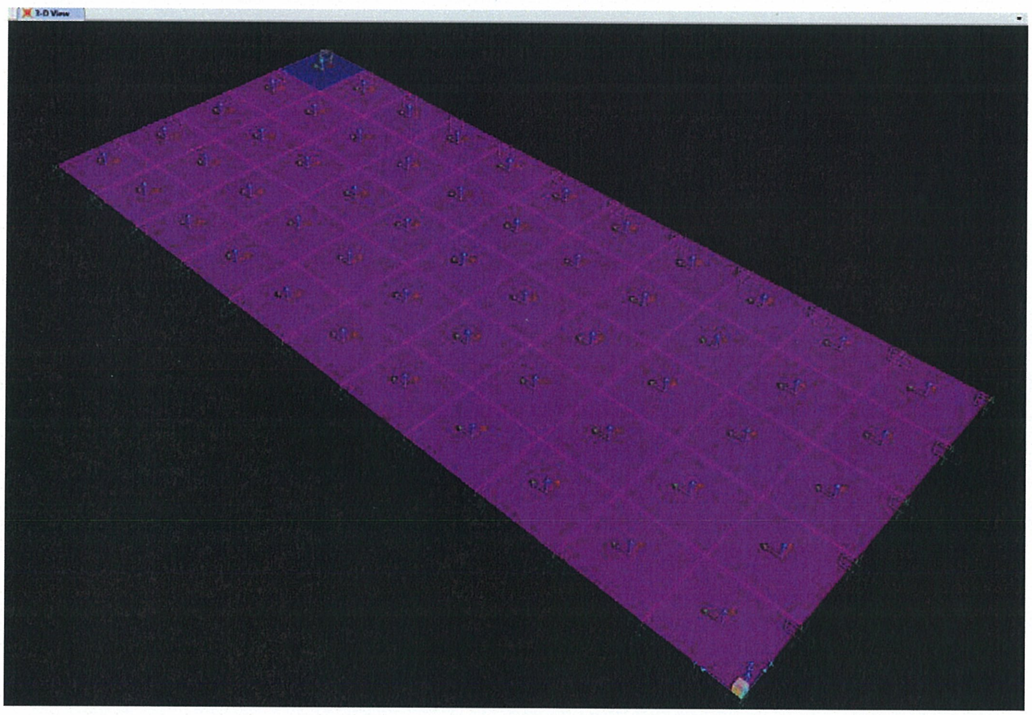

Figure 72 – A-Cell Floor SAP2000 Model

5.2.2 C-Cell Floor Assessment

The C-Cell (Pyro Cell) floor is a structural two-way slab approximately 12-in. thick with a length of 19 ft 3 in. and width of 12 ft. Reinforcing consists of #5 (5/8-in. diameter) bar spaced at 9 in. along the bottom, running in both the longitudinal (east/west) and lateral (north/south) directions (Figure 73 and Figure 74). Figure 75 shows the SAP2000 model used to represent C-Cell floor.

Top reinforcing is placed as:

- #8 bar (1-in. diameter) spaced at 9 in., extending out 4 ft from the south wall
- #7 bar (7/8-in. diameter) spaced at 12 in., extending out 4 ft from the north wall
- #5 bar spaced at 9 in., extending out 4 ft from the east and west walls.

In both directions at mid-span, there is no top layer reinforcement.

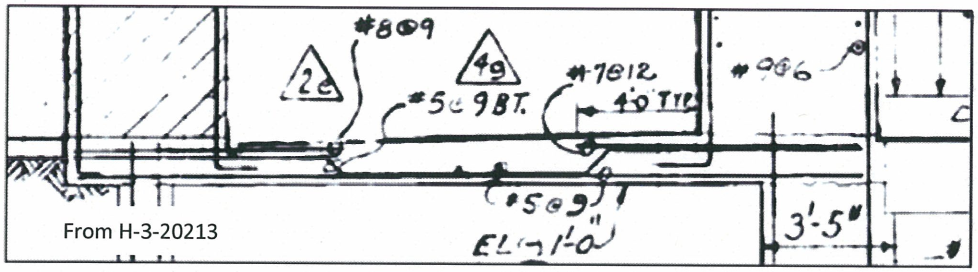

Figure 73 – C-Cell Floor Section (North – South Span)

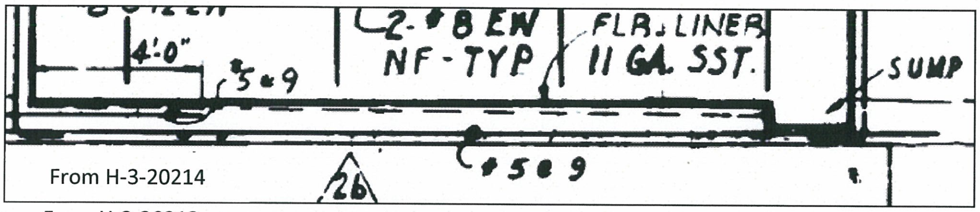

Figure 74 – C-Cell Floor Section (East – West Span)

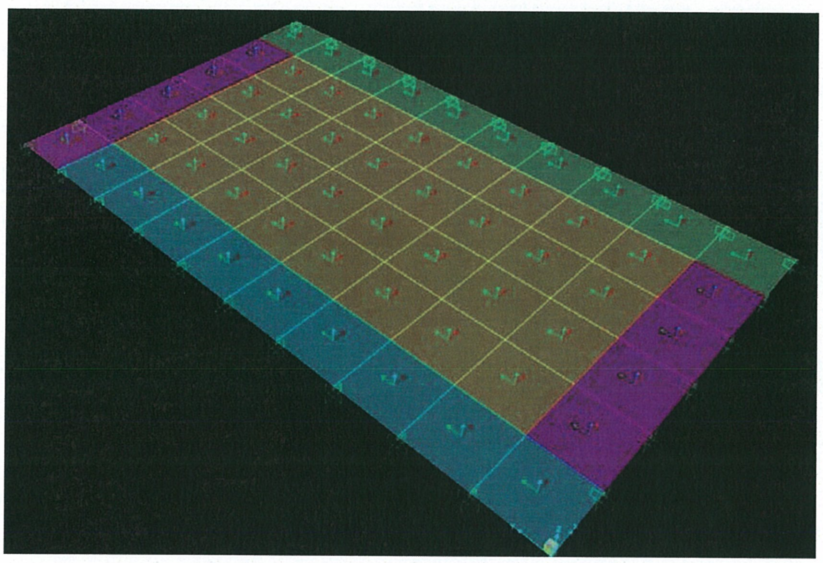

Figure 75 – C-Cell Floor SAP2000 Model

5.2.3 D-Cell Floor Assessment

The D-Cell (Mechanical Cell) floor is a structural two-way slab approximately 24 in. thick with a length of 21 ft and width of 13 ft. Reinforcing consists of #9 (1 and 1/8-in. diameter) bar spaced at 9 in., top and bottom, running in both directions (Figure 76). Figure 77 shows the SAP2000 model used to represent D-Cell floor.

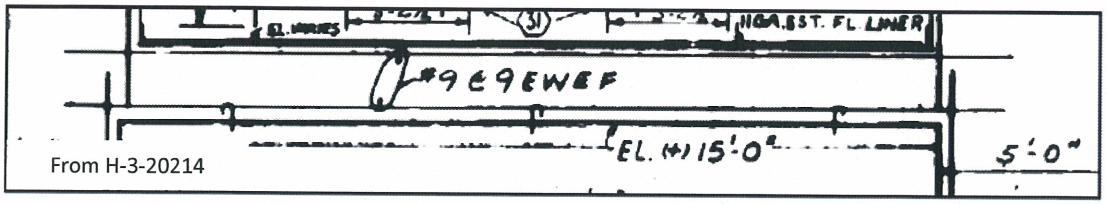

Figure 76 – D-Cell Floor Section (East – West Span)

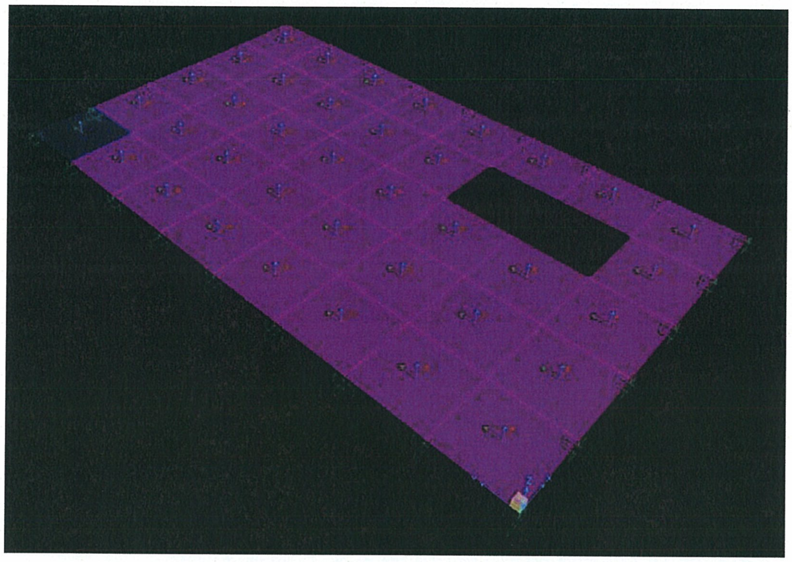

Figure 77 – D-Cell Floor SAP2000 Model

5.3 Soil Stabilization

A curtain wall is the proposed volume control method for excavated B-Cell floor soil. The walls with sacrificial soil nails, or drill string, will form a curtain around the contaminated soil materials below B-Cell per radiological and operational requirements. The curtain wall will be installed using vertical drilling at the (-)10-ft elevation on the west and south sides of B-Cell, from the 0-ft elevation on the north side of B-Cell, and using horizontal drilling on the east side of B-Cell. There are a number of potential interferences in the soil as discussed below. Final design of the curtain walls will be based on field testing.

5.3.1 Internal Bores

In order to access contaminated soil (geologic media) below B-Cell, borings will need to be made from inside of the 324 Building to depth. Primary borings will consist of diamond cores through the foundation slab, whereas, secondary borings consist of drilled soil nails through the previously established foundation core holes.

Since curtain wall installation requires core drilling through the existing concrete floor, the potential for hitting buried lines is a concern. As precursor to drilling, the foundation will be extensively surveyed for buried electrical conduits/wires.

Core Drill Installation/Operation

In order to access the soil below the B-Cell structure for construction of a curtain wall, small diameter cores (approximately 4 in.) will be drilled through the foundation slab in galleries on three sides of the cell. The coring will cut through approximately 6 to 9 in. of reinforced concrete dependent on the depth of the slab as-built and core drilling angle (from vertical to 45 degrees).

Percussion Drill Installation

A drilling rig is required to place soil nails and a curtain wall below the B-Cell north, south, and west walls. In order for this rig to effectively access the soil material below the cell walls, it is required to be capable of drilling within the operating galleries adjacent to the cell walls (i.e., limited access and height). Further, this rig must be capable of effective drilling through dense sand and sand with gravel/boulders. Therefore, the drill rig must have sufficient mass to compensate from significant down-force from the rig hammer and drilling from vertical through acute angles. Additionally, the drill rig must be capable of travelling through facility galleries, elevators, personnel doorways, etc. Because drilling and curtain wall material injection is to be completed within the confines of the 324 Building, the drill rig must not generate noxious fumes (exhaust), and as such the drill is expected to operate using 480V, three phase, 60 Hertz electrical power with hydraulic operator multiple function systems. The drill rig must be fitted with a percussion drill head (drifter) with a material swivel subassembly that will allow curtain wall material to be injected into the drill hole continuously during soil nail installation. The soil nails will then be left in place.

Vertical Curtain Wall Placement

The vertical curtain wall is an array of in-situ solidified pillars intended to overlap one another, forming a vertical secant wall. These columns are placed around three sides of B-Cell, forming a wall capable of eliminating, or significantly reducing, the "sloughing" of materials into the excavation pit. Either a binder or chemical grout will be used to form these columns, and will require a set time that will optimize column internal void fill, thus leading to larger compressive and shear strength values. These types of materials are preferred because they do not add volume to the mixture, but rather fill the interstitial voids within the soil. The specific type of material intended for the curtain wall application has not yet been determined; curtain wall material selection will take place following the successful completion of PoP testing.

5.3.2 External Bores

Curtain wall placement below the east wall of B-Cell provides a significant challenge, as access to the wall is precluded from vertical drilling, due to radiological and foundation wall/slab morphology in and below the air lock. As a result, curtain wall placement will be completed by access to the B-Cell foundation wall at the (-)10-ft elevation and simultaneous drilling and material injection from north to south from a depth of (-)10 to (-)20 ft. This is similar to vertical drilling wherein soil nails are driven while curtain wall material is injected directly into the columns via the drill bit. However, the east wall will be drilled horizontally or near horizontally forming an overlapping horizontal secant columns.

Horizontal Drill Installation

Because the curtain wall on the east side of B-Cell below (-)10 ft. is inaccessible through the facility and the curtain wall is required to be placed to a depth of (-)20 ft., directional drilling technology and equipment were selected. This technology requires little or no excavation for drill string penetration; therefore, the drill rig is placed some distance from the north side of the 324 Building where the drill string can run parallel to and below the east foundation wall from north to south.

The directional drill has virtually the same attributes as the percussion drill system described above. Directional drilling will utilize rotation/percussion and drill bits capable of depth and direction control from the surface controlled by the driller throughout completion of the drilled hole. The bit and drill string then are inserted into the soil outside of the facility at an acute angle while curtain wall material is introduced to the fluid swivel at the drill head where it exits at the drill bit. The direction and depth of the drill bit is monitored electronically from the ground surface with a sonde. Additional drill string and couplers are added to the string as needed. Once the drill bit and following drill string are at the appropriate depth and parallel with the foundation slab of B-Cell, drilling and material injection continues in a horizontal configuration forming a continuous curtain wall column. The bit and drill string are sacrificed in situ due to radiological considerations.

Horizontal Curtain Wall Placement

The horizontal curtain wall is composed of an array of horizontal columns. The horizontal curtain wall placement proceeds from depth (e.g., (-)17.5 ft to (-)15 ft), forming a horizontal secant wall. This wall will not be morphologically equivalent to the vertical secant wall(s) above, as a result of drilling and curtain wall material set time wherein columns will be oblate, or flattened on either end. These horizontal columns, however, are considered for the most part continuous vertically, bottom column placed initially and each adjacent column placed one after another from depth upward to the (-)12-ft elevation. The horizontally drilled and placed curtain wall, installed from outside the facility will, for the most part, intersect with the vertically drilled and placed curtain walls placed from within the facility.

6.0 Recovery and Backup Operations

As many of the project activities will be done remotely, it is important to design for recovery, replacement, and/or backup of key operations. This is a detailed exercise and the draft of a Recovery and Backup Matrix is included in Appendix G.

Development of recovery and backup options requires a well-defined process, and the necessary equipment to support that process. While the major process steps are defined, the 30% Design is still evolving related to equipment and related equipment operations. Once the design matures past the 30% level, further development of the Recovery and Backup Matrix (Appendix G) will occur post 30% Design moving forward.

7.0 Authorization Basis Impacts

The safety basis for the 324 Building is documented in WCH-140, *324 Building Basis for Interim Operation* (Authorization Basis). Specific safety items are identified within the document. The confinement provided by the hot-cell structure, or REC, the structural integrity of the facility, the EP-324-O1-S Stack, and connecting ductwork from the facility to the stack, are Safety Class systems, structures, and components. These systems in combination reduce the consequences incurred as a result of a worst-case accident. From WCH-140, the worst-case accident includes the drop of an open top container filled with dispersible materials from B-Cell onto the floor of the Airlock, with the container damaging the Airlock floor and Zone 1 ductwork.

Other accidents directly related to planned activities in the REC are small or large fires within the REC. The hot cell structure and ventilation system provide a boundary to prevent unfiltered releases due to a fire. An additional defense-in-depth feature is the fire protection program which controls the combustible loading and door configuration to reduce the potential for a small fire to develop into a large fire in the REC.

7.1 Radiological Engineering Complex Cells Structure

Remediation activities will impact the REC structure with respect to the Authorization Basis. Excavation of soil from beneath the B-Cell foundation will change the current load path of the REC to the soil. The addition of the new foundation will provide the structural integrity of the REC as soil is removed from under the existing foundation. As part of the analysis supporting the design, the change in the load path and its impact will be evaluated. Reduction in the REC structural integrity from a safety perspective will be minimized or prevented through the addition of the new foundation.

7.2 Fire Loading

Fire loading within the REC is controlled in accordance with the Administrative Controls defined in Section 5.4 of WCH-141, *Technical Safety Requirements*. As part of the design and operations planning, the combustible material loading in each cell of the REC will be tracked to ensure fire loading is maintained within current limits. During planned operations, various doors within the REC may be open for periods longer than currently envisioned in the fire hazards analysis. Once the operational movement of materials is better defined, planned fire loading will be evaluated against the current requirements.

7.3 Waste Handling Accident

The controlling accident for the 324 Building is a drop of a waste container within the Airlock. The potential consequence of this accident drives the identification of the few Safety Class systems or structures. During remediation operations, waste from B-Cell will be moved through the Airlock to the other cells in the REC. These planned activities will not challenge the analyzed drop accident for the following reasons:

- Accident assumes the total activity in B-Cell is contained in a single package.
  - Based on the dispersion of activity in the soil and the limited space and configuration within the hot cell only part of the source term will be potentially at risk during the remediation.
- Accident assumes a cohesionless powder.
  - All materials in the waste packages will either be solid (sections of the floor) or contaminated soil.

8.0 Proof-of-Principle Testing

Testing (PoP) will be performed to show the feasibility of key aspects of the remediation process approach. Specific PoP testing will be performed for the following areas:

1. Binder/Soil formulation/mixing and sack handling operations,
2. Floor saw operation,
3. Remote Excavator Arm operation, and
4. Curtain wall.

Specific test plans for each of these PoP tests have been prepared and are included in Attachment C to this report.

While some of the tests can be carried out with basic equipment and tools, the floor saw testing and REA testing require test structures to properly perform the testing. The floor saw test requires a concrete floor slab with a stainless-steel liner attached, similar to the actual liner in B-Cell. In addition, the REA test requires construction of a concrete wall, similar to a B-Cell wall, to mount the REA.

The following paragraphs provide further detail for each PoP test as well as the floor and wall test structures. In addition, major equipment and material items required to support the PoP testing are identified.

8.1 Binder and Waste Sacks

The purpose of this testing is to determine the appropriate binder formulation as well as the proper soil and binder mix formulation. This testing also provides PoP validation of the conceptual design for remediation of the soil beneath B-Cell. The scope of the testing related to the binder and waste sacks includes:

- Development/determination of specific chemical binder for mixing with soil.
- Soil/binder mix ratio to minimize volume increase.
- Waste sack and stand design and handling operations as it relates to the proposed remediation operations process.
- Success of soil and binder mixing.

The test objectives for the chemical binder and sack handling are identified in KUR-1782P-TPL-001, *Soil/Chemical Binder and Waste Bag Test Plan* (Attachment C), but are listed here for convenience.

The specific test objectives for binder formulation include:

1. Determine binder formulation to provide adequate soil/binder mix set time to support waste sack handling and potential soil/binder mix flow in the disposal cell.
2. Determine equipment cleaning requirements.
3. Determine if binder color agent is required to determine proper mixing.

The specific test objectives for the soil and binder mix formulation include:

1. Develop at least two variations of binder mix formulas for sand to: 1) promote flow of the soil/binder mix to efficiently utilize disposal cell volume; and 2) minimize the soil/binder mixed volume.
2. Determine binder mix formulation for cobble.
3. Determine proper cobble/binder mix method.

The specific test objectives identified for waste sack handling include:

1. Validate the sack design.
2. Validate the sack stand design.
3. Validate remote sack handling operations.
4. Demonstrate mixture flow from sacks.

The soil and binder mixing test objectives include:

1. Determine/demonstrate binder application.
2. Demonstrate soil/binder mixing with excavation equipment.
3. Determine soil/binder buildup on equipment.

4. Develop method for cleaning soil/binder buildup from equipment.
5. Evaluate the effects of residual/overflow binder in the excavation area.

8.2 Floor Saw

The purpose of the saw testing is to validate the saw and blade selection as well as provide PoP validation of the conceptual design for cutting of the floor within B-Cell.

The scope of the testing related to this plan includes determining and validating the saw design for cutting the liner/concrete of B-Cell. The testing scope also evaluates the handling and positioning of the saw within the cell. The test objectives for the floor saw cutting are identified in KUR-1782P-TPL-002, *Floor Saw Cutting Test Plan* (Attachment C), but are listed here for convenience.

The specific test objectives for the cutting through a combination of materials include:

1. Determine proper combination blade for stainless steel and concrete.
2. Determine saw stability during operation (i.e., is saw weight sufficient for gravity operation).
3. Determine minimum depth of cut required to allow floor to be efficiently demolished if complete cuts are not achievable.
4. Verify proper saw cutting with no coolant and determine saw wear rate.
5. Determine spark potential as it relates to fire hazard.
6. Determine dust generation and migration characteristics as it relates to ventilation and filters as well as visibility.

The specific test objective for saw handling and placement include:

1. Demonstrate remote handling and placement at cut locations.

8.3 Remote Excavator Arm

The purpose of this testing is to provide PoP and operational validation of the design for removal of the debris/floor and remediation of the soil beneath B-Cell.

The scope of the testing related to the REA includes mounting and basic operations. In addition, this testing also includes demonstration of REA integrated operations with other remediation equipment. The test objectives for the REA testing are identified in KUR-1782P-TPL-003, *Remote Excavator Arm (REA) Test Plan* (Attachment C), but are listed here for convenience.

The specific test objectives for REA mounting and operations include:

1. Demonstrate remote REA mounting to post.
2. Demonstrate structural attachment to thru-wall supports.
3. Demonstrate remote attachment of controls, monitoring, and hydraulic lines.
4. Demonstrate post load monitoring/sensing.
5. Demonstrate capability to accommodate typical digging, hammering, and shearing loads.

The specific test objectives for REA integrated operations include:

1. Demonstrate REA operations within the required envelope.
2. Demonstrate binder application to the soil and mixing with REA.

3. Determine soil/binder buildup on equipment.
4. Develop method for cleaning soil/binder buildup from REA.
5. Evaluate the effects of residual/overflow binder in the excavation area on REA operations.
6. Demonstrate remote sack handling operations with REA.
7. Demonstrate sack install and removal from stand.

8.4 Curtain Wall

The purpose of the curtain wall test is to demonstrate the ability of the curtain wall to stabilize the soil at the B-Cell excavation perimeter around the contaminated soil.

The curtain wall PoP testing will include not only the evaluation of the materials, but the drilling and material injection methods as well. The curtain wall final material selection will be determined prior to submittal of the 90% Design Package, following the successful completion of bench-scale PoP testing.

The test objectives for the curtain wall are identified in KUR-1782P-TPL-004, *Chemical Grout Curtain Test Plan* (Attachment C), and are listed below for convenience.

The specific test objectives for curtain wall PoP tests include:

1. Determine drilling rate in sand and sand/gravel.
2. Determine injection rate in sand and sand/gravel.
3. Determine optimum bit configuration.
4. Evaluate different strength mixtures.
5. Determine capabilities of mixing and pumping equipment.
6. Evaluate pump tubing/piping and required system pressure and volume per unit time requirements.
7. Develop multiple material set times under drill operations.
8. Develop multiple material set times under set-in conditions.
9. Determine soil physical characteristics after curtain wall material placement, e.g., compressive strength, shear, elevated temperature.
10. Determine morphology of vertical and horizontal columns with coaxial soil nails or directional drill steel.
11. Determine drill hole spacing for optimum curtain wall column placement.

Additional curtain wall tests are planned to be conducted at the Mockup and Testing Facility.

8.5 Saw Test Floor

The PoP floor is based on the existing B-Cell floor design. While the actual B-Cell floor is a 6-in. thick concrete slab on grade with thickened edges and a stainless-steel liner on top, the saw test floor is comprised of a reinforced 9-in. thick concrete slab on grade with a stainless-steel liner on the top of the slab and anchored to lengths of embedded structural angle (Figure 78). The 9-in. thickness of the test floor provides assurance that if the saw is positioned over a floor section that is thicker than the nominal 6-in. floor thickness, the saw will have sufficient margin to cut through the additional floor thickness.

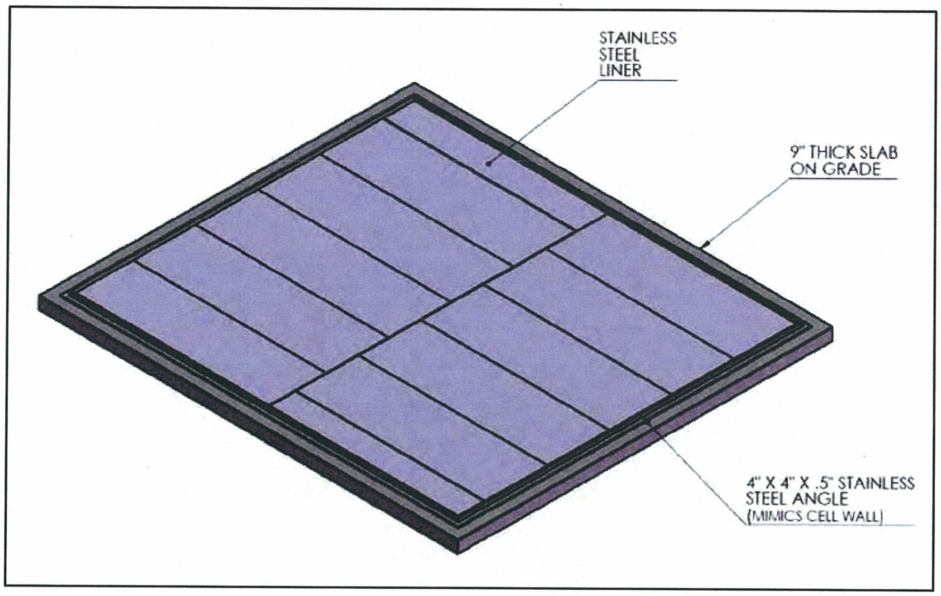

Figure 78 – Saw Cutting Proof-of-Principle Floor

Actual saw operations in B-Cell will position the saw at strategic locations based on a cut plan. The current cut plan sections the floor into 20-in. by 20-in. squares. This size of floor sections will fit (with some margin) into the waste sacks for disposal in the A-Cell.

The current cut plan allows for cutting through the length of a liner anchor embedment angle; however, it may be prudent to avoid cutting through the liner anchor embedment angle to extend blade life and increase cut speed. Since some margin exists for floor section size variance to fit within the waste sack, the saw can be positioned slightly off of the planned cut path to avoid the anchor embedment. However, it is also prudent to validate that the saw can cut through the length of an anchor embed angle.

As noted previously, the PoP floor design is based on the existing B-Cell floor design. Accordingly, the location of the saw on the PoP floor can be adjusted as needed to demonstrate saw operation on the worst-case floor section that may include cutting through the length of a liner anchor embedment angle.

8.6 Remote Excavator Arm Test Wall

The REA PoP wall design thickness is based on the existing B-Cell shield wall for the normal density concrete section of the cell wall (Figure 79). The wall is a 5-ft 4-in. thick concrete, free standing, steel reinforced, structure that sits atop a 24 in. thick stabilizing base. The top of the stabilizing base is at grade level, and the base extends down 2 ft. The wall height from grade elevation is 16 ft. The wall is capable of supporting the REA weight as well as resisting the digging forces generated by the REA hydraulics.

The PoP wall design includes core drilled REA mounting holes. The wall reinforcing steel is also positioned in such a way so as to allow future core drilling to allow testing of new hole positions if needed.

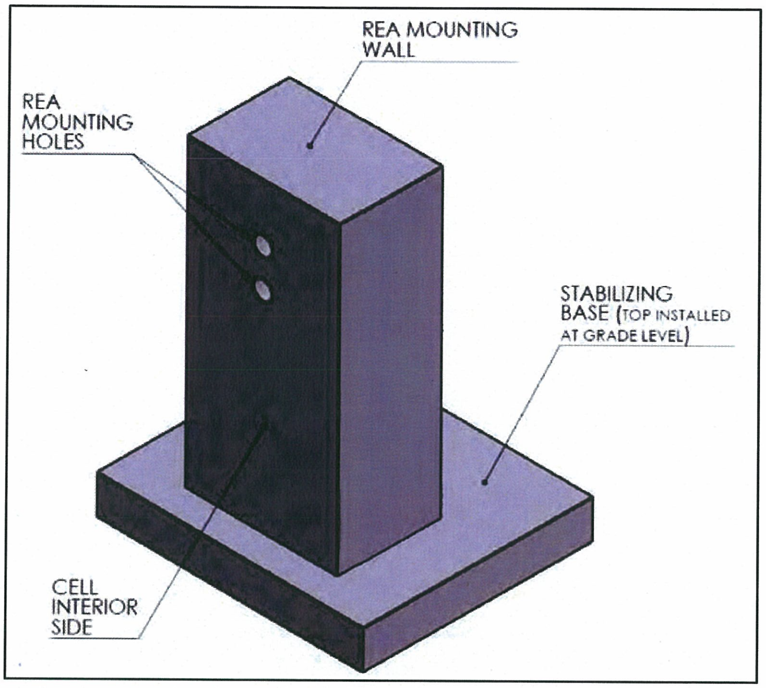

Figure 79 – REA Proof-of-Principle Wall

8.7 Equipment and Materials

The major items identified for use in the PoP tests include equipment items as well as structural items and materials to support the tests. Table 5 provides an abbreviated listing of the equipment and materials required for the PoP testing.

Table 5 – Abbreviated List of Equipment and Materials

Item	Description
Equipment	
REA	John Deere 35G excavator
Concrete Saw	DTI Hycycle® wall saw
Soil Sacks	Bulk material sacks, 1-yd capacity
Sack Handling Equipment	Stands, handling fixtures, etc.
Test Structures	
REA Wall Design	Concrete wall
Floor Design	Concrete pad with stainless-steel liner
Consumable Materials	
Binder	See Terms and Definitions
Chemical Grout	See Terms and Definitions
Wall Saw Blades	Concrete saw blades of various designs/compositions

Hycycle® is a registered trademark of Diamond Tech, Inc., Rocklin, California.

9.0 Schedule and Risk

9.1 Project Schedule

A high-level project baseline schedule was prepared during the initial stage of this project, and has been approved by WCH. Critical Path Methods of planning and scheduling were used to develop the schedule via Primavera P6®[8] software. Subcontractor detailed schedules feed into the project master schedule. The current project schedule is provided in Appendix C of this document.

Table 6 – Major Project Milestones for Phases I and II

Milestone	Date
Notice to Proceed	20 Jan 2014
Mobilization Submittals Approved	5 Mar 2014
Phase I Complete	8 May 2014
30% Design Approved	11 Jul 2014
Mockup Facility Design Complete	4 Aug 2014
Prototype Testing Complete	22 Sep 2014
60% Design Approved	13 Oct 2014
Long Lead Equip Identified	13 Oct 2014
Revised Estimate for Phases III & IV	24 Nov 2014
90% Design Approved	27 Jan 2015
Mockup Facility Operational	14 Apr 2015
100% Design Approved	21 Aug 2015

A working level schedule has also been developed to be used as a rolling 3-week look-ahead schedule, intended to control both the engineering and mockup activities and deliverables. The working level schedule is organized and coded with the related Work Breakdown Structure codes. This schedule is statused on a weekly basis by the Project Controls Lead with input from all project team members, and reviewed at weekly progress meeting with WCH.

9.2 Risk Assessment

A project risk assessment was initially performed during the proposal phase to evaluate areas of potential cost and schedule risk. The resulting risk register is updated as the project evolves, and was updated for this 30% Design stage. The current Risk Register is in Appendix D of this document. This initial assessment was performed by a cross-functional team of subject matter experts, who provided a broad view of project risks. As a result of this assessment, a risk contingency amount was calculated (approximately $2.3M) that is recommended to be included by WCH in the project funding.

Risk mitigation actions have been developed, and are incorporated in the project schedule and current design, or as future action items in the Action Item List. During project execution, a monthly review of

[8] Primavera P6 is a registered trademark of the Oracle Corporation, Redwood Shores, California.

risk issues will be performed during project reviews to see if any strategic changes are needed. If serious new issues are identified, a separate meeting for review of risk issues will be called immediately, and the appropriate mitigation actions will be identified and assigned.

9.3 Quality and Constructability Reviews

To date, Kurion has performed one surveillance on the implementation of procedures, that addresses NQA-1, *Quality Assurance Requirements for Nuclear Facilities Applications*, for the 300-296 Soil Remediation Project, with zero findings and three observations. A further surveillance of Kurion and RSE activities was conducted in June 2014 and will be documented elsewhere. Within the same time frame, AREVA has conducted two audits and a surveillance on Kurion, as well as additional overview performed through meetings and conference calls. AREVA has also performed an audit and initial surveillance on Federal Engineers and Constructors (FE&C).

As part of the design process, constructability reviews are performed on the design media at each stage of design. During the 30% Design Review, a constructability review of the drawings was performed by FE&C. Only minimal comments were noted at this stage, due to the lack of detail. A more substantial review will be performed at the 60% stage, and again at the 90% Design stage.

10.0 References

0300X-CA-N0115, *Revised Radiological Inventory for the 324 Building REC Cells, Airlock and Pipe Trench*, Rev. 0, June 15, 2010,Washington Closure Hanford, Richland, Washington.

ACI 318-11, *Building Code Requirements for Structural Concrete and Commentary*, American Concrete Institute, Farmington Hills, Michigan.

Contract C036502A00, Exhibit D, *Waste Site 300-296 Soil Contamination under 324 B-Cell Remediation Subcontract Scope of Work*, AREVA Federal Services LLC, Richland, Washington.

DOE/RL-2001-36, *Hanford Site-wide Transportation Safety Document*, Rev 1-E, May 2011, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

ENG-1-3.2, *Design Hazard Identification*, Washington Closure Hanford, Richland, Washington.

H-3-20213, "Structural Concrete Hot Pilot Cells – Area 3 Sections & Details," Sheet 1, Rev. 7, January 1988, U.S. Atomic Energy Commission, Hanford Atomic Products Operation, General Electric, Richland, Washington.

H-3-20214, "Structural Concrete Hot Pilot Cells – Area 3 Sections & Details," Sheet 1, Rev. 6, *[Date not legible]*, U.S. Atomic Energy Commission, Hanford Atomic Products Operation, General Electric, Richland, Washington.

H-3-20271, "Step Plug & Sleeve Hot Pilot Cells and Hot Met. Cells," Rev. 3, April 1966, U.S. Atomic Energy Commission, Hanford Atomic Products Operation, General Electric, Richland, Washington.

H-3-70478, "B-Cell Exhaust Frame Assembly," Sheet 1, Rev. 0, September 1992, U.S. Department of Energy, Richland Operations Office, Pacific Northwest Laboratories, Richland, Washington.

KUR-1782F-RPT-001, *300-296 Soil Remediation Project Phase I& II - Assessment Report*, Rev. 0 Draft, May 28, 2014, Kurion, Inc., Richland, Washington.

KUR-1782F-RPT-002, *300-296 Soil Remediation Project Phase I& II – Conceptual Design Report*, Rev. A Draft, Kurion, Inc., Richland, Washington.

NQA-1, *Quality Assurance Requirements for Nuclear Facilities Applications*, 2008 Edition with 2009 Addenda, American Society of Mechanical Engineers, New York, New York.

PNNL-21214, *Numerical Modeling of ^{90}Sr and ^{137}Cs Transport from a Spill in the B-Cell of the 324Building*, Pacific Northwest National Laboratory, Richland Washington.

WCH-140, *324 Building Basis for Interim Operation*, Rev. 5, March 2012, Washington Closure Hanford, Richland, Washington.

WCH-141, 324 Building Technical Safety Requirements, Rev. 0, July 2007, Washington Closure Hanford, Richland, Washington.

WCH-191, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, Rev. 2, February 22, 2011, Washington Closure Hanford, Richland, Washington.

Appendix A: Preliminary Lists

Major Design Issues List

No.	Issue	Status	Plan
1	A/D Crane Reliability	Currently Operable	A-Cell Crane can be a backup with cable upgrade
2	B-Cell Crane Reliability	Currently Operable	Use Upper REA to relieve majority of use, 3- and 6-ton cranes will be each other's backup.
3	C-Cell Crane Reliability	Currently Operable	Use MSMs to assist in waste sack placement
4	C Cell Floor Capacity	400 lb/ft^2	
5	A Cell Floor Capacity	1000 lb/ft^2	
6	Soil Capacity under new Footing		Soil under the spread footing should be collected and subject to geotechnical analysis before final footing design.
7	Thermal Loading > 100 Watts/Monolith(M-SPA Limit)		
8	Acceptability of Binder for Immobilization per M-SPA		
9	Changing Cs/Sr ratios in soil based on depth		
10	Ability to Remove C/D Cell floor plug		Crane tools will test removal and lifting of hatch before operations begin
11	Waste sack lifting device	Concept identified	
12	Cell Door Failure (Open)		
13	Cell Door Failure (Close)		
14	Saw Blade Changing (frequency & method)		
15	Contamination on B-Cell Transfer Barrier when moved into the Air Lock		
16	Decon/Dose Reduction in Air Lock		
17	Spread of soil contamination in the Airlock		
18	Total waste volumes exceeding available space		Low dose packages of soil shipped from REC
19	Final REC configuration state for future monolith sectioning	This issue is related to any design issues as it relates to future facility sectioning for transport to final disposal site	
20	Removal of cores for REA Mounting	The issue is removal of cores into gallery or push them into the cell.	
21	Horizontal Grout Curtain Wall/Sonde	Directional control of grout curtain installation	Necessity of horizontal grout curtain being evaluated

Drawings

Drawing Number	Description	30%	60%	90%
Electrical				
KUR-1782F-DWG-E001	Electrical Site Modified Utility Plan		X	X
KUR-1782F-DWG-E002	Electrical Modified Power Plan		X	X
KUR-1782F-DWG-E003	Electrical Equipment Connection Schedule			X
KUR-1782F-DWG-E004	Electrical Details			X
General				
KUR-1782F-DWG-G001	Process Flow Diagram		X	
Civil				
KUR-1782F-DWG-C001	Structural REC @ EL. -10'-0"	X	X	X
KUR-1782F-DWG-C002	Structural REC @ EL. 0'-0"	X	X	X
KUR-1782F-DWG-C003	Structural Section A	X	X	X
KUR-1782F-DWG-C004	Structural Section B	X	X	X
KUR-1782F-DWG-C005	Notes Sheet		X	X
KUR-1782F-DWG-C006	Sections for 'B-Cell' South/North Walls		X	X
KUR-1782F-DWG-C007	Sections for 'B-Cell' East/West Walls		X	X
KUR-1782F-DWG-C008	Concrete Sections and Details		X	X
KUR-1782F-DWG-C009	Misc. Details		X	X
KUR-1782F-DWG-C010	Site Plan		X	X
KUR-1782F-DWG-C011	Excavation Plan for H. Curt Wall Install		X	X
KUR-1782M-DWG-C001	Structural REC @ EL. -10'-0"			
KUR-1782M-DWG-C002	Structural REC @ EL. 0'-0"			
I & C				
KUR-1782F-DWG-I001	I&C		X	
KUR-1782F-DWG-I002	I&C		X	
KUR-1782F-DWG-I003	I&C		X	
KUR-1782F-DWG-E010, 4 Sheets	Single Line Diagram	X	X	X
Mechanical				
KUR-1782F-DWG-M001	GA – Overall 324 Building, Sht 1		X	
	GA – 324 Building REC, Sht 2		X	
	GA – 324 Building B-Cell, Sht 3		X	
KUR-1782F-DWG-M002	Interface Design		X	
KUR-1782F-DWG-M003	HVAC Modifications, A-Cell, Sht 1		X	
	HVAC Modifications, B-Cell, Sht 2		X	
	HVAC Modifications, C-Cell, Sht 3		X	

Drawing Number	Description	30%	60%	90%
	HVAC Modifications, D-Cell, Sht 4		X	
KUR-1782F-DWG-M004	Upper REA GA		X	
KUR-1782F-DWG-M005	Lower REA GA		X	
KUR-1782F-DWG-M006	Transfer Barrier GA		X	
KUR-1782F-DWG-M007	Dust Control GA (and detail drawings)			
KUR-1782F-DWG-M008	Snorkel Design and Installation Drawings (Vary from cell to cell)			
KUR-1782F-DWG-M-REC-1100-000	Through Support Anchor Plate	X		
KUR-1782F-DWG-M-REC-1110-000	Upper and Lower REA – REA Through Support	X		
KUR-1782F-DWG-M-REC-1120-000	Through Support - Upper	X		
KUR-1782F-DWG-M-REC-1130-000	Through Support Lower	X		
KUR-1782F-DWG-M-REC-1200-000	Overall Assembly, Lower REA	X		
KUR-1782F-DWG-M-REC-1300-000	Overall Assembly, Upper REA	X		
KUR-1782F-DWG-M-REC-1400-000	Tool Holder	X		
KUR-1782F-DWG-M-REC-2000-000	Transfer Barrier	X		
KUR-1782F-DWG-M-REC-2100-000, 2 sheets	Transfer Barrier, Transfer Barrier Frame	X		
KUR-1782F-DWG-M-REC-2200-000, 2 sheets	Transfer Barrier, Transfer Barrier Cart	X		
KUR-1782F-DWG-M-REC-4100-000	Bag Assembly	X		
KUR-1782F-DWG-M-REC-4200-000	Bag Stand	X		
KUR-1782F-DWG-M-REC-5000-000	Grout Tube - Grout Tube	X		
KUR-1782F-DWG-M-REC-8100-000	A-Cell Dam	X		
KUR-1782F-DWG-M-REC-8200-000	Overall REA Offset Hook	X		
KUR-1782F-DWG-I-REC-9000-000, 4 Sheets	Vision System One Line Diagram	X		
KUR-1782F-DWG-I-REC-9100-000, 2 Sheets	Thru Wall Vision and Lighting Assembly	X		
KUR-1782F-DWG-I-REC-9200-000, 2 Sheets	Thru Wall Lighting Assembly	X		
KUR-1782F-DWG-I-REC-9290-000	Cell Window Light Array	X		
KUR-1782F-DWG-I-REC-9300-000	Local Lighting & Vision Control Station	X		
KUR-1782F-DWG-I-REC-9500-000, 2 Sheets	Remote Lighting & Vision Control Layout	X		
KUR-1782F-DWG-I-REC-9600-000, 2 Sheets	Crane Lighting & Vision Assembly	X		
KUR-1782F-DWG-P001, 4 Sheets	Soil Remediation Process Flow Diagram, Grout Removal, Sht 1	X		
	Soil Remediation Process Flow Diagram, Floor Removal, Sht 2	X		

Drawing Number	Description	30%	60%	90%
	Soil Remediation Process Flow Diagram, Primary Soil to C-Cell, Sht 3	X		
	Soil Remediation Process Flow Diagram, Primary & Secondary Soil to D-Cell, Sht 4	X		
KUR-1782F-DWG-P002, 2 Sheets	Soil Remediation Equipment Interface Diagram Sht 1	X		
	Soil Remediation Equipment Interface Diagram Sht 2	X		
KUR-1782F-DWG-P300	Reserved by Mike A. 5/29/14			
KUR-1782F-DWG-P400	Reserved by Mike A. 5/29/14			

Specifications

Specification Number	Description / Title	30%	60%	90%
Instrumentation				
KUR-1782F-SPEC-I001	Place Holder		X	X
KUR-1782F-SPEC-I002	Place Holder		X	X

Calculations

Calculation Number	Description / Title	30%	60%	90%
Civil				
KUR-1782F-CALC-C001	324 Building Structural Stability Evaluation	X	X	X
KUR-1782F-CALC-C002	324 Building B-Cell Foundation Design	X	X	X
KUR-1782F-CALC-C003	A-, C-, D-Cell Floor Structural Analysis	X	X	X
KUR-1782F-CALC-C004	End State Structural Evaluation			X
KUR-1782F-CALC-C005	Miscellaneous Structural Evaluation/Design			X
Electrical				
KUR-1782F-CALC-E001	Electrical Load Calculation		X	X
Mechanical				
KUR-1782F-CALC-M001	30% Design Scoping Calculation	X	X	X
KUR-1782F-CALC-M002	Equipment Sizing		X	X
KUR-1782F-CALC-M003	Crane Design/Selection		X	X
KUR-1782F-CALC-M004	Air Flow through Snorkel			X

Integrated Work Control Program

Work Package Activity	IWCP Category
Site Mobilization	Routine/Type 4 (electrical connection to trailer)
Facility Upgrades	Type 4/1
Concrete Boring/Cutting*	Type 1
Grout Curtain*	Type 1
B-Cell Structural stabilization	Type 1
REA Equipment Installation	Type 1
Cell/Airlock Debris Removal**	Type 1
Transfer Barrier Installation	Type 1
Waste Packaging**	Type 1
B-Cell floor Demolition***	Type 1
Soil Excavation***	Type 1
Site Characterization /Sampling***	Type 1
Backfill	Type 4
Demobilization	Routine/Type 4 (electrical disconnect)

Note: (*), (**), (***) Like work activities may be combined into a single IWCP work package

Material Safety Data Sheets

- Equipment fluids
  - REA Hydraulic
  - Brokk Hydraulic
  - Saw Hydraulic
  - Saw Cooling
- Process fluids
  - Binder
  - Binder Additives
- General
  - Lubricants
  - Concrete

Miscellaneous Documents/Reports

Document No.	Description
KUR-1782F-LST-002	Equipment List
AREVA	Radiological Exposure Estimates
AREVA A-300-296-00131	Debris Tracking Within REC
N/A	Fabrication Packages
N/A	Material Safety Data Sheets
	Design Review Meeting Minutes
N/A	Testing
	Prototype/Proof of Principle Testing Plan
KUR-1782P-TPL-001	Soil/Chemical Binder and Waste Bag Test Plan
KUR-1782P-TPL-002	Floor Saw Cutting Test Plan
KUR-1782P-TPL-003	Remote Excavator Arm (REA) Test Plan
KUR-1782P-TPL-004	Chemical Grout Curtain Test Plan
N/A	Prototype/Proof of Principle Testing Reports
KUR-1782M-PLN-001	Mockup and Testing Plan
N/A	Mockup and Testing Details
N/A	Qualification/Testing Packages/Procedures
	Design Review Presentation
	Interfaces
	Design Input

REMEDIATION EQUIPMENT LIST -- 30% Design

300-296 Soil Remediation

Phase[1]	Long Lead? (Y/N)	Quantity for 324 install/use	Equipment Name	Equipment Abbreviation	If fabricated or modified, by who?	Brand	Model Number	Weight (lbf)	Power Requirements (as applicable)	Quality Classification
R, M	N	1	Remote Excavator Arm, Upper	REA-U	Kurion	(John Deere)	(50G Boom & Stick)			GS
R, M, P	N	3	Remote Excavator Arm, Lower	REA-L	Kurion	(John Deere)	(35G Boom & Stick)			GS
R, M	N	1	Hydraulic Power Unit, REA	HPU						TBD
R	N	1	Brokk							GS
R, M	N	1	Transfer Barrier		Kurion					GS
R, M	N	1	Waste Sack Stand		Kurion					GS
R, M	N	tbd	Camera -- Crane Transportable	CAM-CT	Kurion					GS
R, M	N	tbd	Camera -- Thru Wall	CAM-TW						GS
R, M	N	tbd	Light Bar		Kurion					GS
R	N	1	CHA Boom Crane	CHA-Boom						TBD
R	N	1	A-Cell Crane	A-Crane						TBD
R	N	1	A/D Crane	A/D-Crane						TBD
R	N	1	B-Cell 3T Crane	B-3T						TBD
R	N	1	B-Cell 5T Crane aka 10T	B-5T				12700	480VAC/3ph/60Hz	TBD
R	N	1	B-Cell Jib Crane	B-Jib						TBD
R	N	1	C-Cell Crane	C-Crane						TBD
R	N	4	Hoist Rings							TBD
R, M, P	N	1	Floor Saw		Kurion	Concut	AK-400	~350	480VAC-30A	GS
R, M, P			Blade, Floor Saw			Concut				GS
R, M		1	Dust Control System		Kurion					GS
		250	Waste Sack, Primary							GS
		250	Waste Sack, Secondary							GS
R, M		1	Hammer			Indeco	HP500	510		GS
R, M		1	Shear			Cat	S305	1280		GS
P		tbd	Master Slave Manipulator	MSM						TBD
M		tbd	Master Slave Manipulator	MSM						TBD
R		tbd	Master Slave Manipulator	MSM						TBD
R, M, P		4	Quick Hitch, Master			Oilquick				TBD
R, M, P		4	Quick Hitch, Tool			Oilquick				TBD
R, M, P		1	Powergrip bucket			HELAC		na		GS
		1	Sack Stand--C-Cell		Kurion					GS
		1	Sack Stand--New Sacks		Kurion					GS
R		1	A-Cell Dam							TBD
		tbd	Spare Tool Rack -- REA		Kurion					GS
			Binder Hose							GS

REMEDIATION EQUIPMENT LIST -- 30% Design

300-296 Soil Remediation

Phase[1]	Long Lead? (Y/N)	Quantity for 324 install/use	Equipment Name	Equipment Abbreviation	If fabricated or modified, by who?	Brand	Model Number	Weight (lbf)	Power Requirements (as applicable)	Quality Classification
			Binder Hose Guide		Kurion					GS
			Control Radio System						2 watt (Battery)	GS
			Flow Analyzer						(Battery)	GS
			Static Mixer							GS
			Skid Steer Lift Truck			Bobcat	S100	4100 lbs	Diesel Hydraulic (35 hp)	GS
			Lift Truck Forks							GS
R, M			Binder Pump					600 lbs	240 V 60 cycle 3 phase (transformed)	GS
			Evaporative Cooling Unit					300 lbs	15 A	GS
			Storage Tanks							GS
			Environmental Enclosure Heater (BDH Portable Electric Blower Heater)			BERKO	BDH1521B	65 lbs	240V 15 kW 3 phase	GS
			Environmental Enclosure							GS
			Forced Air Propane Construction Heater			Mr. Heater	MH60FAV	17	1.4-3 #/hr Propane 110 V	GS
			225 Gallon Free-Standing Tank			Ace Roto Mold	FS0225-38	~85-140		GS
			Chemical Storage Tank Systems and Accessories			Poly Processing				GS
			Portable Evaporative Cooling Unit			Port-A-Cool	PAC2K363S/PAC2K36HZ	205	11.2 Amps 115 V	GS
			Metering Pump			ProMinent				GS
			Grouting system-stations,pumps,mixers...			Obermann	DP 50-4 ?	616	7.5 kW 208 V	GS
			Static Fluid Mixer			stamixco	Type "GX-LR"		NA	GS
			Flow Analyzer			NuFlo	MC-II	6	3.6 V Battery	GS
			Flow Totalizer			FloPro	9100		Battery	GS
			Two-Way Radios			Motorola	RDU220/RDV220	0.5	7.2 V Battery	GS
			Two-Way Radio System			Motorola	Mototrbo system			GS
			Two-Way Radios			Motorola	RDU-4160-D	0.6	7.2 V Battery	GS

REMEDIATION EQUIPMENT LIST -- 30% Design

300-296 Soil Remediation

Phase[1]	Long Lead? (Y/N)	Quantity for 324 install/use	Equipment Name	Equipment Abbreviation	If fabricated or modified, by who?	Brand	Model Number	Weight (lbf)	Power Requirements (as applicable)	Quality Classification

Notes:
1) Phase is representative of which activity the piece of equipment supports. R=REC, P= PoP, M=Mockup, E=Existing

Abbreviations/Shorthand:
na=not available
NA=not applicable
tbd=to be determined

Appendix B: ALARA Forms

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ALARA Design Review Worksheet

Task Description: 324 B-Cell Soil Removal 30% Design Document No.: ______

Design Package Identifier: ______

Project Start Date: February 2014 Project No.: 300-296

Location: 300/324/B-Cell Project: ______

Responsible Design Engineer	Signature	Date
Radiological Engineer Review	Signature	Date
Safety Representative or Industrial Hygienist Review	Signature	Date

ALARA DESIGN REVIEW

Design considered features to keep radiation exposures in radiological areas ALARA. Examples of features and controls to be considered are provided below:

- Confinement and ventilation systems to provide protection from airborne contamination. Features to prevent the release of radioactive material to the workplace atmosphere. Control of inhalation of radioactive materials by workers.
- Entry controls for radiological areas, commensurate with existing or potential hazards within the areas.
- Control devices for reducing occupational exposures (including shielding, hoods, gloveboxes, contaminants, interlocks, barricades, shielded cells, decontamination features, and remote operations.)

1. ALARA - Time	Yes	No	N/A
a. Provisions to allow quick removal of components located in radiation areas.	☒	☐	☐
b. Equipment specifications are written to require the minimum maintenance consistent with high reliability.	☒	☐	☐
c. Valves selected to minimize maintenance requirements and located to minimize exposure.	☐	☐	☒
d. Special tools and/or instruments to reduce exposures from the work or operation.	☒	☐	☐
e. Isolation valves to allow easy instrument removal.	☐	☐	☒
f. Easily read recording devices located in accessible areas with as low radiation zones.	☒	☐	☐
2. ALARA - Distance	**Yes**	**No**	**N/A**
a. Radioactive components located in appropriate radiation zones and as far from accessible locations as possible.	☐	☐	☒
b. Non-radioactive components located in low radiation zones.	☒	☐	☐
c. Penetrations in shielding located away from accessible locations.	☒	☐	☐
d. Runs of tubing/piping are routed through compatible radiation zones.	☐	☐	☒

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ALARA Design Review Worksheet

3. ALARA - Shielding	Yes	No	N/A
a. Shielding provided to meet exposure criteria in accessible locations.	☒	☐	☐
b. Penetrations shielded to meet exposure criteria in accessible locations.	☒	☐	☐
c. Provisions to allow ready installation/removal of required temporary shielding.	☒	☐	☐
MATERIALS	☐	☐	☐
a. Materials chosen to be compatible with the service environment.	☐	☐	☒
4. Source Term Buildup	**Yes**	**No**	**N/A**
a. Short runs of radioactive piping sloped down to reduce accumulation of material.	☐	☐	☒
b. Long runs of radioactive piping sloped down to minimize any crud buildup?	☐	☐	☒
c. Drains at low points in systems to flush out crud.	☐	☐	☒
d. Radioactive systems designed to minimize or eliminate dead legs, standpipes, or low points.	☐	☐	☒
e. Connections on radioactive piping made above the centerline to reduce crud traps.	☐	☐	☒
5. Contamination Control	**Yes**	**No**	**N/A**
a. Pumps and valves in radioactive service selected to minimize leakage.	☐	☐	☒
b. Provisions for collecting and treating radioactive leakage.	☐	☐	☒
c. Space provided for access control points (PPE collection points, step off pads, etc.)	☒	☐	☐
d. Potential sources of contamination located in suitable contamination areas.	☒	☐	☐
6. Decontamination	**Yes**	**No**	**N/A**
a. Provisions for flushing, draining, or cleaning radioactive equipment (remotely or in situ).	☒	☐	☐
b. Alternative decontamination methods if normal decontamination is not possible.	☐	☐	☒
c. Smooth surfaces (nonporous, free from cracks and sharp corners) in areas that might become contaminated. (Use of untreated wood, porous gaskets/rubber, etc. avoided).	☒	☐	☐
d. Decontaminable coatings in areas subject to contamination.	☒	☐	☐
7. Airborne Activity	**Yes**	**No**	**N/A**
a. Ventilation designed to flow from areas of low contamination to areas of high contamination.	☒	☐	☐
b. Sources of airborne contamination located in appropriate ventilation zones.	☒	☐	☐
c. Provisions to reduce localized airborne activity at its source (e.g., leakage, collection systems, component selection, local ventilation.	☒	☐	☐
d. Alternate methods of airborne activity control (e.g., wetting surfaces, underwater decontamination, facility equipment or other state-of-the-art equipment).	☒	☐	☐
e. HEPA filtration for air exhausted from radioactive contamination areas to the environment.	☒	☐	☐
f. Filters chosen and located to be inspected, tested, and changed easily.	☒	☐	☐
g. Exhaust point is located where exhausted air is not returned to the building.	☒	☐	☐

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ALARA Design Review Worksheet

8. Process Instrumentation	Yes	No	N/A
a. Clear and unambiguous readouts.	☒	☐	☐
b. Testable instruments and controls.	☒	☐	☐
c. Connections provided for all required tests.	☒	☐	☐
d. Instrumentation chosen to maximize service life and ease of calibration, and to minimize maintenance (including calibration) and crud accumulation.	☒	☐	☐
e. Readouts or control points for instruments and controllers located in low radiation zones.	☒	☐	☐
9. Other	**Yes**	**No**	**N/A**
a. List any other ALARA design features identified for consideration in this design. Enter NONE if no additional features were identified.	☒	☐	☐

This ALARA Design Review worksheet must be submitted to Document Control to be retained as a record. This record must receive a document number, as required in BSC-1-7.4, prior to submittal.

10. Comments:

This work is required to be performed remotely due to the radiation levels in the soil under B-Cell. The remote design of the equipment and the shielding provided by the REC cell structures provide the primary ALARA mechanisms for this project.

The primary dose expected during this project is from Airlock entries to perform waste load-outs and to perform maintenance on the REC cranes. There is not a good predictor for crane maintenance, and waste load-outs are a natural result of this maintenance. For planning purposes, it is assumed there will be one Airlock entry per month for crane repair during operation, and one Airlock entry for waste load-out after every third entry for repair. Dose estimates for Airlock entries have historically averaged 100 mrem per hour per person. Assuming a 6 month operating window, this will result in 6 repair entries and 2 waste load out entries. An additional waste load out entry will be required at the start of the project to remove the current debris load in the airlock. Total estimated for these entries is 3,450 person-mrem.

The majority of the operation of the remote equipment will be performed from a trailer located outside the 324 facility. There are provisions to operate equipment from the 324 galleries using cameras, crane pendants and manipulators while looking through the B-Cell window. Dose rate at the window is approximately 1 mrem/hour. Assuming that approximately 10% of the work will be performed this way, or about 100 hours, the total estimated dose would be 100 person-mrem.

There is a potential that the floors for C-Cell and A-Cell will need to be reinforced. This will need to be done from the ventilation space under the cells which is a high radiation, high contamination area. The manned entries to perform this work are estimated to take 20 hours if required. Each person will be limited to 250 mrem. This is a total of 5,000 person-mrem for the effort. Note, this is only if it is determined to be necessary.

A grout curtain will be installed under the B-Cell foundation. Part of that effort will be done by drilling through the floor in Room 18. There is a general area dose rate of 2 mrem/hour in room 18. The estimated time to perform the drilling and inject the grout is 80 person hours for a total dose of 160 person-mrem.

Contamination control processes such as strippable coatings will be used where possible.

Although not a dose control issue, contamination control when removing manipulators will also be addressed through the use of a work planning team. The donuts used in the past are no longer present and many of the boots on the manipulator arms are damaged. This will result in high contamination levels on the manipulators.

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ALARA
Design Review Screening Form

Task Description: Remote Soil Removal 30% Design Document No.: ________

Design Package Identifier: ________

Location: 324 B-Cell Project: 300-296

ALARA DESIGN REVIEW SCREENING FORM	SELECT APPLICABLE CRITERION
1. If the implementation, operation, maintenance and/or decommissioning of the design could result in one or more of the following: - Collective exposure in excess of 1,000 person-mrem - Individual exposure in excess of 400 mrem TEDE then **ALARA Design Worksheet IS REQUIRED.**	X
2. If the implementation, operation, maintenance and/or decommissioning of the design would not result in any of the conditions under screening criterion 1, then **ALARA Design Worksheet is NOT required.**	

Project Engineer: ________ Signature: ________ Date ________

Steve Bump
Radiological Engineer: Signature: ________ Date ________

NOTE: *This ALARA Design Review Screening Form must be submitted to Document Control to be retained as a record. This form must receive a document number, as required in BSC-1-7.4, prior to submittal.*

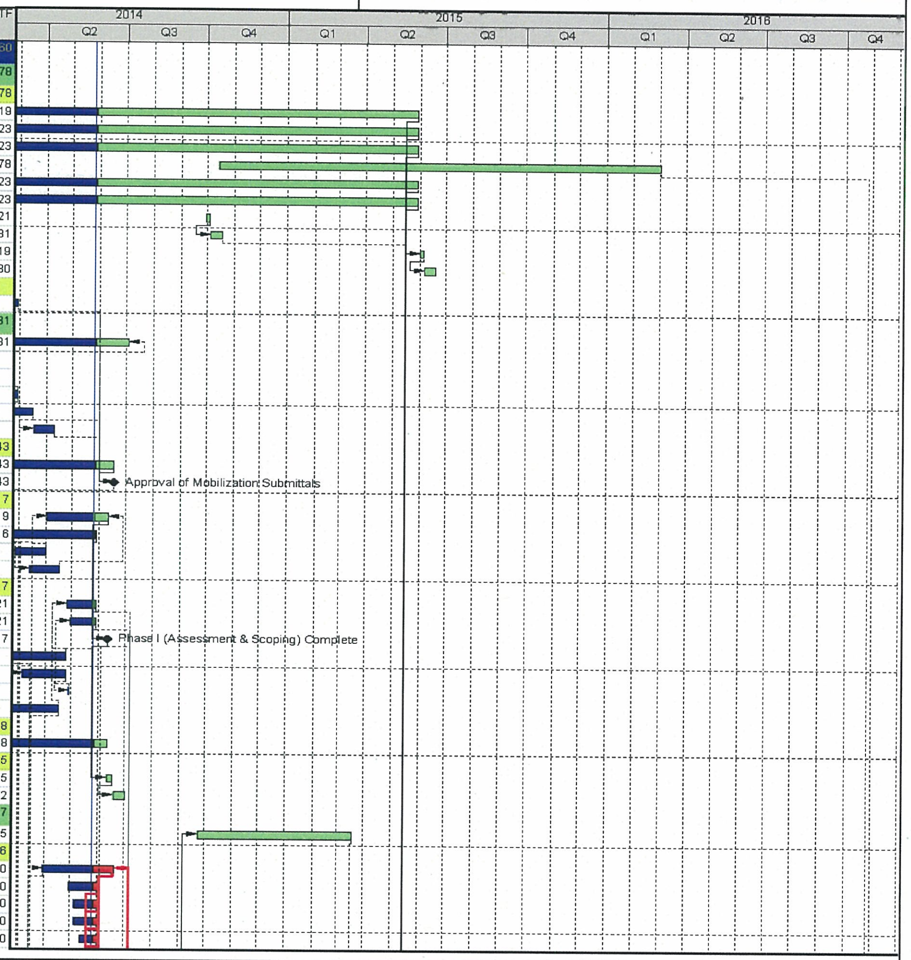
WCH-DE-015 (03/12/2012)

Appendix C: Project Schedule

KURION
Isolating Waste from the Environment

300-296 Soil Remediation Project | Special | 28-May-14 09:50

Activity ID	Activity Name	Physical % Complete	RD	Start	Finish	TF
W324-2 300-296 Soil Remediation Project			539	20-Jan-14 A	11-Oct-16	60
W324-2.1 Project Management			443	20-Jan-14 A	02-Mar-16	178
W324-2.1.1 Project Management			443	20-Jan-14 A	02-Mar-16	178
PM1000	Project Management	26.1%	255	20-Jan-14 A	29-May-15	19
PM1010	Training	26.1%	255	20-Jan-14 A	29-May-15	23
PM1020	Relocation/Travel/Subsistence	26.1%	255	20-Jan-14 A	29-May-15	23
PM1030	Infrastructure/Operation	0%	345	14-Oct-14*	02-Mar-16	178
PM1040	Safety Incentive	26.1%	255	20-Jan-14 A	29-May-15	23
PM1050	Base Fee - PM	26.1%	255	20-Jan-14 A	29-May-15	23
PM1062	Prepare & Submit Award Fee Assessment	0%	5	29-Sep-14*	03-Oct-14	21
PM1063	WCH Review & Approval - Award Fee Assessment	0%	14	04-Oct-14	17-Oct-14*	31
PM1070	Prepare & Submit Award Fee Assessment	0%	5	01-Jun-15*	05-Jun-15	19
PM6090	WCH Review & Approval - Award Fee Assessment	0%	14	06-Jun-15	19-Jun-15*	30
W324-2.1.2 Bonding/Letter of Credit			0	29-Jan-14 A	28-Feb-1...	
PM1100	Bonding/LOC FY (Base Phases 1-2) 2014 - 2015	100%	0	29-Jan-14 A	28-Feb-1...	
W324-2.2 Phase I: PMP & Assessment			28	20-Jan-14 A	03-Jul-14	631
1PH-00200	Initial Training	55%	28	28-Jan-14 A	03-Jul-14	631
1PH-00300	Technical Workshop with WCH	100%	0	29-Jan-14 A	30-Jan-14 A	
MS-00	Notice To Proceed	100%	0	A		
1PH-00100	Mobilize Personnel	100%	0	20-Jan-14 A	27-Feb-1...	
1PH-00310	Prepare Project Managememt Plan	100%	0	04-Feb-14 A	17-Mar-1...	
1PH-00320	WCH Review & Approval - PMP	100%	0	18-Mar-14 A	10-Apr-14 A	
W324-2.2.1 Mobilization Submittals			16	28-Jan-14 A	17-Jun-14	643
1PH-01000	Mobilization Submittals and Approval	99%	16	28-Jan-14 A	17-Jun-14	643
MS-01	Approval of Mobilization Submittals	0%	0		17-Jun-14	643
W324-2.2.2 Assessment of 324 Building			11	18-Feb-14 A	10-Jun-14	7
1PH-02199	WCH Review & Approval - Assessment Reports	90%	16	02-Apr-14 A	10-Jun-14	9
1PH-02100	Assessment of 324 Building	98%	2	18-Feb-14 A	28-May-14	16
1PH-02110	Prepare Facility Assessment Report	100%	0	25-Feb-14 A	01-Apr-14 A	
1PH-02130	Prepare Facility Monoliths End State & Transport Ass...	100%	0	13-Mar-14 A	17-Apr-14 A	
W324-2.2.3 Basis of Design and Conceptual Plan			11	12-Feb-14 A	10-Jun-14	7
1PH-03101	WCH Review & Approval - Soil Remediation Design ...	90%	4	25-Apr-14 A	29-May-14	21
2PH-00520	WCH Review & Approve Conceptual Design	90%	4	29-Apr-14 A	29-May-14	21
MS-02	Phase I (Assessment & Scoping) Complete	0%	0		10-Jun-14	7
1PH-03100	Prepare Design Basis	100%	0	12-Feb-14 A	24-Apr-14 A	
2PH-00500	Prepare Conceptual Design	100%	0	07-Mar-14 A	24-Apr-14 A	
2PH-00510	Conceptual Design Presentation	100%	0	28-Apr-14 A	28-Apr-14 A	
1PH-03110	Prepare Mockup & Testing Plan	100%	0	19-Feb-14 A	17-Apr-14 A	
W324-2.2.4 Base Fee			11	07-Feb-14 A	10-Jun-14	648
1PH-04100	Base Fee - Phase I	95%	11	07-Feb-14 A	10-Jun-14	648
W324-2.2.5 Award Fee			15	10-Jun-14	01-Jul-14	15
1PH-05100	Prepare & Submit Award Fee Assessment - Phase I	0%	5	10-Jun-14	17-Jun-14	15
1PH-05101	WCH Review & Approval - Award Fee Assessment	0%	14	18-Jun-14	01-Jul-14*	22
W324-2.3 Phase II: Engineering Design & Mockup			249	20-Jan-14 A	20-May-15	47
WHC-WP/TP	WCH Develop/Approve Work Package & Tech Proce...	0%	96	23-Sep-14	18-Mar-15	55
W324-2.3.1 30% Design			70	31-Mar-14 A	03-Sep-14	106
2PH-01000	Develop 30% Design	70%	18	31-Mar-14 A	19-Jun-14	0
K301000	Develop Interface Document	25%	7	30-Apr-14 A	04-Jun-14	0
K301010	Develop Design Input Document	15%	7	06-May-14 A	04-Jun-14	0
K301020	Develop Major Design Issues List	50%	7	06-May-14 A	04-Jun-14	0
K302000	Develop/Assemble Hazards Analysis Report	30%	7	12-May-14 A	04-Jun-14	0



Actual Work | Critical Remaining ... | Remaining Work | Milestone

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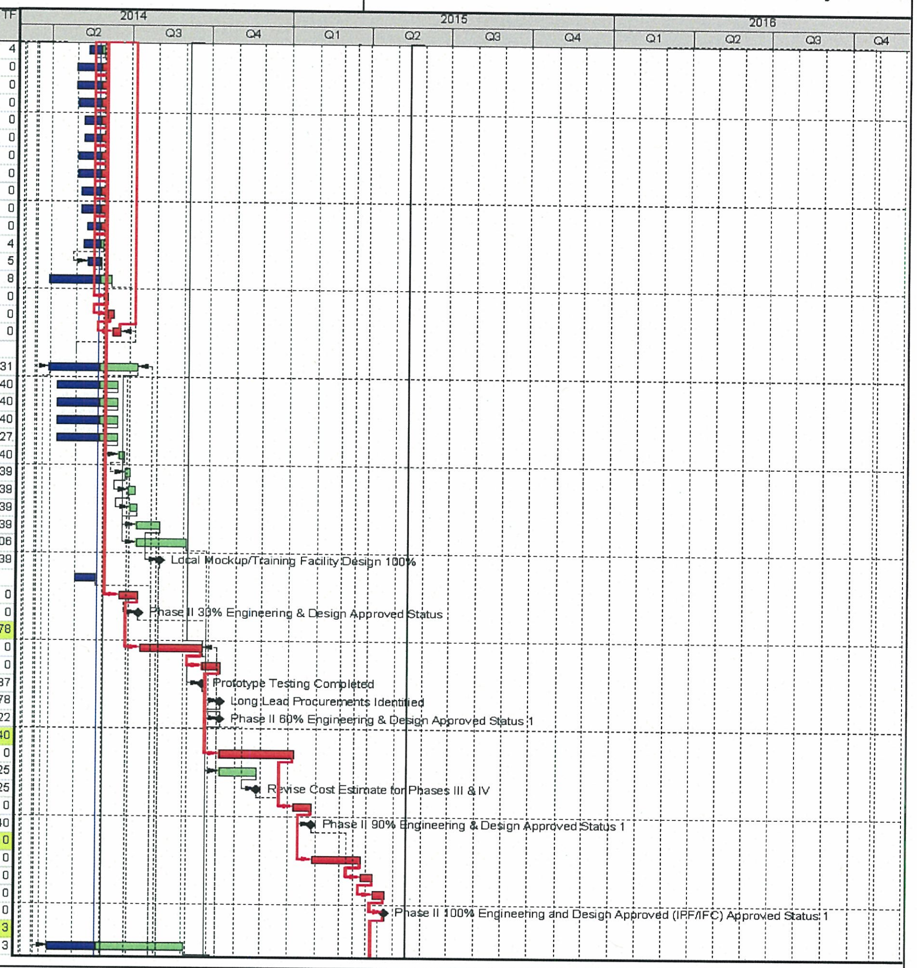
TASK filter: All Activities

300-296 Soil Remediation Project | Special | 28-May-14 09:50

Activity ID	Activity Name	Physical % Complete	RD	Start	Finish	TF
K302020	Develop/Assemble Radiological Exposures Report	80%	3	14-May-14 A	28-May-14	4
K303000	Develop REA(s) Model(s)	90%	7	30-Apr-14 A	04-Jun-14	0
K303010	Develop Transfer Barrier Model	75%	7	30-Apr-14 A	04-Jun-14	0
K304000	Develop Civil Drawings	80%	7	02-May-14 A	04-Jun-14	0
K304010	Develop Arrangement Drawings	35%	7	09-May-14 A	04-Jun-14	0
K304020	Develop Mechanical Drawings	15%	7	09-May-14 A	04-Jun-14	0
K304030	Develop Electrical Drawings	15%	7	02-May-14 A	04-Jun-14	0
K305000	Develop Civil Calculations	15%	7	02-May-14 A	04-Jun-14	0
K305020	Develop Mechanical Calculations	10%	7	08-May-14 A	04-Jun-14	0
K305030	Develop Electrical Calculations	10%	7	08-May-14 A	04-Jun-14	0
K306010	Develop Procurement Specification List	50%	7	12-May-14 A	04-Jun-14	0
K308000	Develop and Assemble Document List	20%	3	09-May-14 A	29-May-14	4
K308010	Review Document List	20%	2	14-May-14 A	28-May-14	5
K309000	Prepare & Release New Equipment Design Section	35%	10	31-Mar-14 A	09-Jun-14	8
K308500	Compile Review Draft	0%	1	05-Jun-14	05-Jun-14	0
K308520	Internal Project (AFS) Review	0%	5	06-Jun-14	12-Jun-14	0
K308550	Incorporate Review Comments	0%	8	10-Jun-14	19-Jun-14	0
2PH-01005	MSM Vendor Inspection	100%	0	30-Apr-14 A	01-May-1...	
2PH-01500	Mockup Facility Design	30%	30	31-Mar-14 A	08-Jul-14	31
KM1000	Develop Mockup Drawings	30%	16	09-Apr-14 A	17-Jun-14	40
KM2000	Develop Mockup Master Equipment List	30%	16	09-Apr-14 A	17-Jun-14	40
KM3000	Develop Calculations	30%	16	09-Apr-14 A	17-Jun-14	40
KM4000	Develop Specifications	30%	16	09-Apr-14 A	17-Jun-14	27
KM1010	Internal Kurion Review Mockup	0%	5	18-Jun-14	24-Jun-14	40
KM7000	Internal Project (AFS) Review	0%	4	26-Jun-14*	01-Jul-14	39
KM7010	Incorporate Comments	0%	5	30-Jun-14	07-Jul-14	39
KM7020	Assemble Design Package	0%	5	01-Jul-14	08-Jul-14	39
2PH-01505	WCH Mockup Design Approval	0%	20	09-Jul-14	05-Aug-14	39
2PH-01510	Develop Mockup Equipment Specs	0%	40	09-Jul-14	03-Sep-14	106
MS-04	Local Mockup/Training Facility Design 100%	0%	0		05-Aug-14	39
KM6000	Design Input for Mockup Facility Permitting	100%	0	01-May-14 A	23-May-1...	
2PH-01700	WCH 30% Design Review/Approval	0%	15	20-Jun-14	11-Jul-14	0
MS-03	Phase II 30% Engineering & Design Approved Status	0%	0		11-Jul-14*	0
W324-2.3.2	**60% Design**		65	14-Jul-14	13-Oct-14	78
2PH-02000	Develop 60% Design	0%	50	14-Jul-14	22-Sep-14	0
2PH-02700	WCH 60% Design Review/Approval	0%	15	23-Sep-14	13-Oct-14	0
MS-07	Prototype Testing Completed	0%	0		22-Sep-14	37
MS-06	Long Lead Procurements Identified	0%	0		13-Oct-14	78
MS-05	Phase II 60% Engineering & Design Approved Status 1	0%	0		13-Oct-14	22
W324-2.3.3	**90% Design**		70	14-Oct-14	27-Jan-15	40
2PH-03000	Develop 90% Design	0%	55	14-Oct-14	06-Jan-15	0
2PH-03010	Prepare/Revise Cost Estimate Phases III & IV	0%	30	14-Oct-14	24-Nov-14	25
MS-09	Revise Cost Estimate for Phases III & IV	0%	0		24-Nov-14	25
2PH-03700	WCH 90% Design Review/Approval	0%	15	07-Jan-15	27-Jan-15	0
MS-08	Phase II 90% Engineering & Design Approved Status 1	0%	0		27-Jan-15	40
W324-2.3.4	**IFC/IFF Design**		60	28-Jan-15	21-Apr-15	0
2PH-04200	Prepare IFC/IFF Design Package	0%	40	28-Jan-15	24-Mar-15	0
2PH-04300	WCH IFC Design Review/Approval	0%	10	25-Mar-15	07-Apr-15	0
2PH-04310	Incorporate Comments & Issue IFC	0%	10	08-Apr-15	21-Apr-15	0
MS-11	Phase II 100% Engineering and Design Approved (IF...	0%	0		21-Apr-15*	0
W324-2.3.5	**Proof of Principle Testing**		80	19-Mar-14 A	17-Sep-14	3
2PH-05100	Procure Proof of Principle Equipment	80%	70	03-Apr-14 A	03-Sep-14	3



Actual Work | Critical Remaining ... | Remaining Work | Milestone

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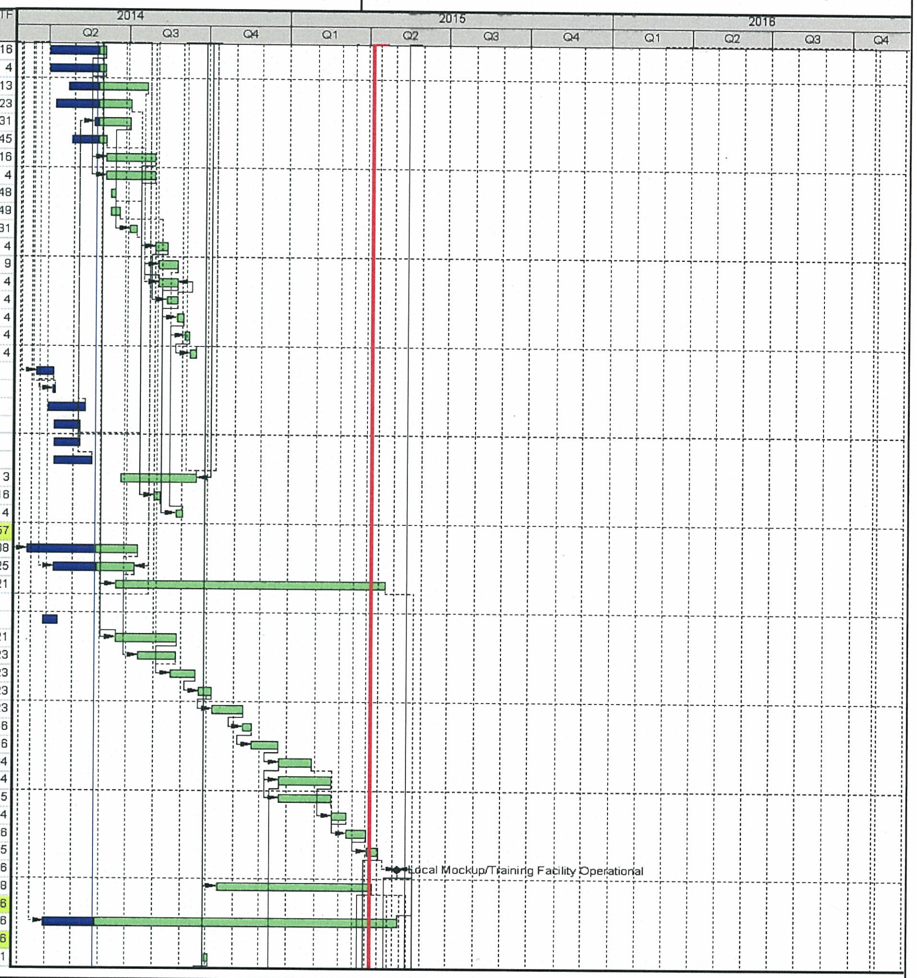
TASK filter: All Activities

300-296 Soil Remediation Project | Special | 28-May-14 09:50

Activity ID	Activity Name	Physical % Complete	RD	Start	Finish	TF
K1000	Develop PoP Facility Design - Arm Wall	95%	7	03-Apr-14 A	04-Jun-14	16
K1010	Develop PoP Facility Design - Saw Floor	95%	7	03-Apr-14 A	04-Jun-14	4
K2060	Procure PoP Saw (Long Lead)	75%	40	24-Apr-14 A	22-Jul-14	13
K2070	Procure PoP Soil Sacks	75%	28	09-Apr-14 A	03-Jul-14	23
K4000	Modify PoP Tractor (Inc Design)	10%	27	23-May-14 A	02-Jul-14	31
K1040	Develop PoP Equipment Design -Saw Remote	10%	8	28-Apr-14 A	05-Jun-14	45
K3010	Fabricate PoP Arm Wall	0%	40	05-Jun-14	31-Jul-14	16
K3020	Fabricate PoP Saw Floor	0%	40	05-Jun-14	31-Jul-14	4
K2080	Procure Consumables for Arm Test	0%	5	10-Jun-14*	16-Jun-14	48
K2090	Procure Consummables for Grout Test	0%	8	11-Jun-14*	20-Jun-14	49
K4010	Ship PoP Modified Tractor to WA	0%	5	03-Jul-14	10-Jul-14	31
K1020	Develop PoP Facility Design - Bag Stand	0%	9	01-Aug-14	13-Aug-14	4
K1050	Develop PoP Equipment Design -Saw Ventilitation	0%	15	05-Aug-14	25-Aug-14	9
K4020	Modify PoP Saw	0%	15	05-Aug-14	25-Aug-14	4
K3000	Fabricate PoP Bag Stand(s)	0%	8	14-Aug-14	25-Aug-14	4
K4030	Ship Modified PoP Saw to Wa	0%	5	26-Aug-14	02-Sep-14	4
K5020	Conduct PoP Saw Test	0%	5	03-Sep-14	09-Sep-14	4
K5030	Prepare Test Reports	0%	5	10-Sep-14	16-Sep-14	4
A1902	Prepare PoP Equipment Submittal	100%	0	19-Mar-14 A	07-Apr-14 A	
A1912	WCH Review & Approval - PoP Equipment	100%	0	08-Apr-14 A	10-Apr-14 A	
K1030	Develop PoP Equipment Design - Tractor	100%	0	03-Apr-14 A	13-May-1...	
K2040	Procure Procure PoP Quick Couplers	100%	0	09-Apr-14 A	09-May-1...	
K2050	Procure PoP Tractor Components (Buckets Hammer ...	100%	0	09-Apr-14 A	09-May-1...	
K2030	Procure PoP Arm/Tractor	100%	0	09-Apr-14 A	21-May-1...	
2PH-05110	Proof of Principle Testing	0%	60	24-Jun-14	17-Sep-14	3
K5000	Conduct PoP Arm Test	0%	5	01-Aug-14	07-Aug-14	16
K5010	Conduct PoP Grout Test	0%	5	26-Aug-14	02-Sep-14	4
W324-2.3.6	**Local Mockup Facility Construction**		239	20-Jan-14 A	06-May-15	57
2PH-02505	WCH Obtain NEPA/NHPA Approval	50%	49	10-Mar-14 A	13-Jul-14	38
A1135	Acquire Facility Permits	35%	24	09-Apr-14 A	08-Jul-14	25
A1139	Mockup Facility Construction Management Support	0%	168	18-Jun-14	21-Apr-15	21
2PH-02500	Secure Mockup Facility Location	100%	0	20-Jan-14 A	19-Feb-1...	
2PH-02501	Alternate Mockup Location Study	100%	0	28-Mar-14 A	14-Apr-14 A	
A1240	Procurement of Materials (based on 90% Design)	0%	40	18-Jun-14	27-Aug-14	21
A1140	Site Prep (Civil/Install Trailers & Utilities)	0%	25	14-Jul-14*	26-Aug-14	23
A1160	B-Cell and Perimeter Footings	0%	17	20-Aug-14	18-Sep-14	23
A1220	Slab on Grade	0%	9	22-Sep-14	06-Oct-14	23
A1180	Perimeter Walls/B-Cell Walls	0%	20	07-Oct-14	10-Nov-14	23
A1230	Backfill Perimeter Walls	0%	11	11-Nov-14	21-Nov-14	46
A1260	Structural Steel Erection/Exterior LTWT Steel/Metal S...	0%	31	21-Nov-14	21-Dec-14	46
A1280	Interior Walls	0%	20	22-Dec-14	28-Jan-15	24
A1300	Electrical/Mechanical	0%	32	22-Dec-14	19-Feb-15	24
A1310	Erect Operations Center	0%	32	22-Dec-14	19-Feb-15	35
A1320	Install Cranes (A&D)	0%	18	20-Feb-15	09-Mar-15	44
A1322	Mockup Construction Acceptance Punchlist	0%	13	09-Mar-15	31-Mar-15	26
A1324	WCH Review & Approval - Construction Acceptance	0%	14	01-Apr-15	14-Apr-15	45
MS-10	Local Mockup/Training Facility Operational	0%	0		06-May-15	16
2PH-01520	Procure Mockup Equipment	0%	120	14-Oct-14	07-Apr-15	78
W324-2.3.7	**Base Fee**		239	31-Mar-14 A	06-May-15	16
2PH-07100	Base Fee - Phase II	0%	239	31-Mar-14 A	06-May-15	16
W324-2.3.8	**Award Fee**		162	29-Sep-14	20-May-15	16
2PH-08100	Prepare & Submit Award Fee Assessment - Phase II	0%	5	29-Sep-14*	03-Oct-14	21



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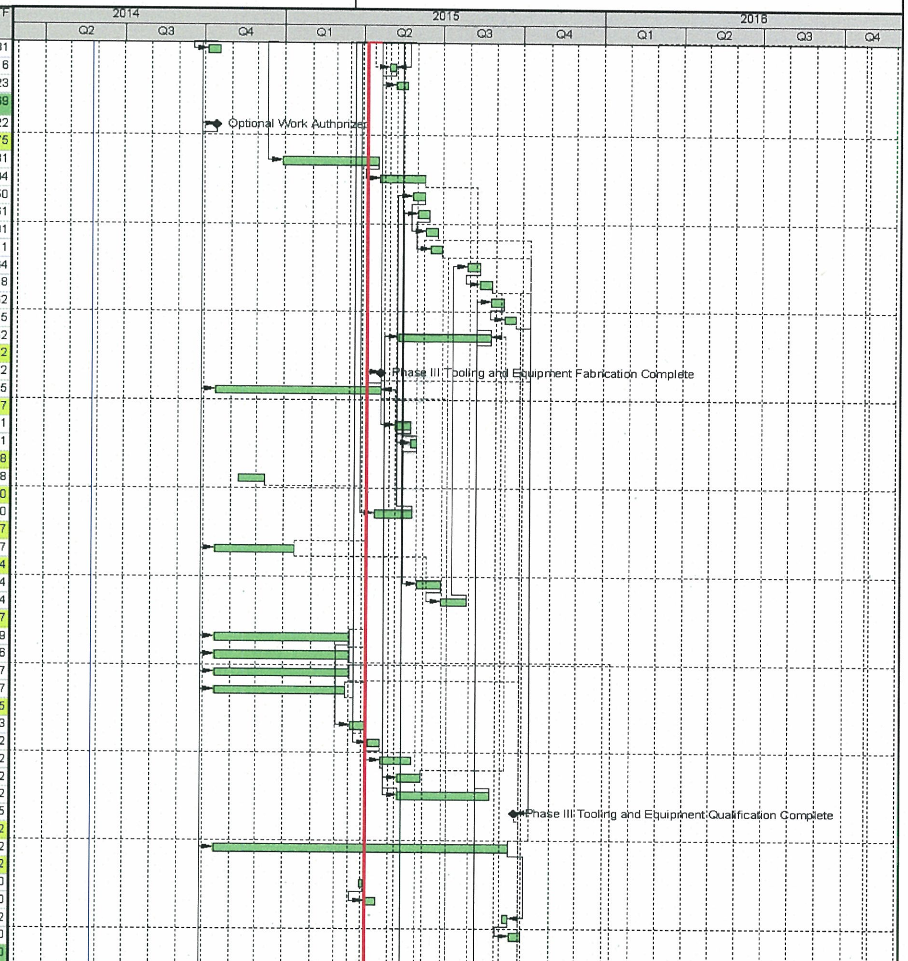
Activity ID	Activity Name	Physical % Complete	RD	Start	Finish	TF
2PH-08101	WCH Review & Approval - Award Fee Assessment	0%	14	04-Oct-14	17-Oct-14*	31
2PH-08120	Prepare & Submit Award Fee Assessment - Phase II	0%	5	30-Apr-15*	06-May-15	16
2PH-08121	WCH Review & Approval - Award Fee Assessment	0%	14	07-May-15	20-May-15*	23
W324-2.4	**Phase III: Procurement, Fabrication, Qualific...**		243	14-Oct-14	30-Sep-15	69
MS-12	Optional Work Authorized	0%	0	14-Oct-14		22
W324-2.4.1	**Local Mock-up Facility Operations**		188	29-Dec-14	22-Sep-15	75
A1400	Prepare Mockup & Testing Procedures	0%	78	29-Dec-14	16-Apr-15	131
A1420	Perform Mockup & Testing Training for Facility Upgra...	0%	30	20-Apr-15	10-Jun-15	104
A1522	Prepare REC Shoring FAT Submittal	0%	8	27-May-15	10-Jun-15	50
A1890	Prepare B-Cell Crane FAT Submittal	0%	8	02-Jun-15	15-Jun-15	81
A1524	WCH Review & Approval - REC Shoring FAT	0%	14	11-Jun-15	24-Jun-15	91
A1892	WCH Review & Approval - Crane FAT	0%	14	16-Jun-15	29-Jun-15	111
A1542	Prepare Facility Upgrade Equip FAT Submittal	0%	8	29-Jul-15	12-Aug-15	64
A1544	WCH Review & Approval - Facility Upgrade Equip FAT	0%	14	12-Aug-15	26-Aug-15	118
A1622	Prepare Remote Equipment FAT Submittal	0%	8	25-Aug-15	08-Sep-15	62
A1624	WCH Review & Approval - Remote Equip FAT	0%	14	09-Sep-15	22-Sep-15	115
A1440	Conduct Performance Testing/WP Input	0%	59	11-May-15	24-Aug-15	62
W324-2.4.2	**B-Cell Crane Replacement Procurement/Fab/Delivery**		130	14-Oct-14	21-Apr-15	182
MS-13	Phase III Tooling and Equipment Fabrication Complete	0%	0		21-Apr-15	182
3PH-02100	Procure / Fab B-Cell Crane for 324	0%	130	14-Oct-14	21-Apr-15	125
W324-2.4.3	**B-Cell Crane Replacement Testing/Qualification/Train...**		17	07-May-15	01-Jun-15	77
A1875	Install B-Cell Replacement Crane	0%	19	07-May-15	25-May-15	111
A1480	Test & Qualify Crane Equipment	0%	4	26-May-15	01-Jun-15	81
W324-2.4.4	**REC Structural Stabilization Procurement/Fab/Delivery**		16	10-Nov-14	09-Dec-14	118
A1500	Procure/Deliver Building Stabilization Equipment	0%	16	10-Nov-14*	09-Dec-14	118
W324-2.4.5	**REC Shoring Testing/Qualification/Training**		24	14-Apr-15	27-May-15	50
A1520	Test & Qualify Soil Shoring Equipment	0%	24	14-Apr-15	27-May-15	50
W324-2.4.6	**Facility Upgrade Equipment Procurement/Fab/Delivery**		60	14-Oct-14	13-Jan-15	197
3PH-06000	Procure/Fab Facility Upgrade Equipment & Materials	0%	60	14-Oct-14	13-Jan-15	197
W324-2.4.7	**Facility Upgrade Equipment Testing/Qualification/Trai...**		32	02-Jun-15	29-Jul-15	64
A1340	Install Excavator Arm and Tooling	0%	15	02-Jun-15	29-Jun-15	64
A1540	Test & Qualify Facility Upgrade Equip/Matls	0%	17	29-Jun-15	29-Jul-15	64
W324-2.4.8	**Remote Equipment Procurement/Fab/Delivery**		105	14-Oct-14	17-Mar-15	207
A1562	Procure Remote Viewing Equipment	0%	105	14-Oct-14	17-Mar-15	79
A1564	Procure Waste Grouting and Backfill Equip	0%	105	14-Oct-14	17-Mar-15	116
A1566	Procure Remote Equipment for 324 Bldg	0%	105	14-Oct-14	17-Mar-15	207
A1560	Procure MSM, Brock & Remote Handling Equipment	0%	80	14-Oct-14	12-Mar-15	77
W324-2.4.9	**Remote Equipment Testing/Qualification/Testing**		132	18-Mar-15	22-Sep-15	75
A1360	Install Lighting & Camera	0%	11	18-Mar-15	08-Apr-15	63
A1580	Test & Qualify Remote Equipment	0%	7	08-Apr-15	20-Apr-15	62
A1600	Test & Qualify Remote Viewing Equipment	0%	19	22-Apr-15	28-May-15	62
A1380	Install Transfer Barrier	0%	15	11-May-15	08-Jun-15	82
A1620	Test & Qualify Soil Grouting & Backfill Equipment	0%	59	11-May-15	24-Aug-15	62
MS-14	Phase III Tooling and Equipment Qualification Complete	0%	0		22-Sep-15	75
W324-2.4.10	**Base Fee**		233	14-Oct-14	16-Sep-15	22
3PH-10100	Base Fee - Phase III	0%	233	14-Oct-14	16-Sep-15	22
W324-2.4.11	**Award Fee**		130	30-Mar-15	30-Sep-15	22
3PH-11100	Prepare & Submit Award Fee Assessment - Phase III	0%	5	30-Mar-15*	03-Apr-15	20
3PH-11101	WCH Review & Approval - Award Fee Assessment	0%	14	04-Apr-15	17-Apr-15*	30
3PH-11110	Prepare & Submit Award Fee Assessment - Phase III	0%	5	10-Sep-15	16-Sep-15	22
3PH-11111	WCH Review & Approval - Award Fee Assessment	0%	14	17-Sep-15	30-Sep-15*	30
W324-2.5	**Phase IV: Installation, Operation, and Demob...**		501	14-Oct-14	11-Oct-16	60



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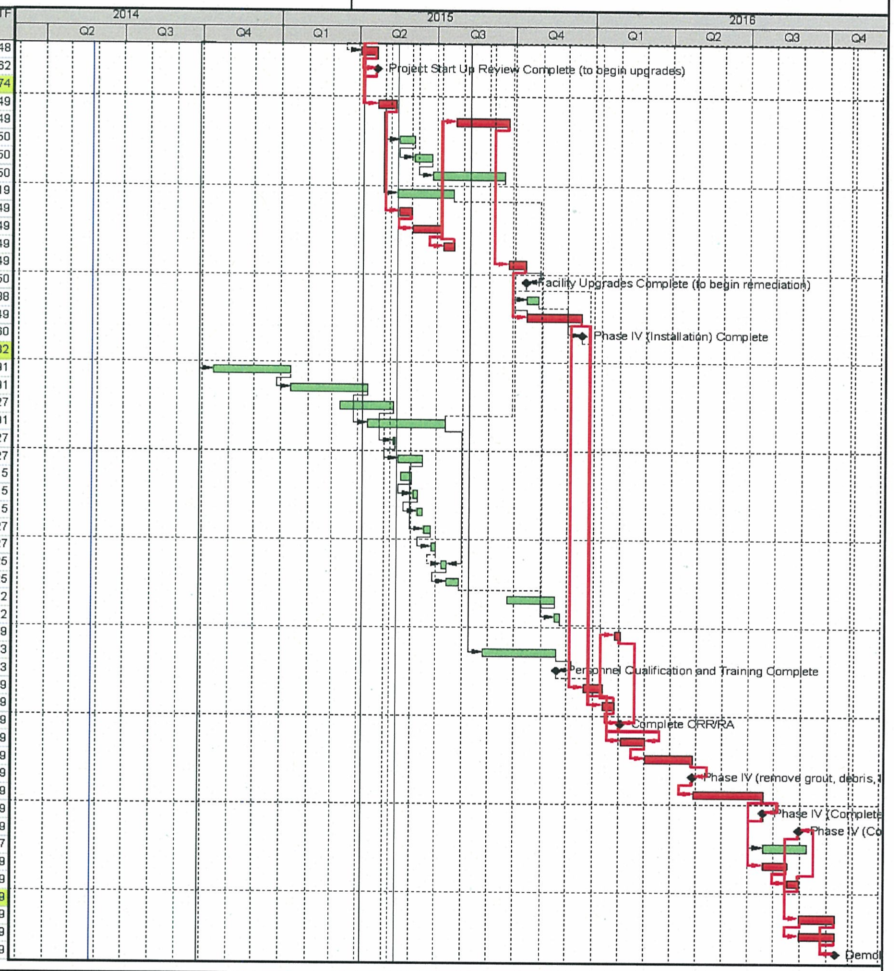
Activity ID	Activity Name	Physical % Complete	RD	Start	Finish	TF
4PH-00100	Project Startup Review (RA)	0%	12	01-Apr-15*	21-Apr-15	48
MS-15	Project Start Up Review Complete (to begin upgrades)	0%	0		21-Apr-15	62
W324-2.5.1	**Installation & Facility Upgrades**		167	22-Apr-15	17-Dec-15	74
A1640	Installation & Upgrades Mobilization	0%	14	22-Apr-15	14-May-15	49
A1660	Install B-Cell Replacement Crane	0%	35	22-Jul-15	22-Sep-15	49
A1670	Install Interior Grout Curtain	0%	10	18-May-15	03-Jun-15	50
A1675	Install Outside Grout Curtain	0%	12	04-Jun-15	24-Jun-15	50
A1680	Install REC Structural Stabilization (Foundation)	0%	47	25-Jun-15	17-Sep-15	50
4PH-01000	Construct New Airlock	0%	45	15-May-15	20-Jul-15	119
A1650	Airlock Charactization/Assessment	0%	8	18-May-15	01-Jun-15	49
A1652	Cleanup Debris & Ship to ERDF	0%	20	02-Jun-15	07-Jul-15	49
A1654	Airlock Dose Reduction	0%	8	08-Jul-15	21-Jul-15	49
A1700	Facility Upgrades	0%	11	23-Sep-15	12-Oct-15	49
MS-16	Facility Upgrades Complete (to begin remediation)	0%	0		12-Oct-15	50
A1725	Mobilize Control Center Trailer	0%	8	14-Oct-15	27-Oct-15	88
A1720	Remote Equipment Installation	0%	36	14-Oct-15	17-Dec-15	49
MS-18	Phase IV (Installation) Complete	0%	0		17-Dec-15	60
W324-2.5.2	**Operations**		478	14-Oct-14	08-Sep-16	82
REM11	WCH - Safety Basis Modification	0%	90	14-Oct-14	11-Jan-15	191
REM25	WCH - DOE Approve Safety Basis	0%	90	12-Jan-15	11-Apr-15	191
REM24	WCH - Draft Plan of Action (POA) - Remediation	0%	35	11-Mar-15*	11-May-15	127
REM018	WCH - Implement Safety Basis	0%	90	12-Apr-15	10-Jul-15	191
REM102	WCH - Internal Review - POA	0%	3	12-May-15	14-May-15	127
REM104	WCH - Finalize/Submit Draft POA to DOE, RA/ORR ...	0%	16	18-May-15	15-Jun-15	127
REM101	WCH - Draft Project Startup Review (PSR) - Remedi...	0%	7	20-May-15*	02-Jun-15	315
REM27	WCH - Review PSR Plan	0%	3	03-Jun-15	08-Jun-15	315
REM28	WCH - Finalize/Approve PSR Plan	0%	4	09-Jun-15	15-Jun-15	315
REM105	WCH - DOE Review POA	0%	6	16-Jun-15	24-Jun-15	127
REM106	WCH - Revise POA in Prep for RA/ORR	0%	3	25-Jun-15	30-Jun-15	127
REM107	WCH - DOE Approval Revised POA	0%	3	07-Jul-15	13-Jul-15	125
REM114	WCH - Finalize Project Startup Review (PSR) Checklist	0%	9	13-Jul-15	27-Jul-15	125
REM103	WCH - Complete Work Packages Required for RA/O...	0%	32	22-Sep-15*	16-Nov-15	62
REM115	WCH - Complete PSR Checklist Activities	0%	4	17-Nov-15	23-Nov-15	62
REM117	WCH - Prep/Issue RA/ORR Report - Remediation	0%	4	27-Jan-16	02-Feb-16	49
A1430	Operations Training at Mockup	0%	50	25-Aug-15	19-Nov-15	63
MS-17	Personnel Qualification and Training Complete	0%	0		19-Nov-15	93
A1760	Operations Mobilization	0%	11	21-Dec-15	12-Jan-16	49
A1740	ORR/RA	0%	8	13-Jan-16	26-Jan-16	49
MS-19	Complete ORR/RA	0%	0		02-Feb-16	49
A1780	Removal of B-Cell Grout and Debris	0%	16	03-Feb-16	02-Mar-16	49
A1800	Remove B-Cell Liner and Floor	0%	32	03-Mar-16	27-Apr-16	49
MS-20	Phase IV (remove grout, debris, liner and floor)	0%	0		27-Apr-16	49
A1840	Remove Primary Zone Soil/Cobble	0%	44	28-Apr-16	18-Jul-16	49
MS-21	Phase IV (Complete Primary Removal Zone Remedia...	0%	0		18-Jul-16	49
MS-22	Phase IV (Complete Complete Rad Survey & Sampling)	0%	0		29-Aug-16	49
A1860	Remove Secondary Zone Soil/Cobble (Optional)	0%	30	19-Jul-16	08-Sep-16	67
A1850	Confirmatory Sampling	0%	16	19-Jul-16	15-Aug-16	49
A1880	Place Waste Site Backfill	0%	8	16-Aug-16	29-Aug-16	49
W324-2.5.3	**Demobilization**		24	30-Aug-16	11-Oct-16	49
4PH-03100	Demobilization	0%	24	30-Aug-16	11-Oct-16	49
4PH-03110	Project Closeout	0%	24	30-Aug-16	11-Oct-16	49
MS-23	Demobilization/Closeout Complete	0%	0		11-Oct-16*	49



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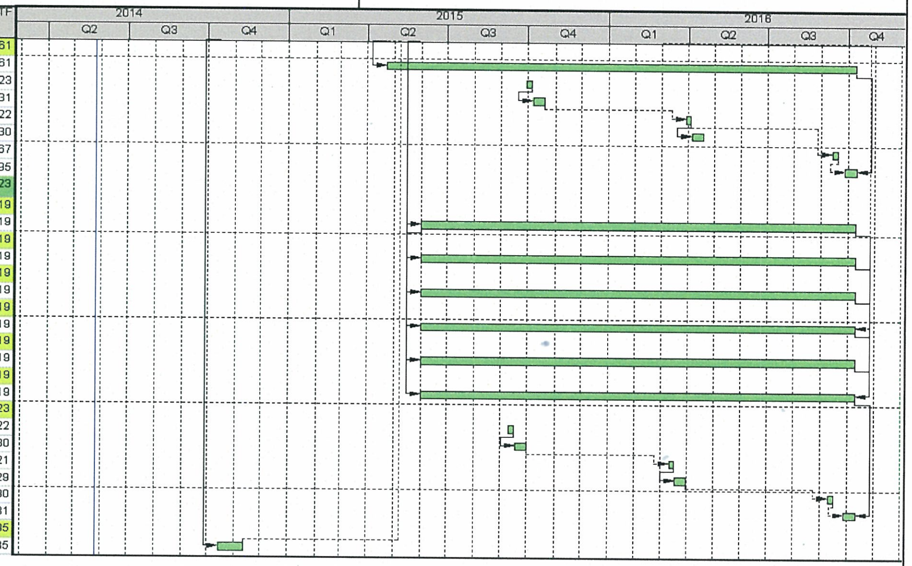
Activity ID	Activity Name	Physical % Complete	RD	Start	Finish	TF
W324-2.5.4	**Phase IV Fee**		370	22-Apr-15	11-Oct-16	61
4PH-04100	Base Fee - Phase IV	0%	370	22-Apr-15	10-Oct-16	61
4PH-04200	Prepare & Submit Award Fee Assessment - Phase IV	0%	5	29-Sep-15*	05-Oct-15	23
4PH-04201	WCH Review & Approval - Award Fee Assessment	0%	14	06-Oct-15	19-Oct-15*	31
4PH-04210	Prepare & Submit Award Fee Assessment - Phase IV	0%	5	29-Mar-16*	04-Apr-16	22
4PH-04211	WCH Review & Approval - Award Fee Assessment	0%	14	05-Apr-16	18-Apr-16*	30
4PH-04220	Prepare & Submit Award Fee Assessment - Phase IV	0%	5	13-Sep-16*	19-Sep-16	67
4PH-04221	WCH Review & Approval - Award Fee Assessment	0%	14	27-Sep-16	11-Oct-16	95
W324-2.6	**Project Management (PM)**		500	14-Oct-14	11-Oct-16	23
W324-2.6.1	**Project Management**		274	01-Jun-15	10-Oct-16	19
PM6000	Project Management	0%	274	01-Jun-15	10-Oct-16	19
W324-2.6.2	**Training - 2**		274	01-Jun-15	10-Oct-16	19
PM6010	Training	0%	274	01-Jun-15	10-Oct-16	19
W324-2.6.3	**Relocation/Travel/Substance**		274	01-Jun-15	10-Oct-16	19
PM6020	Relocation/Travel/Subsistence	0%	274	01-Jun-15	10-Oct-16	19
W324-2.6.4	**Infrastructure/Operations**		274	01-Jun-15	10-Oct-16	19
PM6030	Infrastructure/Operation	0%	274	01-Jun-15	10-Oct-16	19
W324-2.6.5	**Safety Incentive**		274	01-Jun-15	10-Oct-16	19
PM6040	Safety Incentive	0%	274	01-Jun-15	10-Oct-16	19
W324-2.6.6	**Base Fee**		274	01-Jun-15	10-Oct-16	19
PM6050	Base Fee - PM	0%	274	01-Jun-15	10-Oct-16	19
W324-2.6.7	**Award Fee**		272	10-Sep-15	11-Oct-16	23
PM6060	Prepare & Submit Award Fee Assessment - PM	0%	5	10-Sep-15*	16-Sep-15	22
PM6061	WCH Review & Approval - Award Fee Assessment	0%	14	17-Sep-15	30-Sep-15*	30
PM6070	Prepare & Submit Award Fee Assessment - PM	0%	5	11-Mar-16*	17-Mar-16	21
PM6071	WCH Review & Approval - Award Fee Assessment	0%	14	18-Mar-16	31-Mar-16*	29
PM6110	Prepare & Submit Award Fee Assessment - PM	0%	5	09-Sep-16*	15-Sep-16	30
PM6111	WCH Review & Approval - Award Fee Assessment	0%	14	27-Sep-16	11-Oct-16*	31
W324-2.6.8	**Bonding/LOC**		20	14-Oct-14	10-Nov-14	235
PM6080	Bonding/LOC FY 2016-2017 Phase III & IV	0%	20	14-Oct-14	10-Nov-14	235



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Appendix D: Project Risk Register

300-296 SOIL REMEDIATION PROJECT

Rev. 5 June 4, 2014

Project Risk Register

Description		Project's Original Threat Ratings										Description of Original Threat and Impact to Project				
ID Form #	Threat Title/Description	Probability	Probability	Cost Impact ($)	Schedule Impact (d)	Cost Impact Description	Schedule Impact Description	Cost Probability-Impact	Schedule Probability Impact	Cost Score	Schedule Score	Description of Normal Condition of Threat	Consequence of Threat if not Mitigated	Cause Of Threat	Handling Strategy	Proposed Action
1	Scope of facility upgrades is uncertain (mechanical and electrical). Drawings may not be up to date.	50%	Moderate	$150,000	30	Critical	Critical	Moderate-Critical	Moderate-Critical	19	19	Upgrades assumed during the proposal stage are the same as found during the project assessment phase.	Scope could increase (or decrease)	Lack of information during the proposal phase; facility drawings not accurate.	Accept	Will test and check welding outlets planned to be used. Develop RFI to WCH
2	High dose in airlock causes excessive burnout of personnel	40%	Moderate	$300,000	20	Crisis	Significant	Moderate-Crisis	Moderate-Significant	21	14	Airlock can be deconned and shielded to reduce dose by approx. 60%	Could hinder the maintenance of cranes or shipping of waste boxes	Embedded contamination on walls and floor.	Reduce	Remove existing waste items in airlock. Use best practices to decon the airlock and shield the floor drain. Consider rolling shield walls.
3	Critical path delays from NEPA and cultural resource reviews for Mockup Facility	60%	Moderate	$720,000	60	Crisis	Crisis	Moderate-Crisis	Moderate-Crisis	21	21	No delay from NEPA exclusion or cultural resources review	Start of Mockup Construction is impacted day for day	Regulatory reviews and approvals not anticipated during proposal preparation	Reduce	WCH expedite CRR process; simplify Mockup design and reduce construction schedule
4	Loss of ventilation in the 324 hot cells	10%	Very Low	$230,000	10	Critical	Marginal	Very Low-Critical	Very Low-Marginal	10	2	Negative pressure ventilation system controls release of airborne contamination from B-Cell	Ventilation failure could cause contamination to spread into airlock	Ventilation failure could cause B-Cell to go positive and allow contamination leak into airlock.	Reduce	Ensure WCH maintains exhaust fans; provide good air seal around WCTB in door opening.
5	During PoP or mockup, equipment/process may require major modification	10%	Very Low	$200,000	20	Critical	Significant	Very Low-Critical	Very Low-Significant	10	6	Mockup equipment and processes perform as planned and no major mods are required.	Significant modifications required to equipment or methods	Inadequate analysis, proof of principle testing or planning	Reduce	Thorough design/constructability reviews and prototype testing
6	Structural integrity of building deteriorates compromising safety class boundaries	10%	Very Low	$1,200,000	60	Crisis	Crisis	Very Low-Crisis	Very Low-Crisis	11	11	Building remains structurally stable for duration of the project.	Stability is in question and requires action to reinforce.	Cracks or settling noticed due to undermining foundations.	Avoid	Design/construct conservative underpinning foundation before start of work.
7	Spread of contamination from B-Cell into the existing airlock	10%	Very Low	$150,000	20	Critical	Significant	Very Low-Critical	Very Low-Significant	10	6	Contamination in B-Cell is confined to that area.	The airlock becomes unsuitable for manned entry.	Airborne or surface contamination is transferred from B-Cell to the airlock. Wate sack could split open.	Reduce	Maintain negative pressure in B-Cell, tightly seal openings, and control surface contamination on waste packages
8	Spread of contamination during project execution outside the existing airlock	10%	Very Low	$300,000	40	Crisis	Critical	Very Low-Crisis	Very Low-Critical	11	10	Contamination is limited to B-Cell and to a lesser extent in the airlock	Contamination outside the airlock could cause extensive delays	Transfer of surface contamination from equipment/material/personnel movement	Reduce	Closely monitor and decon items moving out of old airlock
9	On the job accidents (injury)	10%	Very Low	$200,000	10	Critical	Marginal	Very Low-Critical	Very Low-Marginal	10	2	No lost time injuries	Loss of fee & future business; possible delay to project	Industrial of radiological accident	Reduce	Instill strong safety culture in team; detailedjob planning & hazard analysis: STAR principle
10	Significant personal contamination event	10%	Very Low	$200,000	10	Critical	Marginal	Very Low-Critical	Very Low-Marginal	10	2	No skin contaminations during project.	Impacts to company reputation; possible schedule impact	Breach in PPE or decon procedures	Reduce	Adequate training for PPE dressing/undressing; close control of decon activities
11	Drilling for grout curtain may generater contamination outside of holes	10%	Very Low	$126,000	10	Critical	Marginal	Very Low-Critical	Very Low-Marginal	10	2	Drill holes are located outside known contaminated area	Contaminated cuttings and exhaust filters must be disposed	Unknown extent of contamination	Reduce	Locate holes at least 5 feet from known contamination plume. Plan operations to handle some contamination.
12	Remote equipment failure during operations	20%	Low	$100,000	10	Critical	Marginal	Low-Critical	Low-Marginal	15	4	Remote equipment operates as designed without failure	Equipment must be replaced during operations	Unrecoverable failure of some piece of remote equipment	Reduce	Design critical remote equipment to be easily replaced with new components, and provide spares.
13	Final 324 Monoliths may not be acceptable for transportation and disposal at ERDF	40%	Moderate	$300,000	40	Crisis	Critical	Moderate-Crisis	Moderate-Critical	21	19	Final endstate monoliths meet all criteria for transportation and disposal at ERDF	Some waste may need to be shipped in separate packages to ERDF; contaminated soil may need to mixed with clean material; extra shielding may need to be added for transport	Thermal load may exceed MSPA transport limit; Chemical binder not currently on approved list of "grouts"; Monolith total activity level may exceed ERDF WAC.	Reduce	Work with WCH and DOE to get chemical binder approved and ensure compliance with other waste criteria.
14	Failure of critical REC Crane (A, B, or A-D)	20%	Low	$1,250,000	120	Crisis	Crisis	Low-Crisis	Low-Crisis	16	16	Existing cranes operate as needed without serious failure	Backup crane must be installed during operations, or other major repair	Equipment failure	Reduce	Provide one or more backup plans for all cranes; contingency ops testing during mockup phase
15	Stakeholder requested changes or delays to approvals	30%	Low	$400,000	20	Crisis	Significant	Low-Crisis	Low-Significant	16	7	No impact to scope or schedule from Stakeholder/regulators engagement	Unidentified scope or delays could be required	Influence of stakeholder/regulator reviews	Transfer	Any impacts must be identified as contract changes and covered by customer
16	Failure of B-Cell door	20%	Low	$600,000	30	Crisis	Critical	Low-Crisis	Low-Critical	16	15	B-Cell door remains operational for duration of project	Door must be repaired during operations	Door sticks and will not open/close	Reduce	Reduce use of the door for transfer of waste by installing a WCTB
17	Plugging of ventilation HEPA filters	20%	Low	$200,000	10	Critical	Marginal	Low-Critical	Low-Marginal	15	4	324 HEPA filters work as designed	Ventilation is shutdown and HEPA filters must be replaced	Excess dust going into ventilation system	Reduce	Install "snorkel" and pre-filter to limit dust to intake; use chemical binder to wet the soil

300-296 SOIL REMEDIATION PROJECT

Rev. 5 June 4, 2014

Project Risk Register

Description		Project's Original Threat Ratings										Description of Original Threat and Impact to Project				
ID Form #	Threat Title/Description	Probability	Probability	Cost Impact ($)	Schedule Impact (d)	Cost Impact Description	Schedule Impact Description	Cost Probability-Impact	Schedule Probability Impact	Cost Score	Schedule Score	Description of Normal Condition of Threat	Consequence of Threat if not Mitigated	Cause Of Threat	Handling Strategy	Proposed Action
18	Total waste volume may exceed capacity of REC cells	30%	Low	$220,000	60	Critical	Crisis	Low-Critical	Low-Crisis	15	16	All waste fits into A, C & D cells	Some waste may need to be shipped to ERDF or stored in airlock/B-Cell	Low packing ration of waste bags, or large quantity of secondary zone soil	Transfer	Waste volumes are estimated in the RFP. Any increase would be a changed condition. Secondary zone is not included in base scope.
19	Loss of trained operators during execution	20%	Low	$40,000	20	Marginal	Significant	Low-Marginal	Low-Significant	4	7	All operators stay for the project duration.	Need to train new operators	Operators quit or retire	Avoid	Always have at leaste one spare operator available
20			Very Low			Negligible	Negligible	Very Low-Negligible	Very Low-Negligible	1	1					
21			Very Low			Negligible	Negligible	Very Low-Negligible	Very Low-Negligible	1	1					
22			Very Low			Negligible	Negligible	Very Low-Negligible	Very Low-Negligible	1	1					
				$6,885,000	600											

300-296 SOIL REMEDIATION PROJECT

Rev. 5 June 4, 2014

Project's Residual Threat Ratings										Cost to Threat after Mitigation						Threat Location		
Probability After Mitigation	Probability	Cost Impact after Mitigation ($)	Schedule Impact After Mitigation (d)	Cost Impact Description	Schedule Impact Description	Cost Probability-Impact	Schedule Probability Impact	Cost Score after Mitigation	Schedule Score after Mitigation	($ / Day) of delayed Schedule	% Held of Cost	% Held of Schedule Delay	Contingency Held due to Cost Threat	Contingency Held due to Schedule Threat	TOTAL CONTINGENCY HELD	HyperLink	Activity WBS	Responsible Party
10%	Very Low	75,000	10	Significant	Marginal	Very Low-Significant	Very Low-Marginal	6	2	$12,000	20%	20%	$15,000	$24,000	$39,000	ID Form # (1)(1A)	5.1.4	FE&C
10%	Very Low	150,000	5	Critical	Negligible	Very Low-Critical	Very Low-Negligible	10	1	$20,000	20%		$30,000		$30,000	ID Form # (2)(1A)	5.1.2	FE&C
10%	Very Low	360,000	30	Crisis	Critical	Very Low-Crisis	Very Low-Critical	11	10	$12,000	20%	20%	$72,000	$72,000	$144,000	ID Form # (3)(1A)	5	AREVA
10%	Very Low	70,000	3	Significant	Negligible	Very Low-Significant	Very Low-Negligible	6	1	$20,000	20%		$14,000		$14,000	ID Form # (4)(1A)	5.2.6	FE&C
10%	Very Low	50,000	10	Significant	Marginal	Very Low-Significant	Very Low-Marginal	6	2	$20,000	20%	20%	$10,000	$40,000	$50,000	ID Form # (5)(1A)	4.9	Kurion
10%	Very Low	300,000	10	Crisis	Marginal	Very Low-Crisis	Very Low-Marginal	11	2	$20,000	20%	20%	$60,000	$40,000	$100,000	ID Form # (6)(1A)	5.1.3	FE&C
10%	Very Low	75,000	5	Significant	Negligible	Very Low-Significant	Very Low-Negligible	6	1	$20,000	20%		$15,000		$15,000	ID Form # (7)(1A)	5.2.6	FE&C
10%	Very Low	150,000	10	Critical	Marginal	Very Low-Critical	Very Low-Marginal	10	2	$20,000	20%	20%	$30,000	$40,000	$70,000	ID Form # (8)(1A)	5.2.6	FE&C
10%	Very Low	50,000	2	Significant	Negligible	Very Low-Significant	Very Low-Negligible	6	1	$20,000	20%		$10,000		$10,000	ID Form # (9)(1A)	5.1	FE&C
10%	Very Low	50,000	2	Significant	Negligible	Very Low-Significant	Very Low-Negligible	6	1	$20,000	20%		$10,000		$10,000	ID Form # (10)(1A)	5.2	FE&C
30%	Low	70,000	3	Significant	Negligible	Low-Significant	Low-Negligible	7	3	$20,000	20%	20%	$14,000	$12,000	$26,000	ID Form # (11)(1A)	5.1.3	FE&C
20%	Low	80,000	5	Significant	Negligible	Low-Significant	Low-Negligible	7	3	$20,000	20%	20%	$16,000	$20,000	$36,000	ID Form # (12)(1A)	5.2	FE&C
10%	Very Low	50,000	5	Significant	Negligible	Very Low-Significant	Very Low-Negligible	6	1	$20,000	20%		$10,000		$10,000	ID Form # (13)(1A)	5.2	AREVA
20%	Low	750,000	30	Crisis	Critical	Low-Crisis	Low-Critical	16	15	$20,000	50%	50%	$375,000	$300,000	$675,000	ID Form # (14)(1A)	5.1	FE&C
30%	Low	400,000	20	Crisis	Significant	Low-Crisis	Low-Significant	16	7	$20,000	50%	20%	$200,000	$80,000	$280,000	ID Form # (15)(1A)	4.1	Kurion
10%	Very Low	30,000	2	Marginal	Negligible	Very Low-Marginal	Very Low-Negligible	2	1	$20,000	20%		$6,000		$6,000	ID Form # (16)(1A)	5.2	FE&C
10%	Very Low	40,000	2	Marginal	Negligible	Very Low-Marginal	Very Low-Negligible	2	1	$20,000	20%		$8,000		$8,000	ID Form # (17)(1A)	5.2	FE&C

300-296 SOIL REMEDIATION PROJECT

Rev. 5 June 4, 2014

Project's Residual Threat Ratings										Cost to Threat after Mitigation						Threat Location		
Probability After Mitigation	Probability	Cost Impact after Mitigation ($)	Schedule Impact After Mitigation (d)	Cost Impact Description	Schedule Impact Description	Cost Probability-Impact	Schedule Probability Impact	Cost Score after Mitigation	Schedule Score after Mitigation	($ / Day) of delayed Schedule	% Held of Cost	% Held of Schedule Delay	Contingency Held due to Cost Threat	Contingency Held due to Schedule Threat	TOTAL CONTINGENCY HELD	HyperLink	Activity WBS	Responsible Party
30%	Low	220,000	60	Critical	Crisis	Low-Critical	Low-Crisis	15	16	$20,000	50%	50%	$110,000	$600,000	$710,000	ID Form # [illegible]	5.2	FE&C
10%	Very Low	60,000	2	Significant	Negligible	Very Low-Significant	Very Low-Negligible	6	1	$20,000	20%		$16,000		$16,000	ID Form # [illegible]	5.2	FE&C
	Very Low			Negligible	Negligible	Very Low-Negligible	Very Low-Negligible	1	1							ID Form # [illegible]		
	Very Low			Negligible	Negligible	Very Low-Negligible	Very Low-Negligible	1	1							ID Form # [illegible]		
	Very Low			Negligible	Negligible	Very Low-Negligible	Very Low-Negligible	1	1							ID Form # [illegible]		
		$3,050,000	216										$1,021,000	$1,228,000	$2,249,000			

Appendix E: Draft Hazard Identification Form

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DESIGN HAZARD IDENTIFICATION SCOPING

Print Form

Work Package No.: Building 324 Soil Remediation Conceptual Design Rev.: 0 Date.: 4/23/14

Description of Work: Installation and Operation of Equipment for Remediation of Contaminated Soil Under Building 324 B-Cell

Initiator: Robert R. Heim

Pre-Screening Questions	Yes	No	Don't Know	Walkdown Team Considerations
1. Does the work involve new hazards OR a change in work area conditions?	☒	☐	☐	IH, IS, RC, EPL, PE
2. Could the work cause a Derived Air Concentration (DAC), 50% of a Permissible Exposure Limit (OSHA), or a Threshold Limit Value (ACGIH) to be exceeded?	☒	☐	☐	IH, IS, RC, EPL, PE, Competent Person - Asbestos
3. Could the work expose workers to a high radiation field?	☒	☐	☐	RC, PE
4. Is the work complex with extreme technical difficulty, possibly requiring concurrent multiple-craft personnel and/ or an increased level of supervision?	☒	☐	☐	IH, IS, RC, EPL, PE
5. Does the work require new/revised environmental and/or excavation permits or plans, OR modify facility or equipment regulated under regulatory permit/order, OR impact cultural or ecological resources?	☒	☐	☐	RC, EPL
6. Does the work require new tasks not previously performed in this facility/site?	☒	☐	☐	IH, IS, RC, EPL, PE
7. Does the work use technology/tools for the first time OR require new/additional knowledge/training?	☒	☐	☐	IH, IS, RC, PE
8. Does the work require a critical lift (rigging) and/or fall protection plan?	☒	☐	☐	IS, RC, PE Hoisting and Rigging Superintendent/FE, Competent Person - Fall Protection
9. Could the work expose workers to electrical shock or flash hazards?	☒	☐	☐	IH, IS, RC, EPL, PE, Electrical Field Engineer
10. Could the work expose workers to uncharacterized areas and/or legacy waste/process fluids?	☒	☐	☐	IH, IS, RC, PE
11. Does the work require entry into a permitted confined space OR cutting/breaching process piping?	☒	☐	☐	IH, IS, RC, PE
12. Does the work require special engineering controls?	☒	☐	☐	IH, IS, RC, EPL, PE
13. Could other work in the area create additional hazards OR defeat hazard control strategies?	☒	☐	☐	IS
14. Does the work adversely affect the building/facility emergency plan?	☒	☐	☐	IH, IS, RC, PE
15. Does the work expose workers to ambient temperatures of 27°C (80°F) while requiring wearing an impermeable layer of PPE?	☒	☐	☐	IH, IS, RC, PE
16. Will waste be generated by this process?	☒	☐	☐	WSL

Physical location walkdown required? ☐	ALARA considerations indicate a tabletop discussion in lieu of a walkdown. ☒

Identify the walkdown team or tabletop discussion team based on those questions above with a "Yes" or "Don't Know" response.	☒ PE (Project Engineer)	☐ PS (Project Support)	☒ IS (Industrial Safety)
	☒ EPL (Env. Project Lead)	☒ IH (Industrial Hygiene)	☐ Craft
	☒ RC (Radcon)	☒ WSL (Waste Shipping Lead)	☒ Others

Project Safety Rep	Date	Project Engineer	Date
Radiological Engineer	Date	Project Env. Lead	Date

WCH-DE-013 (03/12/2012)

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Print Form

DESIGN HAZARD IDENTIFICATION CHECKLIST

DHI# KUR-1782-DHI-001 Rev.: 1, Draft

Specific Job Scope/Location: Installation and Operation of Equipment for Remediation of Contaminated Soil Under Building 324 B-Cell

Work Package No.: Building 324 Soil Remediation 30% Design Rev.: 1 Initiator: Robert R. Heim Date: 6/20/14

RC = RadCon IS = Industrial Safety IH = Industrial Hygiene PE = Project Engineering ES = Engineering Services PS = Project Support

FUNCTIONAL ORG	HAZARD SOURCES	EXAMPLES	APPLIES?		POTENTIAL HAZARD BARRIERS/CONTROLS																				
			Y	N	Hazard Removal	De-energize	Lockout & Tagout	Physical Barrier	Proper Anchoring	Containment	Isolation (Valves, piping, vacuum)	Pressure Relief Valve	Distance	Limit Time	Ventilation	Environmental Permits/Plans	Cultural Review	Ecological Review	Apply Fixative	Protective Clothing/Gloves/Equipment	Respiratory Protection	Inventory Control	Warning Sound/Light	Proper Packaging	Exclusion Zone/Sign
IS/IH/PE/PS	ELECTRICAL	High Voltage and Current Sources	X			X	X	X												X					
		Transformers	X			X	X	X																	X
		Batteries/Capacitors	X																						
		Static Electricity	X																						
IS/IH/PE/PS	MOTION	Shears, Sharp Edges, Pinch Points, Punctures, Machinery	X					X												X					
		Vehicles, Forklifts, Man-lifts, Man-baskets, Cranes	X					X												X			X		X
		Mass in Motion, Flying Debris/Dust	X					X		X					X					X	X				X
		Repetitive		X																					
		Rotating Equipment	X				X	X												X					
IS/PE/PS	GRAVITY-MASS	Falling	X					X	X											X					X
		Falling Objects	X		X			X												X					X
		Open Water (pools, basins, flooding)		X																					
		Access/Egress	X		X			X																	X
		Roof/Floor Overloading	X																						
		Lifting	X																	X					X
		Tripping, Slipping	X		X			X												X					X

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DESIGN HAZARD IDENTIFICATION CHECKLIST

FUNCTIONAL ORG	HAZARD SOURCES	EXAMPLES	APPLIES? Y	APPLIES? N	POTENTIAL HAZARD BARRIERS/CONTROLS: Hazard Removal	De-energize	Lockout & Tagout	Physical Barrier	Proper Anchoring	Containment	Isolation (valves, piping, vacuum)	Pressure Relief Valve	Distance	Limit Time	Ventilation	Environmental Permits/Plans	Cultural Review	Ecological Review	Apply Fixative	Protective Clothing/Gloves/ Equipment	Respiratory Protection	Inventory Control	Warning Sound/Light	Proper Packaging	Exclusion Zone/Sign
IS/IH/PE/PS	PRESSURE	Chemical Reactions		X																					
		Noise	X					X												X					X
		Confined/Compressed Gases/Steam	X							X	X	X													
		Extreme Wind	X					X												X					X
IH/IS/PE/PS	CHEMICAL	Corrosive Materials		X																					
		Flammable/Explosive Materials	X		X			X		X														X	
		Toxic Materials		X																					
		Reactive Materials		X																					
		Noxious Odors		X																					
		Carcinogenic Materials		X																					
		Oxygen Deficiency/Confined Space (including Pyrophoric materials and asphixiants)	X					X												X	X				X
IS/IH/PE/PS	BIOLOGICAL	Blood, Airborne Pathogens		X																					
		Animal, Insects, etc.	X		X			X												X	X				
		Sewage, Septic		X																					
IS/IH/PE/PS	HEAT	Electrical		X																					
		Plasma/Cutting Torch/Welding		X																					
		Natural Gas/Gasoline/Propane	X					X														X			X
		Friction	X												X					X					X
		Extreme Weather/Temperature	X												X					X					
		Spontaneous Combustion		X																					

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DESIGN HAZARD IDENTIFICATION CHECKLIST

FUNCTIONAL ORG	HAZARD SOURCES	EXAMPLES	APPLIES?		POTENTIAL HAZARD BARRIERS/CONTROLS																				
			Y	N	Hazard Removal	De-energize	Lockout & Tagout	Physical Barrier	Proper Anchoring	Containment	Isolation (Valves, piping, vacuum)	Pressure Relief Valve	Distance	Limit Time	Ventilation	Environmental Permits/Plans	Cultural Review	Ecological Review	Apply Fixative	Protective Clothing/Gloves/ Equipment	Respiratory Protection	Inventory Control	Warning Sound/Light	Proper Packaging	Exclusion Zone/Sign
IS/IH/PS	COLD	Cryogenic Materials		X																					
		Ice, Snow, Wind, Rain, Extreme Weather/Temperatures	X					X												X					
RC/ES/PS	IONIZING RADIATION	Radioactive Materials	X		X			X		X			X	X	X					X	X	X			X
		Radioactive Contamination	X		X			X		X					X				X	X	X				X
		Alpha Contamination/High-Risk Rad Work	X		X			X		X			X	X	X				X	X	X				X
		Radiation Generating Devices		X																					
		Ionizing Radiation	X		X			X		X			X	X						X	X				X
ES/IS/IH/RC/PS	NON-IONIZING RADIATION	Rf Fields		X																					
		Infrared Sources		X																					
		Ultraviolet (including sunburn) / Light Intensity	X					X												X					
		Plasma Beam/Laser Beam		X																					
		Chemical Reactions		X																					
		Microwaves		X																					
ES	NUCLEAR	Nuclear Criticality		X																					
ES/PS	ENV & WASTE MANAGEMENT	Environmental Sampling or Investigations	X					X		X			X	X	X	X				X	X			X	
		Generate Waste	X					X		X			X	X	X					X	X			X	
		Air Emissions or Systems	X					X		X	X				X	X					X				
		Cultural Impacts		X																					
		Ecological Impacts	X		X			X		X						X		X							X
		Liquid Discharges or Systems		X																					
		Wetlands/Erosion Control	X					X																	
		Waste Storage/Disposal	X					X		X				X	X									X	X
		Biological Transport Vectors (see form WCH-EE-284)		X																					

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DESIGN HAZARD IDENTIFICATION CHECKLIST

ADDITIONAL WALKDOWN COMMENTS:

WORK METHODS:

DETAILED HAZARD DESCRIPTION AND POTENTIAL BARRIERS:

Hazards and potential controls not adequately covered in the list:

1. Potential exists for static discharge from vacuum hose (static build-up during dust collection). Hoses shall be grounded to minimize risk of discharge.
2. Lifting Hazard: Lifting of materials that present a potentially unacceptable risk for personnel injury, damage, release of radioactivity or cause a significant work delays (Critical Lifts). Mitigation: Prepare, review, and execute Critical Lift Plans for critical lifts.
3. Ionizing Radiation Hazards: Spread of radioactive contamination and personnel exposure to radioactive materials. Mitigation: Perform work in accordance with Radioactive Work Permits (RWP).
4. Batteries can be included in computers and battery back-ups used in the control room. Designs of these components shall be in accordance with NFPA/NEC and possess labeling from NRTL.

Other hazards and potential barriers/controls (not included in the list):

1. Weakening foundations/footings. As a part of the B324 Remediation, soil supporting the building footers under the B-cell walls will be removed, partially undermining the footers. To mitigate the reduction of the footer strength, supplementary footers will be poured in place outside one of the B-cell wall. It will be of sufficient size and include the attachments required to support the wall during soil remediation.
2. The depth of excavation in the B-cell will to be up to 13' below the floor. This results in significant potential for cave-in of the excavation walls. The earth beneath B324 B-cell floor is comprised of sandy soils with cobbles resulting in unstable walls at depths considerably less than the planned excavation depth. To mitigate this risk, the following barriers/controls will be implemented. i). A grout curtain will be installed around the perimeter of the B-cell forming a rigid wall to hold back the native soils outside of the excavation. ii). Heavy equipment will be excluded from the areas outside the B-cell to prevent excessive soil pressures on the grout curtain. iii). Water that collects outside B324 will be removed immediately to prevent infiltration into the excavation and degradation of the grout curtain.
3. Several pieces of powered equipment (REA's) will be installed and operated in the B-cell. Uncontrolled REA collisions with the B-Cell structure and appurtenances may result in damage to equipment or facility. To mitigate damage to the cell and the equipment, hard-stops,machine limits, and vision systems

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DESIGN HAZARD IDENTIFICATION CHECKLIST

will be incorporated into the equipment design to minimize collisions.

Team Leader Print Name & Title / Sign / Date	Print Name & Title / Sign / Date	Print Name & Title / Sign / Date
Print Name & Title / Sign / Date	Print Name & Title / Sign / Date	Print Name & Title / Sign / Date
Print Name & Title / Sign / Date	Print Name & Title / Sign / Date	Print Name & Title / Sign / Date
Independent Review Print Name & Title / Sign / Date		

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft[redacted] Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32[redacted] Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
HAZARD CATEGORY: ELECTRICAL										
1	Buried Cables	☒	☐	Supplemental footer outside the west wall of the B-Cell, grout curtain installed around perimeter of B-Cell below the floor level.	Other than	Damage to underground utilities during installation of footer (separating basement floor from the wall), installation of the REAs in B-Cell walls, and installation of the grout curtain. Potential to encounter conduit and piping runs in the B-Cell walls and in/ under floors (energized and un-eneergized circuits and process lines).	Perform utility locates prior to digging, boring, and/or cutting.	☒	☐	1
2	Overhead Cables	☒	☐	Indoor temporary lighting and overhead utilities and outdoor overhead utilities (overhead power lines).	Other than	Damage to overhead utilities inside and outside of building during installation of footer and grout curtain.	Install barriers to exclude operations below low hanging overhead utilities or protect overhead utilities. Establish safe staging areas for construction equipment when not in use.	☒	☐	2
3	Cable Runs	☒	☐	Crane cabling, temporary lighting. in the airlock, cells, and the CHA.	Other than	Damage to crane cabling and temporary lighting during operations in airlock, cells, and the CHA.	Review existing conditions for presence of cabling and temporary lighting to ensure that they are not damaged during operations.	☒	☐	3
4	Service Outlets/Wiring	☒	☐	Surface mounted electrical conduit and outlets in the airlock, cells, and CHA.	Other than	Damage to surface mounted electrical conduit and outlets during operations in the airlock, cells and the CHA.	Review existing conditions for presence of surface mounted electrical conduit and outlets that could be damaged during operations. Provide protection or remove equipment as required.	☒	☐	3
5	Foreign Voltage or Back-Feed (UPS, Emergency Generator)	☐	☒					☐	☐	

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft[redacted] Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32[redacted] Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
HAZARD CATEGORY: ELECTRICAL										
6	Batteries/Capacitors	☒	☐	Batteries and battery back-up units used in computer equipment in the control station.	Other than	Rupture, corrosion, and failure due to short circuit, water infiltration, and uncontrolled conditions resulting in heat generation.	Design equipment circuits in accordance with NFPA/NEC requirements. Use listed components.	☐	☒	
7	Diesel Units	☐	☒					☐	☐	
8	Transformers	☒	☐	Transformer included with the saw equipment located in the airlock and the B-Cell.	Other than	Damage to the transformer and or wiring from material handling operations in the airlock and the B-Cell.	Locate the transformer in a location where it is not susceptable to damage during operations. Route or protect wiring to minimize potential for damage. Remove equipment from the airlock and the B-Cell when no longer used.	☐	☒	
9	Switchgear	☐	☒					☐	☐	
10	Electrical Equipment	☒	☐	Hydraulic Power Unit in building, Concrete Saw, cameras and lighting in the airlock and Cells. Brokk used in the airlock and the CHA. Binder pumps at the pump station and control room located outside the building.	More, no	Electrical short circuit or shock during installation, operation, or troubleshooting. Severed wires during operation.	Isolate electrical utility using LO/TO during installation. Provide proper enclosures/insulation for electrical equipment. Perform energized troubleshooting activities in accordance with Energized Electrical Work Permit. Route or guard wiring to protect from damage during operations. Design equipment to fail safe upon loss of power.	☒	☐	4
11	Motors	☒	☐	Hydraulic Power Unit in building, saw in the airloick and the B-Cell, binder pumps at the pump station outside the building.	Other than	Injury from rotating equipment.	Provide barriers and guards in equipment design in accordance with regulations.	☐	☒	

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32 Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
12	Heaters	☒	☐	Drum heater and line tracing at binder pump station. Use of personal heaters at work stations and in control room.	more	Improper use or damage resulting in high temperatures and potentially fire.	Proper use and grounding of heating equipment. Protect heating equipment from damage.	☐	☒	
13	Small Equipment	☒	☐	Hand held electrical tools, extension cords, lights and cameras.	Other than	Hand tools misused or modified. Use of faulty equipment.	Use the correct tool for the job. Inspect hand tools and cords for damage prior to use. Repair or replace faulty equipment and cords. Use appropriate PPE. Use GFCI proteced circuits.	☐	☒	
14	Other (specify) Lighting Dust Collection	☒	☐	Temporary Lighting SSaw	None Other than	Loss of power. Static discharge causing injury to woerker.	Ensure that emergency egress routes are marked and egress lighting is operational. Ensure collection hoses are conductive and adequately grounded.	☐	☒	
HAZARD CATEGORY: FLAMMABLE MATERIALS / FIRE										
15	Gasoline	☒	☐	Outdoor equipment	Other than	Loss of fuel (leaks) due to punctured tank or filling operations (spills).	Only operate vehicles on terrain for which they were designed. Fuel equipment in designated areas away from the facility.	☐	☒	
16	Lube Oil	☒	☐	Hydraulic Power Unit, Brokk and Brokk tools, REA tools, and REAs.	Other than	Hydraulic/lube oil catches fire.	Use non-combustable hydraulic oils. Limit quantities in the building.	☒	☐	5
17	Diesel Fuel	☒	☐	Outdoor equipment	Other than	Loss of fuel (leaks) due to punctured tank or filling operations (spills).	Only operate vehicles on terrain for which they were designed. Fuel equipment in designated areas away from the facility.	☐	☒	

300-296 SOIL REMEDIATION PROJECT

Rev. 5 June 4, 2014

Project's Residual Threat Ratings										Cost to Threat after Mitigation						Threat Location		
Probability After Mitigation	Probability	Cost Impact after Mitigation ($)	Schedule Impact After Mitigation (d)	Cost Impact Description	Schedule Impact Description	Cost Probability-Impact	Schedule Probability Impact	Cost Score after Mitigation	Schedule Score after Mitigation	($ / Day) of delayed Schedule	% Held of Cost	% Held of Schedule Delay	Contingency Held due to Cost Threat	Contingency Held due to Schedule Threat	TOTAL CONTINGENCY HELD	HyperLink	Activity WBS	Responsible Party
30%	Low	220,000	60	Critical	Crisis	Low-Critical	Low-Crisis	15	16	$20,000	50%	50%	$110,000	$600,000	$710,000	ID Form # (18)(1A)	5.2	FE&C
10%	Very Low	80,000	2	Significant	Negligible	Very Low-Significant	Very Low-Negligible	6	1	$20,000	20%		$16,000		$16,000	ID Form # (19)(1A)	5.2	FE&C
	Very Low			Negligible	Negligible	Very Low-Negligible	Very Low-Negligible	1	1							ID Form # (20)(1A)		
	Very Low			Negligible	Negligible	Very Low-Negligible	Very Low-Negligible	1	1							ID Form # (21)(1A)		
	Very Low			Negligible	Negligible	Very Low-Negligible	Very Low-Negligible	1	1							ID Form # (22)(1A)		
		$3,050,000	216										$1,021,000	$1,228,000	$2,249,000			

Appendix E: Draft Hazard Identification Form

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DESIGN HAZARD IDENTIFICATION SCOPING

Work Package No.: Building 324 Soil Remediation Conceptual Design Rev.: 0 Date.: 4/23/14

Description of Work: Installation and Operation of Equipment for Remediation of Contaminated Soil Under Building 324 B-Cell

Initiator: Robert R. Heim

Pre-Screening Questions	Yes	No	Don't Know	Walkdown Team Considerations
1. Does the work involve new hazards OR a change in work area conditions?	[X]	[ ]	[ ]	IH, IS, RC, EPL, PE
2. Could the work cause a Derived Air Concentration (DAC), 50% of a Permissible Exposure Limit (OSHA), or a Threshold Limit Value (ACGIH) to be exceeded?	[X]	[ ]	[ ]	IH, IS, RC, EPL, PE, Competent Person - Asbestos
3. Could the work expose workers to a high radiation field?	[X]	[ ]	[ ]	RC, PE
4. Is the work complex with extreme technical difficulty, possibly requiring concurrent multiple-craft personnel and/ or an increased level of supervision?	[X]	[ ]	[ ]	IH, IS, RC, EPL, PE
5. Does the work require new/revised environmental and/or excavation permits or plans, OR modify facility or equipment regulated under regulatory permit/order, OR impact cultural or ecological resources?	[X]	[ ]	[ ]	RC, EPL
6. Does the work require new tasks not previously performed in this facility/site?	[X]	[ ]	[ ]	IH, IS, RC, EPL, PE
7. Does the work use technology/tools for the first time OR require new/additional knowledge/training?	[X]	[ ]	[ ]	IH, IS, RC, PE
8. Does the work require a critical lift (rigging) and/or fall protection plan?	[X]	[ ]	[ ]	IS, RC, PE Hoisting and Rigging Superintendent/FE, Competent Person - Fall Protection
9. Could the work expose workers to electrical shock or flash hazards?	[X]	[ ]	[ ]	IH, IS, RC, EPL, PE, Electrical Field Engineer
10. Could the work expose workers to uncharacterized areas and/or legacy waste/process fluids?	[X]	[ ]	[ ]	IH, IS, RC, PE
11. Does the work require entry into a permitted confined space OR cutting/breaching process piping?	[X]	[ ]	[ ]	IH, IS, RC, PE
12. Does the work require special engineering controls?	[X]	[ ]	[ ]	IH, IS, RC, EPL, PE
13. Could other work in the area create additional hazards OR defeat hazard control strategies?	[X]	[ ]	[ ]	IS
14. Does the work adversely affect the building/facility emergency plan?	[X]	[ ]	[ ]	IH, IS, RC, PE
15. Does the work expose workers to ambient temperatures of 27°C (80°F) while requiring wearing an impermeable layer of PPE?	[X]	[ ]	[ ]	IH, IS, RC, PE
16. Will waste be generated by this process?	[X]	[ ]	[ ]	WSL

Physical location walkdown required? [ ]	ALARA considerations indicate a tabletop discussion in lieu of a walkdown. [X]

Identify the walkdown team or tabletop discussion team based on those questions above with a "Yes" or "Don't Know" response.			
	[X] PE (Project Engineer)	[ ] PS (Project Support)	[X] IS (Industrial Safety)
	[X] EPL (Env. Project Lead)	[X] IH (Industrial Hygiene)	[ ] Craft
	[X] RC (Radcon)	[X] WSL (Waste Shipping Lead)	[X] Others

Project Safety Rep	Date	Project Engineer	Date
Radiological Engineer	Date	Project Env. Lead	Date

WCH-DE-013 (03/12/2012)

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DESIGN HAZARD IDENTIFICATION CHECKLIST

DHI# KUR-1782-DHI-001 Rev.: 1, Draft

Specific Job Scope/Location: Installation and Operation of Equipment for Remediation of Contaminated Soil Under Building 324 B-Cell

Work Package No.: Building 324 Soil Remediation 30% Design Rev.: 1 Initiator: Robert R. Heim Date: 6/20/14

RC = RadCon IS = Industrial Safety IH = Industrial Hygiene PE = Project Engineering ES = Engineering Services PS = Project Support

FUNCTIONAL ORG	HAZARD SOURCES	EXAMPLES	APPLIES?		POTENTIAL HAZARD BARRIERS/CONTROLS																				
			Y	N	Hazard Removal	De-energize	Lockout & Tagout	Physical Barrier	Proper Anchoring	Containment	Isolation (Valves, piping, vacuum)	Pressure Relief Valve	Distance	Limit Time	Ventilation	Environmental Permits/Plans	Cultural Review	Ecological Review	Apply Fixative	Protective Clothing/Gloves/Equipment	Respiratory Protection	Inventory Control	Warning Sound/Light	Proper Packaging	Exclusion Zone/Sign
IS/IH/PE/PS	ELECTRICAL	High Voltage and Current Sources	X			X	X	X												X					
		Transformers	X			X	X	X																	X
		Batteries/Capacitors	X																						
		Static Electricity	X																						
IS/IH/PE/PS	MOTION	Shears, Sharp Edges, Pinch Points, Punctures, Machinery	X					X												X					
		Vehicles, Forklifts, Man-lifts, Man-baskets, Cranes	X					X												X			X		X
		Mass in Motion, Flying Debris/Dust	X					X		X					X					X	X				X
		Repetitive		X																					
		Rotating Equipment	X				X	X												X					
IS/PE/PS	GRAVITY-MASS	Falling	X					X	X											X					X
		Falling Objects	X		X			X												X					X
		Open Water (pools, basins, flooding)		X																					
		Access/Egress	X		X			X																	X
		Roof/Floor Overloading	X																						
		Lifting	X																	X					X
		Tripping, Slipping	X		X			X												X					X

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DESIGN HAZARD IDENTIFICATION CHECKLIST

FUNCTIONAL ORG	HAZARD SOURCES	EXAMPLES	APPLIES? Y	APPLIES? N	Hazard Removal	De-energize	Lockout & Tagout	Physical Barrier	Proper Anchoring	Containment	Isolation (valves, piping, vacuum)	Pressure Relief Valve	Distance	Limit Time	Ventilation	Environmental Permits/Plans	Cultural Review	Ecological Review	Apply Fixative	Protective Clothing/Gloves/Equipment	Respiratory Protection	Inventory Control	Warning Sound/Light	Proper Packaging	Exclusion Zone/Sign
IS/IH/PE/PS	PRESSURE	Chemical Reactions		X																					
		Noise	X					X												X					X
		Confined/Compressed Gases/Steam	X							X	X	X													
		Extreme Wind	X					X												X					X
IH/IS/PE/PS	CHEMICAL	Corrosive Materials		X																					
		Flammable/Explosive Materials	X		X			X		X														X	
		Toxic Materials		X																					
		Reactive Materials		X																					
		Noxious Odors		X																					
		Carcinogenic Materials		X																					
		Oxygen Deficiency/Confined Space (including Pyrophoric materials and asphixiants)	X					X												X	X				X
IS/IH/PE/PS	BIOLOGICAL	Blood, Airborne Pathogens		X																					
		Animal, Insects, etc.	X		X			X												X	X				
		Sewage, Septic		X																					
IS/IH/PE/PS	HEAT	Electrical		X																					
		Plasma/Cutting Torch/Welding		X																					
		Natural Gas/Gasoline/Propane	X					X														X			X
		Friction	X												X					X					X
		Extreme Weather/Temperature	X												X					X					
		Spontaneous Combustion		X																					

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DESIGN HAZARD IDENTIFICATION CHECKLIST

FUNCTIONAL ORG	HAZARD SOURCES	EXAMPLES	APPLIES?		POTENTIAL HAZARD BARRIERS/CONTROLS																				
			Y	N	Hazard Removal	De-energize	Lockout & Tagout	Physical Barrier	Proper Anchoring	Containment	Isolation (Valves, piping, vacuum)	Pressure Relief Valve	Distance	Limit Time	Ventilation	Environmental Permits/Plans	Cultural Review	Ecological Review	Apply Fixative	Protective Clothing/Gloves/ Equipment	Respiratory Protection	Inventory Control	Warning Sound/Light	Proper Packaging	Exclusion Zone/Sign
IS/IH/PS	COLD	Cryogenic Materials		X																					
		Ice, Snow, Wind, Rain, Extreme Weather/Temperatures	X					X												X					
RC/ES/PS	IONIZING RADIATION	Radioactive Materials	X		X			X		X			X	X	X					X	X	X			X
		Radioactive Contamination	X		X			X		X					X				X	X	X				X
		Alpha Contamination/High-Risk Rad Work	X		X			X		X			X	X	X				X	X	X				X
		Radiation Generating Devices		X																					
		Ionizing Radiation	X		X			X		X			X	X						X	X				X
ES/IS/IH/RC/PS	NON-IONIZING RADIATION	Rf Fields		X																					
		Infrared Sources		X																					
		Ultraviolet (including sunburn) / Light Intensity	X					X												X					
		Plasma Beam/Laser Beam		X																					
		Chemical Reactions		X																					
		Microwaves		X																					
ES	NUCLEAR	Nuclear Criticality		X																					
ES/PS	ENV & WASTE MANAGEMENT	Environmental Sampling or Investigations	X					X		X			X	X	X	X				X	X			X	
		Generate Waste	X					X		X			X	X	X					X	X			X	
		Air Emissions or Systems	X					X		X	X				X	X					X				
		Cultural Impacts		X																					
		Ecological Impacts	X		X			X		X						X		X							X
		Liquid Discharges or Systems		X																					
		Wetlands/Erosion Control	X					X																	
		Waste Storage/Disposal	X					X		X				X	X									X	X
		Biological Transport Vectors (see form WCH-EE-284)		X																					

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DESIGN HAZARD IDENTIFICATION CHECKLIST

ADDITIONAL WALKDOWN COMMENTS:

WORK METHODS:

DETAILED HAZARD DESCRIPTION AND POTENTIAL BARRIERS:

Hazards and potential controls not adequately covered in the list:

1. Potential exists for static discharge from vacuum hose (static build-up during dust collection). Hoses shall be grounded to minimize risk of discharge.
2. Lifting Hazard: Lifting of materials that present a potentially unacceptable risk for personnel injury, damage, release of radioactivity or cause a significant work delays (Critical Lifts). Mitigation: Prepare, review, and execute Critical Lift Plans for critical lifts.
3. Ionizing Radiation Hazards: Spread of radioactive contamination and personnel exposure to radioactive materials. Mitigation: Perform work in accordance with Radioactive Work Permits (RWP).
4. Batteries can be included in computers and battery back-ups used in the control room. Designs of these components shall be in accordance with NFPA/NEC and possess labeling from NRTL.

Other hazards and potential barriers/controls (not included in the list):

1. Weakening foundations/footings. As a part of the B324 Remediation, soil supporting the building footers under the B-cell walls will be removed, partially undermining the footers. To mitigate the reduction of the footer strength, supplementary footers will be poured in place outside one of the B-cell wall. It will be of sufficient size and include the attachments required to support the wall during soil remediation.
2. The depth of excavation in the B-cell will to be up to 13' below the floor. This results in significant potential for cave-in of the excavation walls. The earth beneath B324 B-cell floor is comprised of sandy soils with cobbles resulting in unstable walls at depths considerably less than the planned excavation depth. To mitigate this risk, the following barriers/controls will be implemented. i). A grout curtain will be installed around the perimeter of the B-cell forming a rigid wall to hold back the native soils outside of the excavation. ii). Heavy equipment will be excluded from the areas outside the B-cell to prevent excessive soil pressures on the grout curtain. iii). Water that collects outside B324 will be removed immediately to prevent infiltration into the excavation and degradation of the grout curtain.
3. Several pieces of powered equipment (REA's) will be installed and operated in the B-cell. Uncontrolled REA collisions with the B-Cell structure and appurtenances may result in damage to equipment or facility. To mitigate damage to the cell and the equipment, hard-stops,machine limits, and vision systems

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DESIGN HAZARD IDENTIFICATION CHECKLIST

will be incorporated into the equipment design to minimize collisions.

Team Leader Print Name & Title / Sign / Date	Print Name & Title / Sign / Date	Print Name & Title / Sign / Date
Print Name & Title / Sign / Date	Print Name & Title / Sign / Date	Print Name & Title / Sign / Date
Print Name & Title / Sign / Date	Print Name & Title / Sign / Date	Print Name & Title / Sign / Date
Independent Review Print Name & Title / Sign / Date		

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 324 Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
HAZARD CATEGORY: ELECTRICAL										
1	Buried Cables	☒	☐	Supplemental footer outside the west wall of the B-Cell, grout curtain installed around perimeter of B-Cell below the floor level.	Other than	Damage to underground utilities during installation of footer (separating basement floor from the wall), installation of the REAs in B-Cell walls, and installation of the grout curtain. Potential to encounter conduit and piping runs in the B-Cell walls and in/ under floors (energized and un-eneergized circuits and process lines).	Perform utility locates prior to digging, boring, and/or cutting.	☒	☐	1
2	Overhead Cables	☒	☐	Indoor temporary lighting and overhead utilities and outdoor overhead utilities (overhead power lines).	Other than	Damage to overhead utilities inside and outside of building during installation of footer and grout curtain.	Install barriers to exclude operations below low hanging overhead utilities or protect overhead utilities. Establish safe staging areas for construction equipment when not in use.	☒	☐	2
3	Cable Runs	☒	☐	Crane cabling, temporary lighting, in the airlock, cells, and the CHA.	Other than	Damage to crane cabling and temporary lighting during operations in airlock, cells, and the CHA.	Review existing conditions for presence of cabling and temporary lighting to ensure that they are not damaged during operations.	☒	☐	3
4	Service Outlets/Wiring	☒	☐	Surface mounted electrical conduit and outlets in the airlock, cells, and CHA.	Other than	Damage to surface mounted electrical conduit and outlets during operations in the airlock, cells and the CHA.	Review existing conditions for presence of surface mounted electrical conduit and outlets that could be damaged during operations. Provide protection or remove equipment as required.	☒	☐	3
5	Foreign Voltage or Back-Feed (UPS, Emergency Generator)	☐	☒					☐	☐	

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 324 Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
HAZARD CATEGORY: ELECTRICAL										
6	Batteries/Capacitors	☒	☐	Batteries and battery back-up units used in computer equipment in the control station.	Other than	Rupture, corrosion, and failure due to short circuit, water infiltration, and uncontrolled conditions resulting in heat generation.	Design equipment circuits in accordance with NFPA/NEC requirements. Use listed components.	☐	☒	
7	Diesel Units	☐	☒					☐	☐	
8	Transformers	☒	☐	Transformer included with the saw equipment located in the airlock and the B-Cell.	Other than	Damage to the transformer and or wiring from material handling operations in the airlock and the B-Cell.	Locate the transformer in a location where it is not susceptable to damage during operations. Route or protect wiring to minimize potential for damage. Remove equipment from the airlock and the B-Cell when no longer used.	☐	☒	
9	Switchgear	☐	☒					☐	☐	
10	Electrical Equipment	☒	☐	Hydraulic Power Unit in building, Concrete Saw, cameras and lighting in the airlock and Cells. Brokk used in the airlock and the CHA. Binder pumps at the pump station and control room located outside the building.	More, no	Electrical short circuit or shock during installation, operation, or troubleshooting. Severed wires during operation.	Isolate electrical utility using LO/TO during installation. Provide proper enclosures/insulation for electrical equipment. Perform energized troubleshooting activities in accordance with Energized Electrical Work Permit. Route or guard wiring to protect from damage during operations. Design equipment to fail safe upon loss of power.	☒	☐	4
11	Motors	☒	☐	Hydraulic Power Unit in building, saw in the airlock and the B-Cell, binder pumps at the pump station outside the building.	Other than	Injury from rotating equipment.	Provide barriers and guards in equipment design in accordance with regulations.	☐	☒	

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32 Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
12	Heaters	☒	☐	Drum heater and line tracing at binder pump station. Use of personal heaters at work stations and in control room.	more	Improper use or damage resulting in high temperatures and potentially fire.	Proper use and grounding of heating equipment. Protect heating equipment from damage.	☐	☒	
13	Small Equipment	☒	☐	Hand held electrical tools, extension cords, lights and cameras.	Other than	Hand tools misused or modified. Use of faulty equipment.	Use the correct tool for the job. Inspect hand tools and cords for damage prior to use. Repair or replace faulty equipment and cords. Use appropriate PPE. Use GFCI proteced circuits.	☐	☒	
14	Other (specify) Lighting Dust Collection	☒	☐	Temporary Lighting SSaw	None Other than	Loss of power. Static discharge causing injury to woerker.	Ensure that emergency egress routes are marked and egress lighting is operational. Ensure collection hoses are conductive and adequately grounded.	☐	☒	
HAZARD CATEGORY: FLAMMABLE MATERIALS / FIRE										
15	Gasoline	☒	☐	Outdoor equipment	Other than	Loss of fuel (leaks) due to punctured tank or filling operations (spills).	Only operate vehicles on terrain for which they were designed. Fuel equipment in designated areas away from the facility.	☐	☒	
16	Lube Oil	☒	☐	Hydraulic Power Unit, Brokk and Brokk tools, REA tools, and REAs.	Other than	Hydraulic/lube oil catches fire.	Use non-combustable hydraulic oils. Limit quantities in the building.	☒	☐	5
17	Diesel Fuel	☒	☐	Outdoor equipment	Other than	Loss of fuel (leaks) due to punctured tank or filling operations (spills).	Only operate vehicles on terrain for which they were designed. Fuel equipment in designated areas away from the facility.	☐	☒	

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Print Form

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft [redacted] Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32 [redacted] Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
HAZARD CATEGORY: FLAMMABLE MATERIALS / FIRE										
18	Buildings & Contents	☒	☐	Project materials stored in the CHA	more	Exceed combustibles limit established in the FHA. Higher potential for uncontrolled fire in buildings.	Prepare inventory of combustible materials (bags, cardboard, pallets, liquids and solids) for consideration in the FHA.	☒	☐	6
19	Trailers & Contents	☒	☐	Control Room trailer	more	Fire in control room.	Limit quantity of combustibles in the control room. Design control room layout in accordance with Life Safety Code. Provide fire extinguishers and smoke/fire detectors. Provide proper separation from other facilities.	☒	☐	
20	Grease	☒	☐	Hydraulic Power Unit, Brokk and Brokk tools, REA tools, and REAs.	Other than	Grease catches fire.	Limit quantities in the building. Do not apply excess material.	☐	☒	
21	Hydrogen	☐	☒	Waste containers, storage cells.	More	Hydrogen build up in containers and storage due to hydrolysis of hydrogneous materials (binder, plastics)	Minimize the amount of hydrogenous materials in waste packaging. Provide adequate ventilation in waste cells. Use binders with minimal hydrogenous materials.	☐	☒	
22	Gases-Other	☐	☒					☐	☐	
23	Organics	☐	☒					☐	☐	
24	Liquids - Other	☒	☐	Saw, binder dispesing lines.	Other than	Cut cooling water line to saw (water drives contamination deeper into the soil). Excess volume of binder consumes waste storage volume.	Monitor pressure/flow/volume of cooling water and binder to detect cut lines or uncontrolled flows.	☒	☐	7
25	Other (specify)	☐	☐					☐	☐	
HAZARD CATEGORY: MECHANICAL / MASS, GRAVITY, HEIGHT										

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft[redacted] Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32[redacted] Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
29	Hoists	☒	☐	Cranes (overhead, tip stick, reverse, gantry), REAs, Brokk	more	Damage of hoisting equipment due to overload or misuse.	Trained operators, mock-up training, design containers to limit weight, know weights of materials lifted, design equipment to fail safe (limit hydraulically), include limit sensors in designs (where practical). No work under suspended loads (exclusion area).	☒	☐	9
30	Jacks	☐	☒					☐	☐	
31	Scaffolds & Ladders	☒	☐	Cranes, C-Cell hatch.	Other than	Injury to personnel due to improper use/construction of ladders and scafolds during crane maintenance, A-Cell crane modification and C-Cell hatch removal.	Trained personnel, competent persons directing construction of scaffolding. Use manlift when possible.	☐	☒	
32	Open Excavation/Trenches/Pits	☒	☐	B-Cell, utdoor excavation west of B-Cell	Other than	Cave-in due to unstable soils.	Installation of grout wall outside of the B-cell to prevent cave-in. Proper side-wall slopes in outdoor excavations or appropriate shoring.	☐	☒	
33	Vessels	☒	☐	Air compressor at the Binder pumping station	More	Failure of pressure tank during operation.	Procure compressor with tank that complies with ASME VIII requirements.	☒	☐	10
34	Vaults	☐	☒					☐	☐	
35	Stability/Toppling Tendency	☒	☐	Outdoor excavation	Other than	Cave-in/toppling of equipment and injury, damage/loss of equipment due to overloaded or unstable soils.	Installation of grout wall outside of the B-cell to prevent cave-in. Proper placement of equipment during outdoor excavations. Use seatbelts when operating equipment. Do not modifiy ROPs on equipment.	☐	☒	

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32 Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
36	Pipes/Raw Water Lines	☒	☐	Process lines embedded in wall. Binder lines from pump station. Water lines for saw.	Damage	Coring holes in B-cell wall severs embedded process lines. Cutting fluids enter piping or process fluids exit process piping. Sever binder line or water cooling lines in B-Cell, airlock or outdoors.	Use drawings and scan walls to determine location of process lines. If relocation of bore hole is not possible, then plug or seal process line prior to boring to prohibit infiltration of cutting fluids. Protect lines or route in out-of-way location.	☐	☒	
37	Shears; sharp edges, pinch points, punctures	☒	☐	REAs, toolst, MSMs, cranes, Brokk, hand tools.	Injury	Cut, pinch and puncture injuries during installation and operation of equipment.	Utilize appropriate PPE, be aware and stay clear of cut, pinch and puncture points of equipment. Equipment design shall incorparate guards.	☐	☒	
38	Mass in Motion/Flying Debris/ Projectiles, Falling Objects	☒	☐	Saw, hammer, cranes, REA's, compressor, soil and materials staged outdoors.	More	Energetic discharge from hammers and shears, swinging loads, dropped loads can cause equipment or facility damage or result in injury. Soil and flying materials from wind. Work at heights. Hose ruptures/failures.	Establish exclusion areas. Perform these operations in rooms to contain material. Provide local dust collection. Wear appropriate PPE. Conduct operations in B-cell to minimize damage to equipment and facility. Secure materials store outdoors. Use hose whips on pressurized lines.	☐	☒	
39	Collapse (e.g., Excavation, Floor, Roof)	☒	☐	B-cell footing	Less	During the excavation process the footing will be undermined and potentially result in collapse.	Install supplemental footers and grout walls around the B-cell walls. Supplemental footers and grout walls shall be sufficient in size and adequately attached to support the B-cell walls during the excavation process. Exclude the use of heavy equipment around the exterior of the B-cell during excavation.	☐	☒	

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Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32[redacted] Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
40	Others working above or below the work area	☒	☐	Hatch removal	More	Swinging or dropped loads, falling material or tools and working at heights can cause equipment or facility damage or p[erssonel injury. Injury to personnel due to improper use/ construction of ladders and scafolds during crane maintenance. A-Cell crane modification and C-Cell hatch removal.	Establish exclusion area. Wear appropriate PPE. Remove loose material. Use fall protection equipment when working at heights above 6'. Evaluate the use of ladders. Tie off tools. Trained personnel, competent persons directing construction of scaffolding. Use manlift when possible.	☐	☒	
41	Roof or Floor Deterioration or Overload	☐	☒					☐	☒	
42	Potential Effects/Injury from Stored Energy	☒	☐	HPU, hydraulic hoses, crane, compressor, hoses	More	Over pressurization of hydraulic/ pneumatic systems, damage to hoses, or dropped loads can cause equipment or facility damage or personnel injury.	Use of PRVs to prevent over-pressure. Hoses shall be routed or provided with guards for protection. Establish exclusion area when lifting loads. Wear PPE.	☐	☒	
43	Other (specify)	☐	☐					☐	☐	
HAZARD CATEGORY: PRESSURE- VOLUME, GASES										
44	Compressed Gas Bottles	☐	☒					☐	☐	
45	Stressed Members	☒	☐	Soil sack	More	Soil sack is overloaded resulting in spread of contamination.	Sack volume shall be designed to preclude overloading.	☐	☒	
46	Compressed Air Tool	☒	☐	Compressor	less	Accumulation of binder in hoses limiting flow.	Use of pipe pig to clean interior of hoses.	☐	☒	
47	Hydraulic Hammer	☒	☐	Hammer, shear	More	Energetic material discharged during operation can cause equipment or facility damage or personnel injury.	Personnel shall not be present in room during hammer and shear operations (in B-cell). Perform hammer operations to minimize damage to equipment and facility.	☐	☒	

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Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32[redacted] Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
HAZARD CATEGORY: PRESSURE- VOLUME, GASES										
48	Other (specify)	☐	☐					☐	☐	
HAZARD CATEGORY: CHEMICAL										
49	Acids/Corrosives	☐	☒					☐	☐	
50	Asbestos/Asbestos Containing Materials	☐	☒					☐	☐	
51	Beryllium	☒	☐	Soils surrounding facility	more	Soils/materials blowing in from other facilities elevating Be levels in work area.	Perform routine surveys. Use appropriate PPE.	☐	☒	
52	Solvents	☒	☐	Control Room	more	Improper use of cleaning solvents (screen cleaners, desk cleaners) result in damage or injury.	Use cleaniners in accordance with instructions. Limit quantity in control room.	☐	☒	
53	Lead/Lead Containing Materials	☐	☒					☐	☐	
54	Other (specify) Sensitizing chemicals	☒	☐	Epoxies/grout used to fix REA supports in B-Cell wall.	Other than	Skin contact with material or breathing fumes sensitizes skin or mucus membranes.	Use materials in accordance with instructions. Wear appropraite PPE.	☐	☒	
HAZARD CATEGORY: RADIATION										

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Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32 Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
HAZARD CATEGORY: RADIATION										
55	Radioactive Materials	☒	☐	Excavated soil, cell and airlock debris, rubblized grout.	More	Personnel exposure to materials removed from the cells and the airlock can result in accumulated dose. Potential for dropped sack in airlock resulting in airborne contamination and personnel uptake. Migration of radioactive materials in soils can contaminate water supplies.	When possible, handle radioactive materials using remote methods. Limit dose through consideration of time, distance and shielding. Establish rad boundaries. Contain and fix loose material. Provide multiple layers of containment where possible. Provide cascading ventilation. Conduct operations without adding free liquids. Remove water pooling outside of the B-cell to prevent percolation into excavation. Use appropriate PPE. Plan work. Follow RWP and postings.	☐	☒	
56	High-Risk Rad Work	☐	☒					☐	☐	
57	Radioactive Contamination	☒	☐	Materials removed from or in cells and airlock.	More	Transfer (spread) of contamination during handling and/or packaging waste materials or equipment maintenance.	Perform operations in accordance with RadCon Manual (monitor, survey, decontaminate, establish boundaries/ barriers). Contain contamination where possible. Apply fixatives during operations and at end of project. Collect dust at point of generation. Use appropriate ventilation. Use appropriate PPE. Follow RWP and postings.	☒	☐	4
58	Radiation-Generating Devices	☐	☒					☐	☐	
59	High Intensity Visible Light	☐	☒					☐	☐	
60	Ultraviolet, Infrared Radiation	☐	☒					☐	☐	
61	Microwave Radiation	☐	☒					☐	☐	

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HAZARDS/OPERABILITY DESIGN SAFETY REVIEW WORKSHEET

Document Number: HDSR# KUR-1782-HDSR-001 Rev No.: 1, Draft [redacted] Project Name: Building 324 Soil Remediation, 30% Design

Prepared by: Robert R. Heim Date: 6/20/14

Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32[redacted] Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
62	Other (specify) Generation of radioactive wastes Shine paths.	☒	☐	B-cell floor and soils. Openings in B-Cell and airlock walls.	Other than	Improperly packaged waste results in contamination of environment or personnel uptake. Shine paths through openings in the B-Cell and airlock.	Package waste in accordance with waste packaging instructions. Use shielding to limit shine paths.	☒	☐	4
HAZARD CATEGORY: THERMAL										
63	Welding Torch	☐	☒					☐	☒	
64	Heater	☒	☐	Drum heater and line tracing at binder pump station. Use of personal heaters at work stations and in control room.	More	Improper use or damage resulting in high temperatures and potentially fire.	Proper use and grounding of heating equipment. Protect heating equipment from damage.	☐	☒	
65	Equipment (Operating)	☒	☐	Saw, HPU	More	In the process of cutting, saw blade can get extremely hot. Contact with blade could damage materials or cause burns (hoses, combustibles, etc).	Upon completion of a cut, the saw blade shall be retracted and cooled in air prior to movement to storage location or next cut. Perform tool changes at beginning of shift to ensure that blade is cool. Avoid blade contact with combustibles and items susceptable to damage from heat. Provide shields or guards and warnings.	☐	☒	
66	Hot Surfaces	☒	☐	saw, HPU	More	Operation of HPU generates heat and hot surfaces. Personnel contact with hot surfaces result in burns.	HPU skid shall incorporate guards, barriers, and warnings to limit access to hot surfaces.	☒	☐	11
67	Other (specify) Building air temperature	☒	☐	Building heating/ colling system	More/Less	Loss of heating and cooling capability.	Curtail operations, exit the building.	☐	☒	
HAZARD CATEGORY: EXPLOSIVE										

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Location/Design: Install/Ops Equipment for Remediation of Contaminated Soil Under Building 32[redacted] Date Analysis Performed: 6/18/14

HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
HAZARD CATEGORY: EXPLOSIVE										
68	Dynamite	☐	☒					☐	☐	
69	Hydrogen	☒	☐	Waste containers, storage cells.	More	Hydrogen build up in containers and storage due to hydrolysis of hydrogneous materials (binder, plastics)	Minimize the amount of hydrogenous materials in waste packaging. Provide adequate ventilation in waste cells. Use binders with minimal hydrogenous materials.	☐	☒	
70	Explosive Gases - Other	☐	☒					☐	☐	
71	Explosive Liquids	☐	☒					☐	☐	
72	Chemicals	☐	☒					☐	☐	
73	Dusts	☐	☒					☐	☐	
74	Other (specify)	☐	☐					☐	☐	
HAZARD CATEGORY: ENVIRONMENTAL / ATMOSPHERIC HAZARDS										
75	Confined Spaces	☒	☐	C-Cell Hatch, footer.	Other than	Work in space not normally occupied and limited egress.	Use of manlift. Limit occupancy and keep egress routes clear.	☐	☒	
76	Oxygen Deficient Atmosphere	☐	☒					☐	☐	
77	High Noise (>85 dBA)	☒	☐	HPU. REA's, binder pumps, compressor	More	Equipment operation results in sustained loud noise causing personnel injury.	Operate remote equipment in B-cell (non-occupied room). Locate HPU in area away from operators. Provide sound proofing barriers around HPU (if required). Provide postings in area where HPU is located. Routinely monitor noise levels. Post high noise areas. Wear appropriate PPE.	☐	☐	

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HAZARD NUMBER	HAZARDS	APPLICABILITY Y	APPLICABILITY N	Structure, System, or Component Involved	Guideword(s)	Deviation(s) Considered	Hazard Barrier/Control	Additional Info/ Action Needed? Y	Additional Info/ Action Needed? N	Action No.
HAZARD CATEGORY: ENVIRONMENTAL / ATMOSPHERIC HAZARDS										
78	Biological (snakes, plants, etc.)	☒	☐	Outdoor and indoor work locations	Other than	Exposure to insect bites and stings, hante virus, and alegens.	Shake PPE before donning, dispose of food wastes, wear half masks if alegens are present.	☐	☒	
79	Heat Stress	☒	☐	Supplementary footers	More	Work outside can result in heat stress or heat stroke.	Drink plenty of fluids. Industrial Hygiene shall develop a work/rest regimen. Rotate workers. Use spot ventilation/cooling.	☒	☐	4
80	Cold Stress	☒	☐	Supplementary footers	More	Work outside can result in hypothermia.	Drink plenty of fluids. Dress appropriately. Watch for signs of hypothermia. Rotate workers.	☐	☒	
81	Extreme Wind	☒	☐	Outdoor work locations	More	Blowing soil/debris, work at heights.	Curtail operations.	☐	☒	
82	Other (specify) Severe weather	☐	☐	Outdoor/indoor locations	More	Lightning, ice, snow, fog, earthquake, range fires, ash.	Curtail operations as required.	☐	☒	

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Comments/Additional Information

Additional Actions for HDSR for B324 Soil Remediation Conceptual Design

1. Perform utility locates prior to digging/boring for footer and grout curtain installation.
2. Evaluate low overhead utilities in work area around footer and grout curtain installation. Establish a safe staging area for heavy equipment when not in use.
3. Perform walkdown of the work area and assess interference with electrical outlets, wiring, and temporary lighting.
4. Prepare permits/plans/instructions (LO/TO, confined space, RWP,energized work, work/rest regimen, waste packaging instructions, etc) for use with the Work Package. Perform work in accordance with permits.
5. Design Input: Use of non-combustible/non-flammable hydraulic oil.
6. Prepare flammables inventory or the control room and the work area for inclusion in the FHA.
7. Design Input: Monitor hydraulic and cooling water systems to identify and shut down systems in event of severed lines.
8. Design Input: Stairs accessing the control trailer shall comply with Life Safety Code.
9. Develop mock-up and training and train personnel.
10. Design Input: Compressor shall be procured with tank satisfying ASME VIII requirements for pressure vessels.
11. Design Input: Design equipment (HPU, Saw, etc) with appropriate guards to protect personnel from rotating and thermal hazards.

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Table 1. Common Hazard and Operability Analysis Terminology

Term	Definition
GUIDEWORDS	Simple words that are used to qualify or quantify the intention in order to guide and stimulate the brainstorming process and discover deviations.
DEVIATIONS	Departures from the intention that are discovered by systematically applying the guidewords to process parameters (e.g., "more pressure," "too high lift height"). This provides a list of potential deviations for the team to consider. Teams may supplement the list of deviations with ad hoc items.

Table 2. Hazard and Operability Guidewords and Meanings

Note: *ENG-1-3.2, "Design Hazard Identification," permits design safety review teams to develop and apply their own guide words if they are more appropriate to the design being considered.*

Guidewords	Meaning	Comments
No	Negation of the Design Intention	No part of the design intention is achieved, or nothing else occurs
Less (Lower)	Quantitative Decrease	Refers to quantities less than required for success of the intention
More (Higher)	Quantitative Increase	Refers to quantities greater than required for success of the intention
Part Of	Qualitative Decrease	Only some of the intentions are achieved; some are not
As Well As	Qualitative Increase	All of the design and operating intentions are achieved together with some additional activity
Reverse	Logical Opposite of the Intention	Examples are reverse flow or chemical reaction or movement of container in wrong direction
Other Than	Complete Substitution	No part of the original intention is achieved. Something quite different happens

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Table 3. Barriers to Prevent / Mitigate Hazards

BARRIERS / CONTROLS

Administrative	***Physical***
Pre-Job Safety Briefing	Engineered Controls (soil overburden, etc.)
Specific Task Training (e.g., sampling)	Protective Equipment (Gloves, Clothing, Respirator, etc.)
Site Controls (e.g., zones)	Warning Signs, Warning Lights
Exclusion Zone/Sign/Posting	Containment
Ecological/Cultural Review	Physical Barrier
Inventory Control	Conduit
Other (specify)	Isolation (Valves, Piping, Vacuum)
	Pressure Relief Valve
Work Permits	Ventilation System
Lockout/Tagout	Proper Packaging
Confined Space Entry	Applied Fixative
Beryllium (BWP)	Proper Anchoring
Radiological (RWP)	Other (specify)
Hot Work (welding/cutting)	
Environmental Plans/Permits	***Actions***
Other (specify)	Limit Time
	Increase Distance
Monitoring	Hazard Removal
Beryllium (air sampling; breathing zone or areal)	Decontamination
Beryllium (wipe or bulk sampling)	Minimize Space
Total Volatile Organic Compounds (VOCs)	De-Energize
Atmospheric Temperature	Other (specify)
Total Dust	
Radiation (mR/Hr)	
Contamination (Other)	
Other (specify)	

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Team Leader: Print Name & Title / Sign / Date	Print Name & Title / Sign / Date	Print Name & Title / Sign / Date
Print Name & Title / Sign / Date	Print Name & Title / Sign / Date	Print Name & Title / Sign / Date
Print Name & Title / Sign / Date	Print Name & Title / Sign / Date	Print Name & Title / Sign / Date

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Isolating Waste from the Environment

Meeting Attendance Record

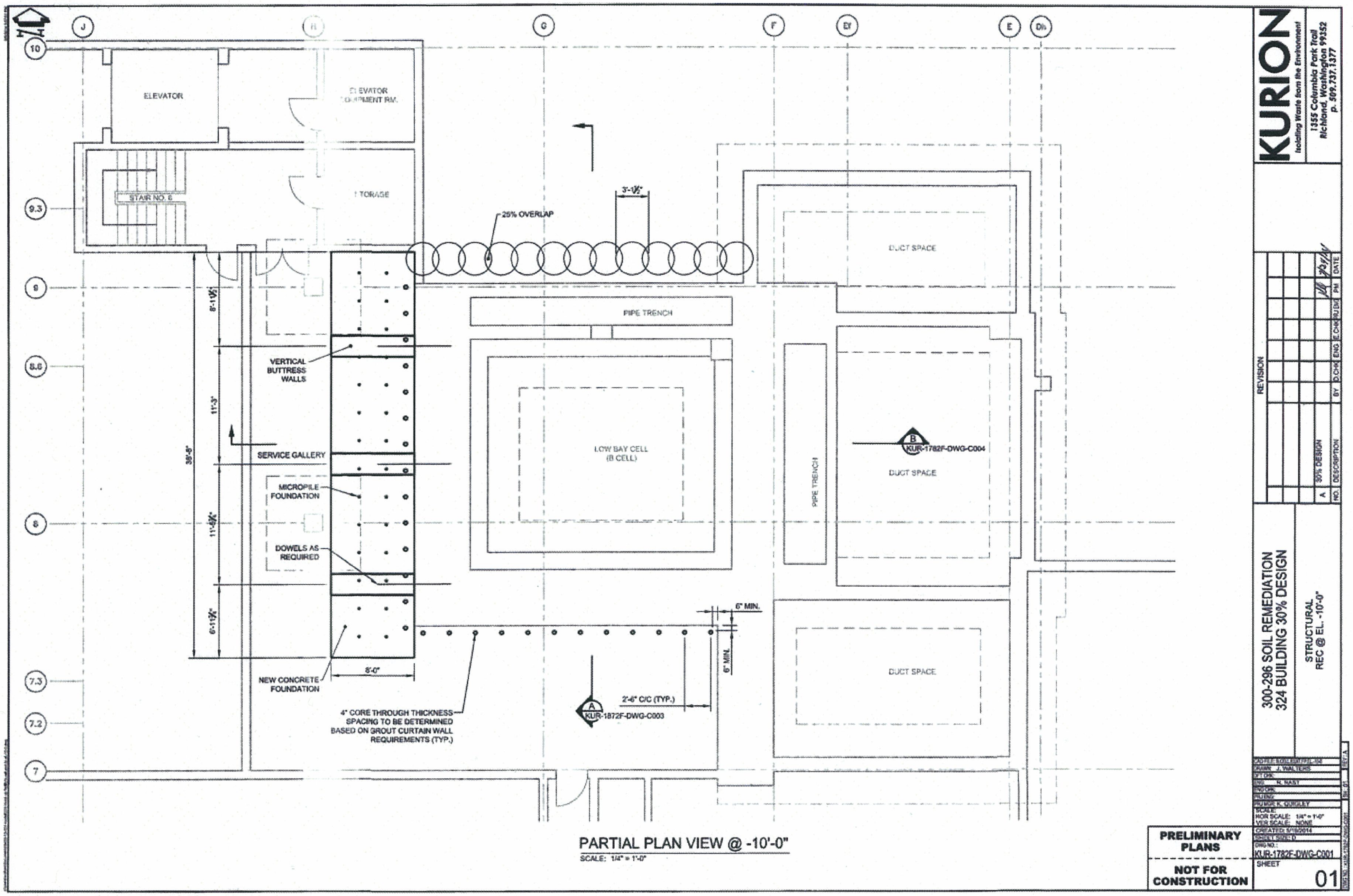
Meeting Title: 300-296 HAZARDS ASSESSMENT

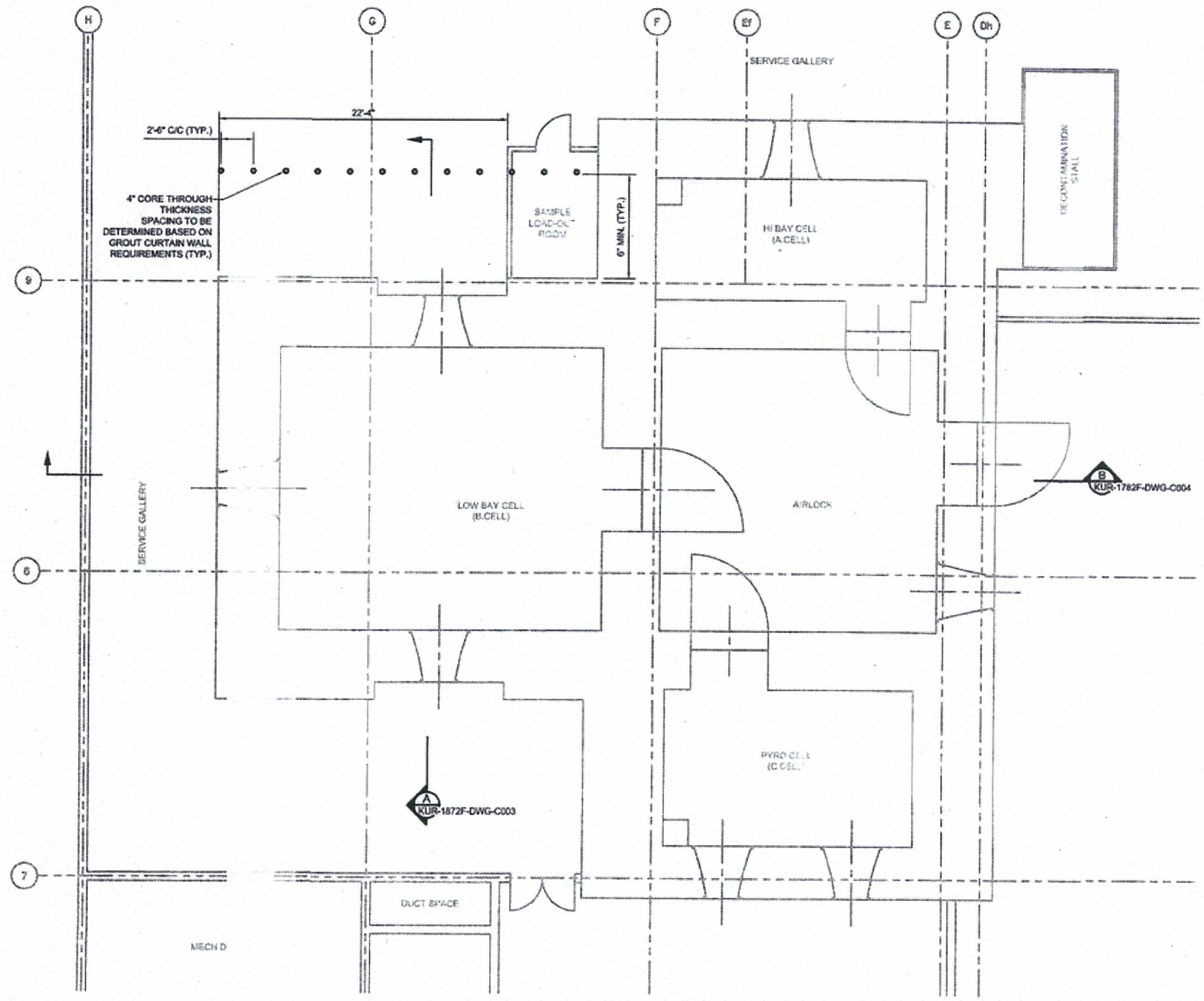
Name	Signature	Date
BRUCE CARPENTER	[signature]	4/16/14
MATT CESCE (Phone)		
BRYAN FLANIGAN (Phone)		
DAVE MOBLEY	[signature]	4/16/14
Stephen Bump	[signature]	4/16/14
Bob Watkins	[signature]	4/16/14
STEVE MARSKE	[signature]	04.16.14
Dave Brown WCH	[signature]	4/16/14
Rob Heim (phone)		

6/18/2014 Hazard Identification Meeting

Attendee	Company	Organization	Role
Bryan Flanagan 509-371-1950	AFS Bryan.Flanagan@areva.com	Engineering	Proj. Eng. Mgr.
Jennifer Stewart	Kurion	Engineering	Principal Engineer
WADE SINGLETON	KURION	ENGINEERING	PROJ ENG.
DAVE MOBLEY	AFS DAVID.MOBLEY@areva.com	ES&H	ESH Mgr.
Steve Bump	AFS 509-942-3639	ES&H	Rad Eng/IH sbump@moellerinc.com
Dave Brown	WCH (509) 430-1300	ESH&Q Eng dhbrown@rcc-wch.com	Procedure
ROBERT HEIM (VIA PHONE)	KURION	ENGINEERING	Sr. ENGINEER

Appendix F: Drawings


ELEVATOR
ELEVATOR EQUIPMENT RM.
STORAGE
STAIR NO. 6
25% OVERLAP
3'-1½"
DUCT SPACE
PIPE TRENCH
VERTICAL BUTTRESS WALLS
SERVICE GALLERY
MICROPILE FOUNDATION
DOWELS AS REQUIRED
NEW CONCRETE FOUNDATION
8'-1½"
11'-3"
38'-8"
6'-1½"
8'-0"
LOW BAY CELL (B CELL)
B
KUR-1782F-DWG-C004
6" MIN.
2'-6" C/C (TYP.)
A
KUR-1872F-DWG-C003
4" CORE THROUGH THICKNESS SPACING TO BE DETERMINED BASED ON GROUT CURTAIN WALL REQUIREMENTS (TYP.)
PARTIAL PLAN VIEW @ -10'-0"
SCALE: 1/4" = 1'-0"
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377
REVISION
A
30% DESIGN
NO.
DESCRIPTION
BY
D.CHK
ENG
E.CHK
RU ENG
PM
DATE
300-296 SOIL REMEDIATION
324 BUILDING 30% DESIGN
STRUCTURAL
REC @ EL. -10'-0"
DRAWN: J. WALTERS
ENG: R. NAST
PM/MGR: K. QUIGLEY
HOR SCALE: 1/4" = 1'-0"
VER SCALE: NONE
CREATED: 5/19/2014
SHEET SIZE: D
DWG NO.:
KUR-1782F-DWG-C001
SHEET
01



PARTIAL PLAN VIEW @ 0'-0"
SCALE: 1/4" = 1'-0"

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PE/EM	PM	DATE
A	30% DESIGN							

REVISION

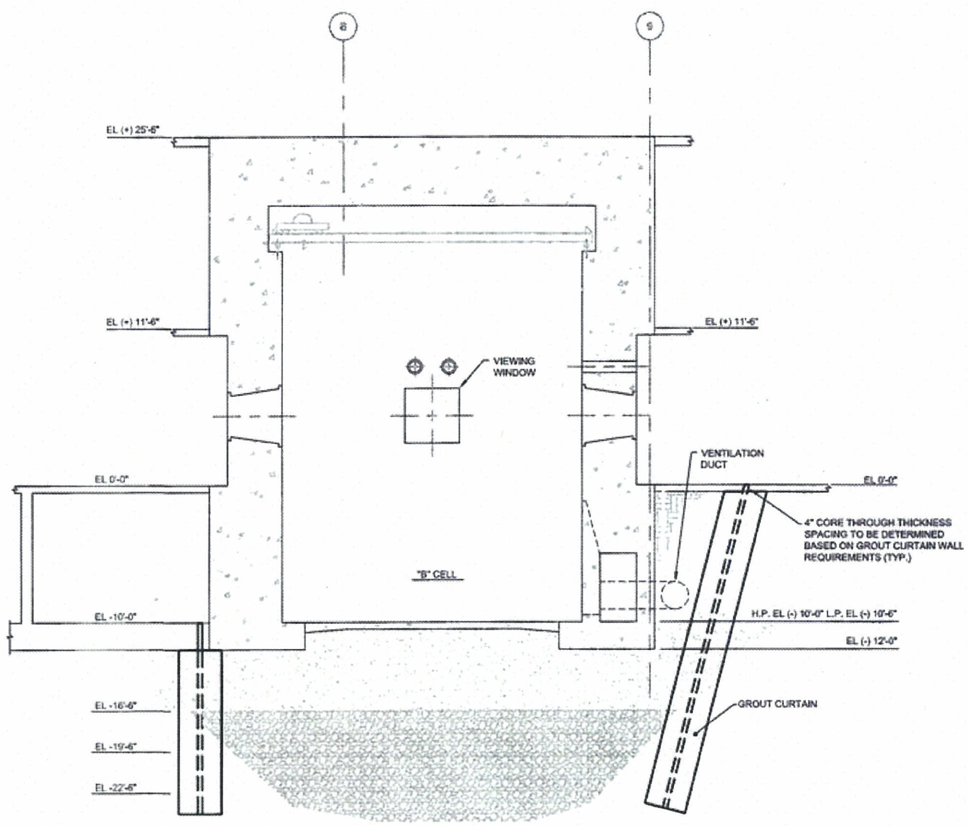
300-296 SOIL REMEDIATION
324 BUILDING 30% DESIGN

STRUCTURAL
REC @ EL. 0'-0"

DRAWN: J. WALTERS
ENG: R. HAST
PM/WPR: K. QUIGLEY
HOR SCALE: 1/4" = 1'-0"
VER SCALE: NONE
CREATED: 5/22/2014
SHEET SIZE: D
DWG NO.: KUR-1782F-DWG-C002
SHEET 01
REV A

PRELIMINARY PLANS

NOT FOR CONSTRUCTION



A SECTION
KUR-1782F-DWG-C001, KUR-1782F-DWG-C002 SCALE: 1/4" = 1'-0"

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	RJ.EK	PM	DATE
A	30% DESIGN							

REVISION

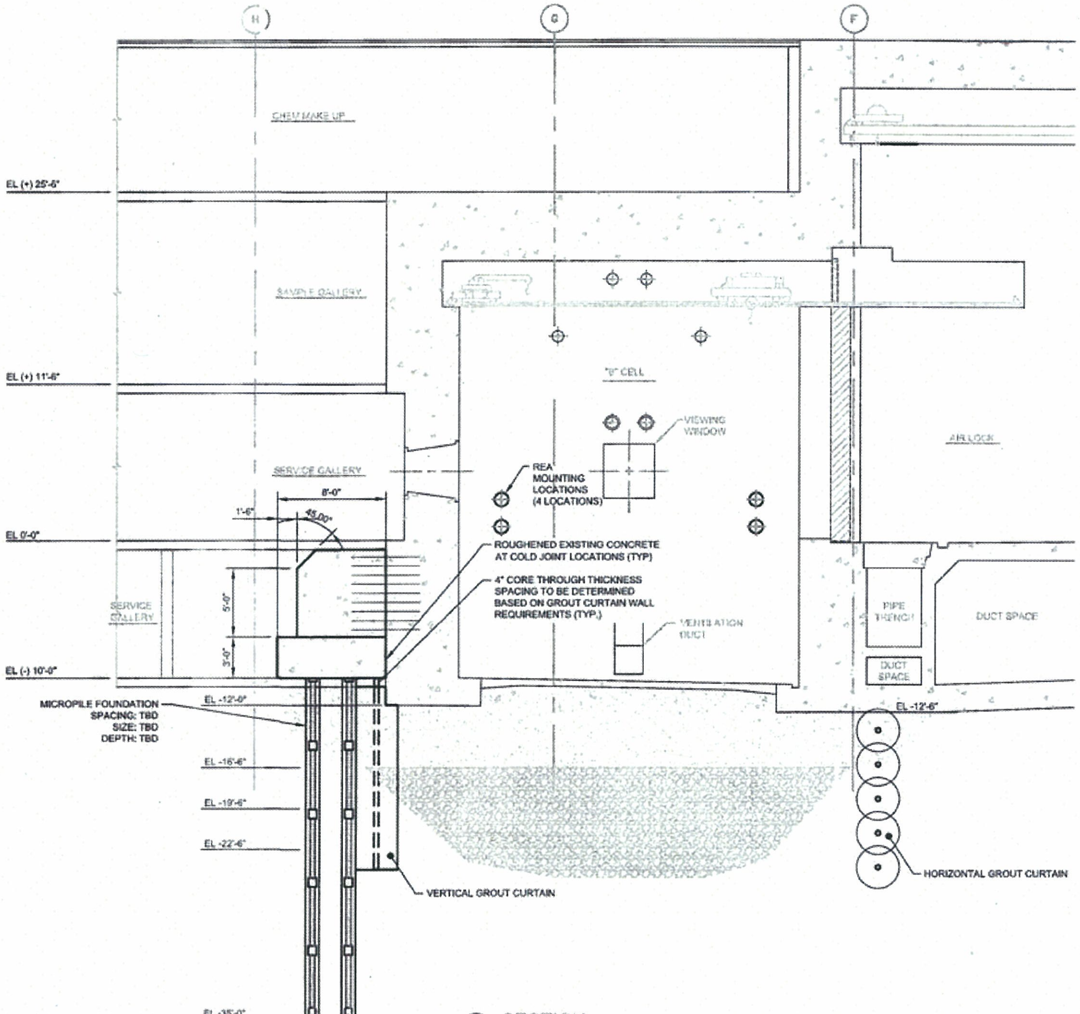
300-296 SOIL REMEDIATION
324 BUILDING 30% DESIGN

STRUCTURAL
SECTION A

DRAWN: J. WALTERS
ENG: R. NAST
PM/MGR: K. QUIGLEY
SCALE: HOR SCALE: 1/4" = 1'-0" VER SCALE: NONE
CREATED: 5/19/2014
SHEET SIZE: D
DWG NO.: KUR-1782F-DWG-C003
REV: A

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

SHEET 01



B SECTION
KUR-1782F-DWG-C001, KUR-1782F-DWG-C002

SCALE: 1/4" = 1'-0"

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PJ ENG	PM	DATE
A	30% DESIGN							

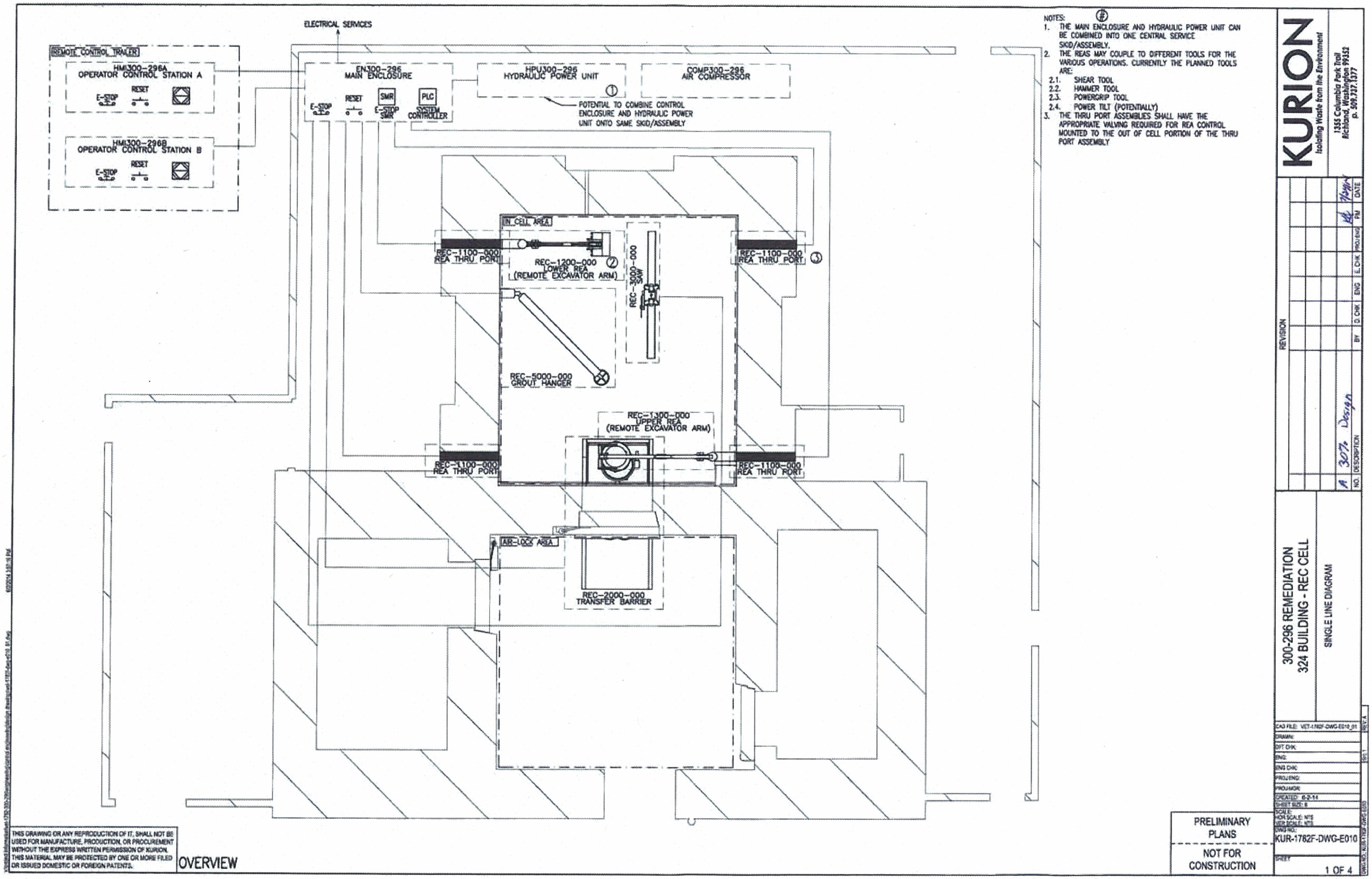
REVISION

300-296 SOIL REMEDIATION
324 BUILDING 30% DESIGN

STRUCTURAL
SECTION B

DRAWN: J. WALTERS
ENG: R. RAST
PROJ MGR: K. QUIGLEY
HOR SCALE: 1/4" = 1'-0"
VER SCALE: NONE
CREATED: 5/19/2014
SHEET SIZE: D
DWG NO.: KUR-1782F-DWG-C004
REV: A
SHEET 01

PRELIMINARY PLANS
NOT FOR CONSTRUCTION


ELECTRICAL SERVICES
REMOTE CONTROL TRAILER
HMI300-296A OPERATOR CONTROL STATION A
E-STOP
RESET
HMI300-296B OPERATOR CONTROL STATION B
E-STOP
RESET
EN300-296 MAIN ENCLOSURE
E-STOP
RESET
SMR
E-STOP SMR
PLC
SYSTEM CONTROLLER
HPU300-296 HYDRAULIC POWER UNIT
COMP300-296 AIR COMPRESSOR
POTENTIAL TO COMBINE CONTROL ENCLOSURE AND HYDRAULIC POWER UNIT ONTO SAME SKID/ASSEMBLY
IN CELL AREA
REC-1100-000 REA THRU PORT
REC-1200-000 LOWER REA (REMOTE EXCAVATOR ARM)
REC-300-000 SAW
REC-5000-000 GROUT HANGER
REC-1300-000 UPPER REA (REMOTE EXCAVATOR ARM)
AIR-LOCK AREA
REC-2000-000 TRANSFER BARRIER
NOTES:
1. THE MAIN ENCLOSURE AND HYDRAULIC POWER UNIT CAN BE COMBINED INTO ONE CENTRAL SERVICE SKID/ASSEMBLY.
2. THE REAS MAY COUPLE TO DIFFERENT TOOLS FOR THE VARIOUS OPERATIONS. CURRENTLY THE PLANNED TOOLS ARE:
2.1. SHEAR TOOL
2.2. HAMMER TOOL
2.3. POWERGRIP TOOL
2.4. POWER TILT (POTENTIALLY)
3. THE THRU PORT ASSEMBLIES SHALL HAVE THE APPROPRIATE VALVING REQUIRED FOR REA CONTROL MOUNTED TO THE OUT OF CELL PORTION OF THE THRU PORT ASSEMBLY
KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377
REVISION
A 30% Design
NO. DESCRIPTION BY D. CHK ENG E. CHK PROJ.ENG PM DATE
300-296 REMEDIATION
324 BUILDING - REC CELL
SINGLE LINE DIAGRAM
CAD FILE:
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PROJ.ENG:
PROJ.MGR:
CREATED: 6-2-14
SHEET SIZE: B
SCALE:
HOR SCALE: NTS
VER SCALE: NTS
DWG NO:
KUR-1762F-DWG-E010
SHEET
1 OF 4
REV A
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
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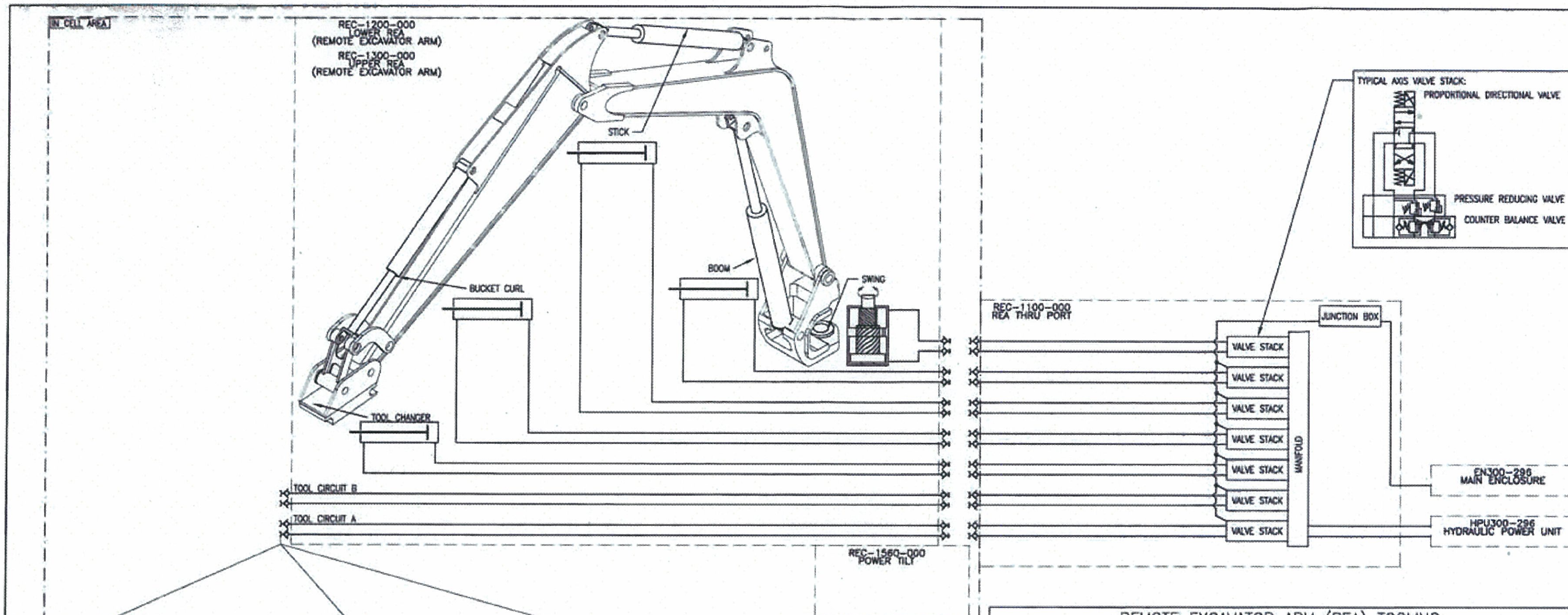
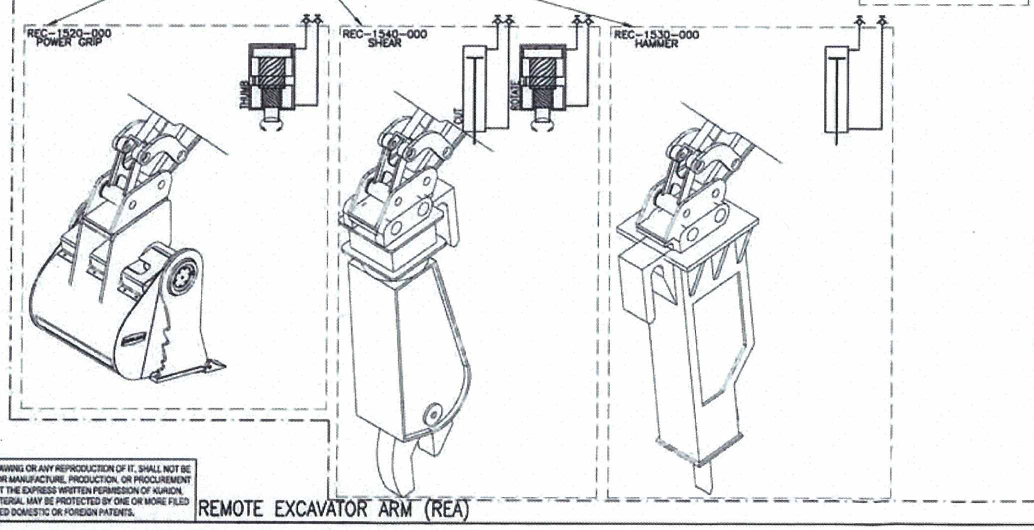
OVERVIEW





REMOTE EXCAVATOR ARM (REA) TOOLING

TOOL	AXIS	# OF LINES	OPERATING PRESSURE (PSI)	FLOW (GPM)	MISC NOTES
POWER GRIP	THUMB	2 (A & B)	3000	2-7	CIRCUIT PRESSURE: 3650-3750PSI
SHEAR	CUT AXIS	2 (A & B)	3625	16	MAXIMUM RATED PRESSURE: 5075PSI
	ROLL AXIS	2 (A & B)	1450	5	
HAMMER	HAMMER	2 (A & B)	1550-1800	8-16	
POWERTILT	POWERTILT	2 (A & B)	3650-3750	0.8-1.5	

REMOTE EXCAVATOR ARM (REA)

AXIS	# OF LINES	OPERATING PRESSURE (PSI)	FLOW (GPM)	MISC NOTES
SWING	2 (A & B)			
BOOM	2 (A & B)			
STICK	2 (A & B)			
BUCKET CURL	2 (A & B)			
TOOL CHANGER	2 (A & B)			

REMOTE EXCAVATOR ARM (REA)

PRELIMINARY PLANS

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1355 Columbia Park Trail
Richland, Washington 99352
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REVISION: A — 30% Design

300-296 REMEDIATION
324 BUILDING - REC CELL
SINGLE LINE DIAGRAM

CAD FILE: VET-1782F-DWG-E010_02
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PROJ ENG:
PROJ MGR:
CREATED: 8-2-14
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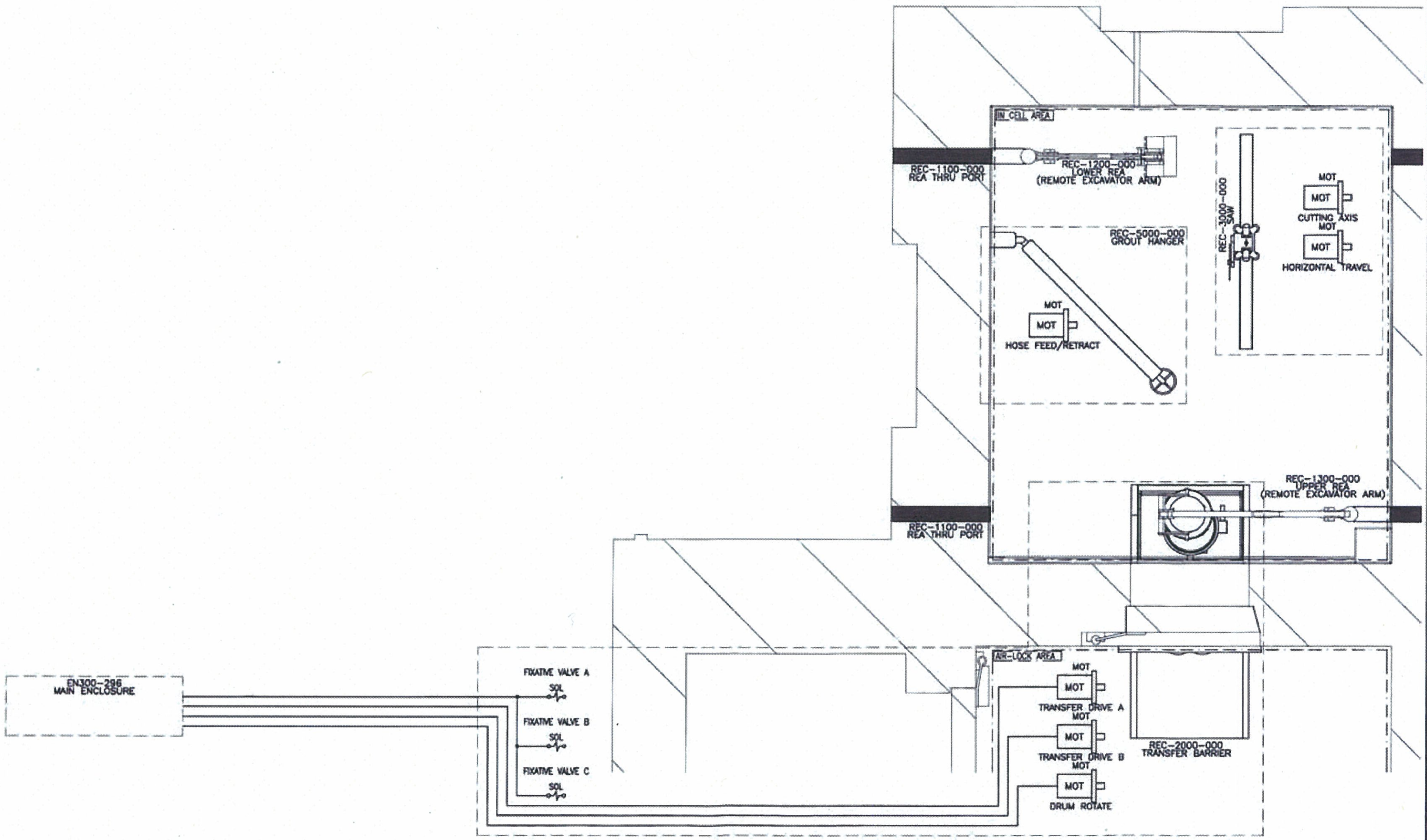
HOR SCALE: NTS
VER SCALE: NTS
DWG NO.: KUR-1782F-DWG-E010
SHEET: 2 OF 4



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Richland, Washington 99352
p. 509.737.1377

NO	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design						[handwritten initials]	[handwritten date]

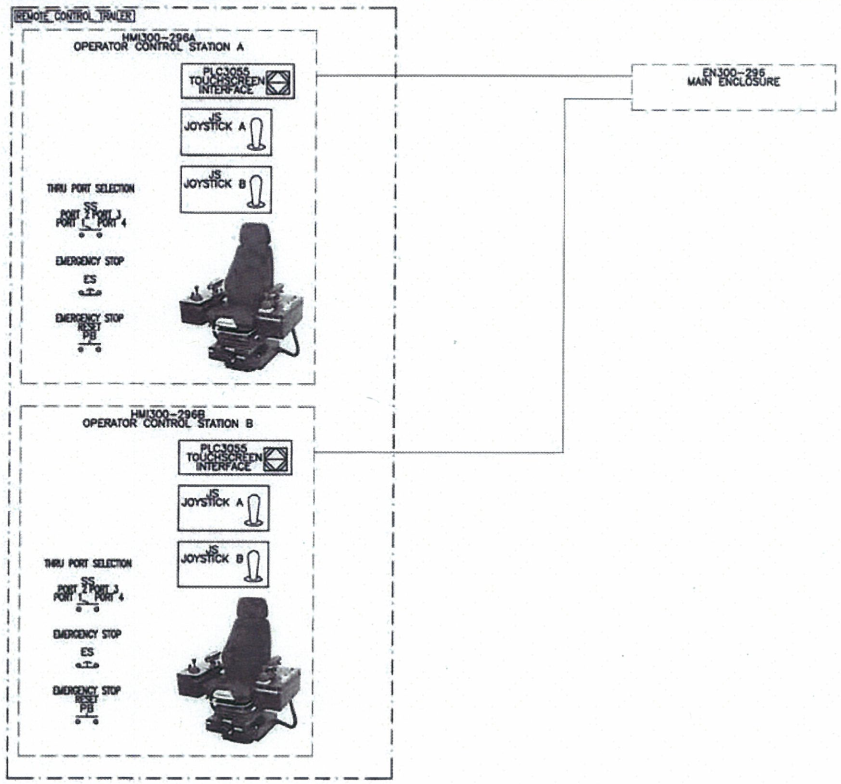
REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL
SINGLE LINE DIAGRAM

CAD FILE: VET-1782F-DWG-E010_S3
REV: A
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PROJ ENG:
PROJ MGR:
CREATED: 6-2-14
SHEET SIZE: B
SCALE:
HOR SCALE: NTS
VER SCALE: NTS
DWG NO.: KUR-1782F-DWG-E010
SHEET: 3 OF 4

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

TRANSFER BASKET CART, GROUT ARM, SAW



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p. 509.737.1377

NO.	DESCRIPTION	BY	D. CHK	ENG	E. CHK	PROJ ENG	PM	DATE
A	30% Design							

REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL
SINGLE LINE DIAGRAM

CAD FILE: VET-1782F-DWG-E010_04
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PROJ ENG:
PROJ MGR:
CREATED: 6-2-14
SHEET SIZE: B
SCALE:
HOR SCALE: NTS
VER SCALE: NTS
DWG NO.: KUR-1782F-DWG-E010
REV: A
SHEET 4 OF 4

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

OPERATOR STATION

NAMEPLATE LETTERING (BYLINE)		NAMEPLATE MATERIAL CODE			NAMEPLATE COLOR CODE		
TYPE	LETTERING HEIGHT	CODE #	MATERIAL TYPE	ATTACHMENT METHOD	CODE #	BACKGROUND COLOR	LETTERING COLOR
B	1/4"	M1	1/8" LAMINATED PLASTIC	EPOXY	1	WHITE	BLACK
A	1/2"	M2	STICKER	N/A	2	RED	WHITE
C	1/8"	M3	DIN ANCHOR LABEL	DIN ANCHOR	3	YELLOW	BLACK

TERMINATION/TAGS

SYMBOL	DESCRIPTION
	TAG, CONDUIT
	TAG, CABLE
	TAG, WIRE
NP#	NAMEPLATE TAG
ITEM	BOM BALLOON

VISION SYSTEM DRAWING SCHEDULE

DRAWING	DESCRIPTION
REC-9000-000	VISION & LIGHTING SYSTEM ONE LINE DIAGRAM
REC-9100-000	THRU WALL VISION & LIGHTING ASSEMBLY
REC-9200-000	THRU WALL LIGHTING ASSEMBLY
REC-9290-000	CELL WINDOW LIGHT ARRAY
REC-9300-000	LOCAL LIGHTING & VISION CONTROL STATION
REC-9500-000	REMOTE LIGHTING & VISION CONTROL LAYOUT
REC-9600-000	CRANE LIGHTING & VISION ASSEMBLY

NAMEPLATE SCHEDULE

NP#	QTY	TYPE	MATERIAL CODE	COLOR CODE	DESCRIPTION
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					

ABBREVIATION

RLVCS	REMOTE LIGTHING & VISION CONTROL SYSTEM
LLVCS	LOCAL LIGTHING & VISION CONTROL SYSTEM

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
XX" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE INC
PART#: -
WT: 4039508.29 Lbs
MATERIAL: Material <not specified>
FINISH: -

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges
103806 E Nipple Vista Drive
Kennewick, Washington 99338
ph: 509.628.9949

REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design						KG	7/24/14

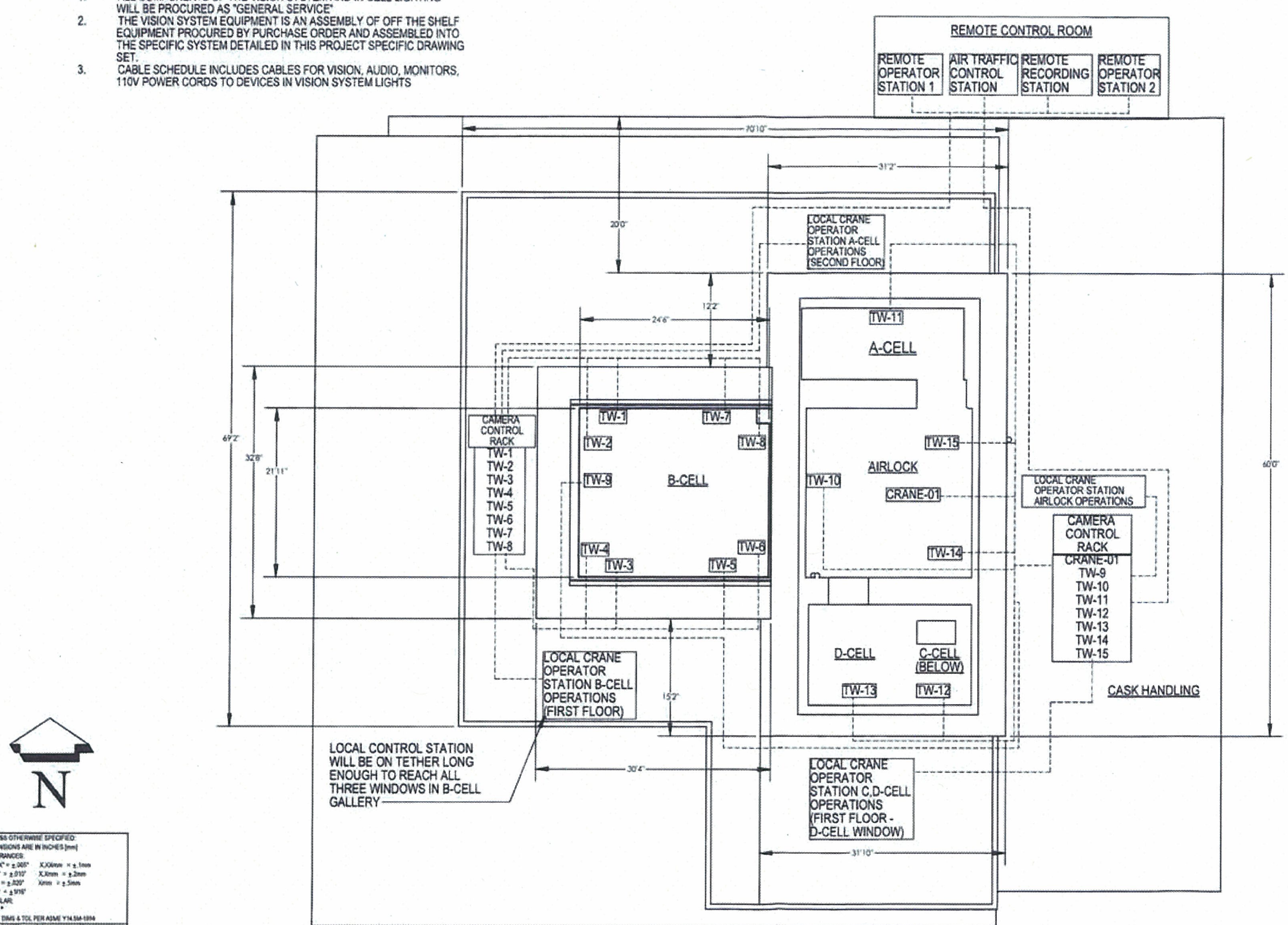
300-296 REMEDIATION
324 BUILDING REC-CELL

VISION SYSTEM ONE LINE DIAGRAM

CAD FILE: REC-9000-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE 1:72
VER SCALE 1:72
DWG NO.:
KUR-1782F-DWG-I-REC-9000-000
SHEET 1 OF 4
REV A

NOTES:

1. ALL COMPONENTS OF THE VISION SYSTEM AND IN CELL LIGHTING WILL BE PROCURED AS "GENERAL SERVICE"
2. THE VISION SYSTEM EQUIPMENT IS AN ASSEMBLY OF OFF THE SHELF EQUIPMENT PROCURED BY PURCHASE ORDER AND ASSEMBLED INTO THE SPECIFIC SYSTEM DETAILED IN THIS PROJECT SPECIFIC DRAWING SET.
3. CABLE SCHEDULE INCLUDES CABLES FOR VISION, AUDIO, MONITORS, 110V POWER CORDS TO DEVICES IN VISION SYSTEM LIGHTS



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.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE INC
PART#: -
WT: 4039508.29 Lbs
MATERIAL: Material <not specified>
FINISH: -

PRELIMINARY PLANS

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103806 E Hipple Vista Drive
Kennewick, Washington 99338
ph: 509 628 9949

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ.ENG	PM	DATE
A	30% Design						KW	7/14/14

REVISION

300-296 REMEDIATION
324 BUILDING REC-CELL

VISION SYSTEM ONE LINE DIAGRAM

CAD FILE: REC-9000-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE: HOR SCALE: 1:150 VER SCALE: 1:150
DWG NO.: KUR-1782F-DWG-I-REC-9000-000
SHEET 2 OF 4
REV A

REMOTE OPERATOR STATION 1

	MONITOR 1			MONITOR 2		
CAMERA	VIEWS	CONTROLS	RECORDS	VIEWS	CONTROLS	RECORDS
TW-1	X	X	X			
TW-2				X	X	X
TW-3						
TW-4						
TW-5	X	X	X			
TW-6				X	X	X
TW-7						
TW-8						
TW-9						
TW-10						
TW-11						
TW-12						
TW-13						
TW-14						
TW-15						
CRANE-01						

REMOTE OPERATOR STATION 2

	MONITOR 1			MONITOR 2		
CAMERA	VIEWS	CONTROLS	RECORDS	VIEWS	CONTROLS	RECORDS
TW-1						
TW-2						
TW-3	X	X	X			
TW-4				X	X	X
TW-5						
TW-6						
TW-7	X	X	X			
TW-8				X	X	X
TW-9						
TW-10						
TW-11						
TW-12						
TW-13						
TW-14						
TW-15						
CRANE-01						

AIR TRAFFIC CONTROL

	MONITOR 1			MONITOR 2		
CAMERA	VIEWS	CONTROLS	RECORDS	VIEWS	CONTROLS	RECORDS
TW-1						
TW-2						
TW-3						
TW-4						
TW-5						
TW-6						
TW-7						
TW-8						
TW-9	X	X	X			
TW-10						
TW-11						
TW-12						
TW-13						
TW-14				X	X	X
TW-15						
CRANE-01						

LOCAL CRANE OPERATOR STATION (A-CELL OPERATIONS)

	MONITOR 1			MONITOR 2		
CAMERA	VIEWS	CONTROLS	RECORDS	VIEWS	CONTROLS	RECORDS
TW-1						
TW-2						
TW-3						
TW-4						
TW-5						
TW-6						
TW-7						
TW-8						
TW-9						
TW-10						
TW-11	X	X	X			
TW-12						
TW-13						
TW-14						
TW-15				X	X	X
CRANE-01						

LOCAL CRANE OPERATOR STATION (C, D-CELL OPERATIONS)

	MONITOR 1			MONITOR 2		
CAMERA	VIEWS	CONTROLS	RECORDS	VIEWS	CONTROLS	RECORDS
TW-1						
TW-2						
TW-3						
TW-4						
TW-5						
TW-6						
TW-7						
TW-8						
TW-9						
TW-10						
TW-11						
TW-12	X	X	X			
TW-13				X	X	X
TW-14	X	X	X			
TW-15						
CRANE-01						

LOCAL CRANE OPERATOR STATION (AIRLOCK OPERATIONS)

	MONITOR 1			MONITOR 2		
CAMERA	VIEWS	CONTROLS	RECORDS	VIEWS	CONTROLS	RECORDS
TW-1						
TW-2						
TW-3						
TW-4						
TW-5						
TW-6						
TW-7						
TW-8						
TW-9	X	X	X			
TW-10				X	X	X
TW-11	X	X	X			
TW-12				X	X	X
TW-13	X	X	X			
TW-14				X	X	X
TW-15	X	X	X			
CRANE-01				X	X	X

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE INC
PART#: -
WT: 4039508.29 Lbs
MATERIAL: Material <not specified>
FINISH: -

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges
103806 E Ripple Vista Drive
Kennewick, Washington 99338
ph: 509.628.9949

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJENG	PM	DATE
A	30% Design						KH	7/24/14

REVISION

300-296 REMEDIATION
324 BUILDING REC-CELL
VISION SYSTEM ONE LINE DIAGRAM

CAD FILE: REC-9000-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE: HOR SCALE: 1:72 VER SCALE: 1:72
DWG NO.: KUR-1782F-DWG-I-REC-9000-000
SHEET 3 OF 4
REV: A

LOCAL CRANE OPERATOR STATION (B-CELL OPERATIONS)

	MONITOR 1			MONITOR 2		
CAMERA	VIEWS	CONTROLS	RECORDS	VIEWS	CONTROLS	RECORDS
TW-1	X	X	X			
TW-2				X	X	X
TW-3	X	X	X			
TW-4				X	X	X
TW-5	X	X	X			
TW-6				X	X	X
TW-7	X	X	X			
TW-8				X	X	X
TW-9						
TW-10						
TW-11						
TW-12						
TW-13						
TW-14						
TW-15						
CRANE-01						

B-Cell Vision System Plan

Desired Cell View	Camera ID	Camera Location	Specific Location	Equipment
REA NW Corner	TW-1	Thru wall North	Sleeve # XXXXXX	RCS-2030
	TW-2	Thru Wall West	Sleeve # XXXXXX	RCS-2030
REA SW Corner	TW-3	Thru wall South	Sleeve # XXXXXX	RCS-2030
	TW-4	Thru Wall West	Sleeve # XXXXXX	RCS-2030
REA SE Corner	TW-5	Thru wall South	Sleeve # XXXXXX	RCS-2030
	TW-6	Thru Wall East	Sleeve # XXXXXX	RCS-2030
REA NE Corner	TW-7	Thru wall North	Sleeve # XXXXXX	RCS-2030
	TW-8	Thru Wall East	Sleeve # XXXXXX	RCS-2030
B-Cell/Airlock Bag Handling Operations	TW-9	West Wall	Sleeve # XXXXXX	RCS-2030
	TW-10	West Wall	Sleeve # XXXXXX	RCS-2030
A-Cell Vision System Plan				
A-Cell Overview	TW-11	North Wall	Sleeve # XXXXXX	RCS-2030
C-Cell Vision System Plan				
C-Cell Overview	TW-12	South Wall	Sleeve # XXXXXX	RCS-2030
D-Cell Vision System Plan				
D-Cell Overview	TW-13	South Wall	Sleeve # XXXXXX	RCS-2030
Airlock Vision System Plan				
Airlock Overview	TW-14	East Wall	Sleeve # XXXXXX	RCS-2030
Airlock Crane Operations	TW-15	East Wall	Sleeve # XXXXXX	RCS-2030
All Cells and Airlock	Crane-01	Crane portable	Crane	RCS-3110

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PART#: -
WT: 4039508.29 Lbs
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A	30% Review						LK	7/24/14

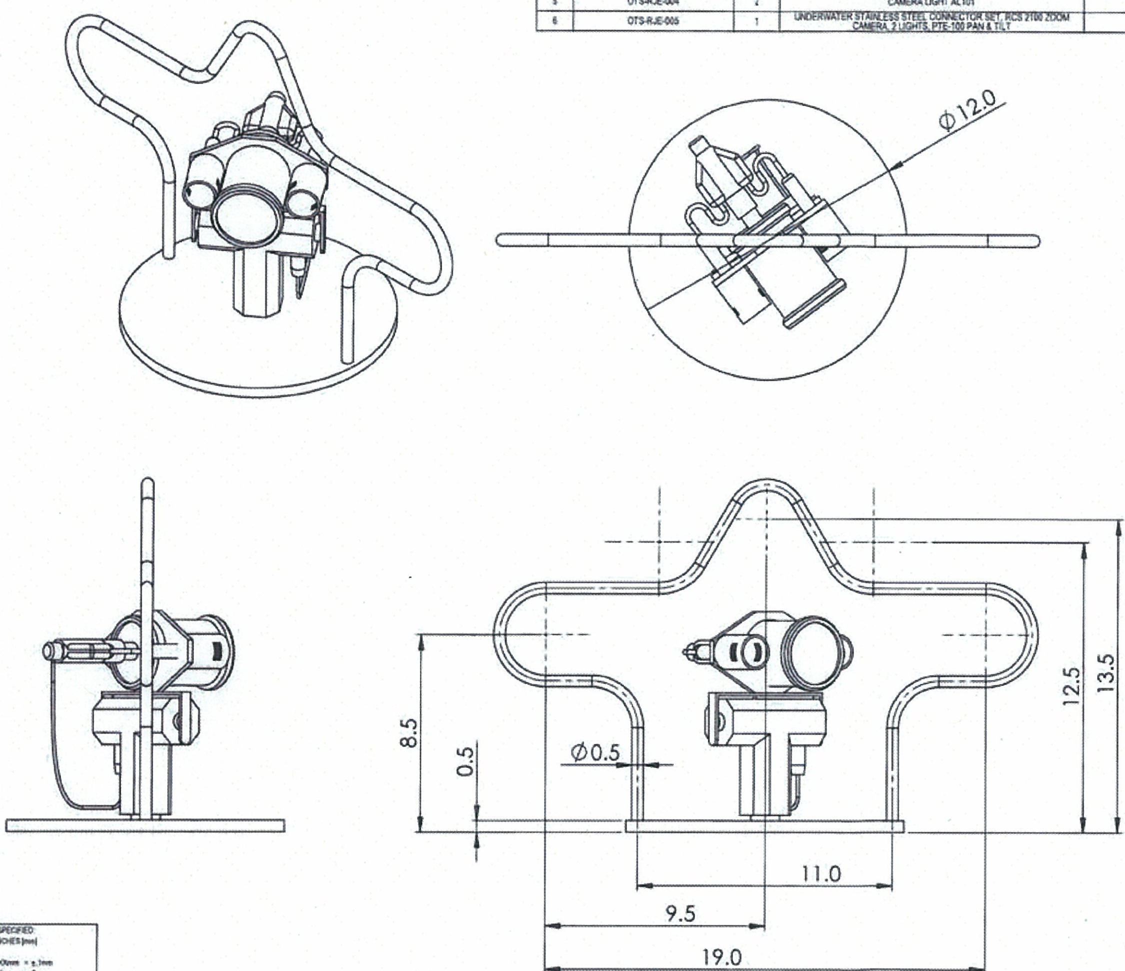
REVISION

300-296 REMEDIATION
324 BUILDING REC-CELL

VISION SYSTEM ONE LINE DIAGRAM

CAD FILE: REC-9000-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:72
VER SCALE: 1:72
DWG NO.: KUR-1782F-DWG-I-REC-9000-000
SHEET 4 OF 4
REV A

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-9600-001	1	CRANE DEPLOYED CAMERA ASSEMBLY				
2	OTS-RJE-001	1	CAMERA PAN & TILT				
3	OTS-RJE-002	1	CAMERA LIGHT BRACKET				
4	OTS-RJE-003	1	CAMERA RCS 3100				
5	OTS-RJE-004	2	CAMERA LIGHT AL101				
6	OTS-RJE-005	1	UNDERWATER STAINLESS STEEL CONNECTOR SET, RCS 2100 ZOOM CAMERA, 2 LIGHTS, PTE-100 PAN & TILT				



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ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE INC
PART#: REC-9600-000
WT: 19.69 Lbs
MATERIAL: Material <not specified>
FINISH: -

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Engineered Solutions for Tomorrows Hazardous Challenges
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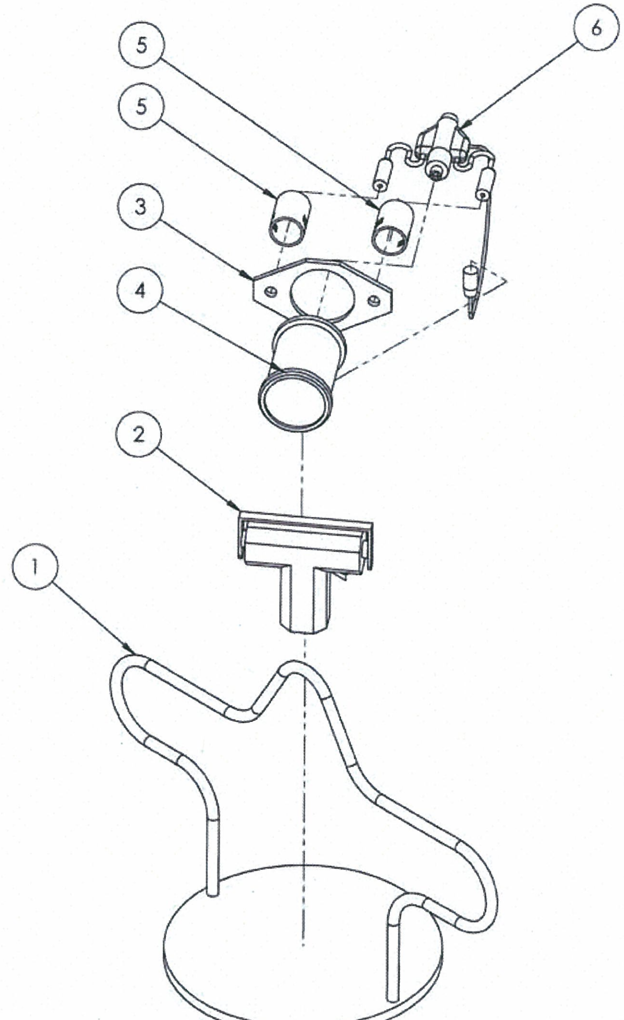
A	30% Design						VG	7/24/14

300-296 REMEDIATION
324 BUILDING - REC CELL

CRANE LIGHTING & VISION ASSEMBLY

CAD FILE: REC-9600-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:5
VER SCALE: 1:5
DWG NO.: KUR-1782F-DWG-I-REC-9600-000
SHEET 1 OF 2
REV. A



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REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL

CRANE LIGHTING & VISION ASSEMBLY

CAD FILE: REC-9600-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:5
VER SCALE: 1:5
DWG NO.:
KUR-1782F-DWG-I-REC-9600-000
SHEET
2 OF 2
REV A

PRELIMINARY PLANS

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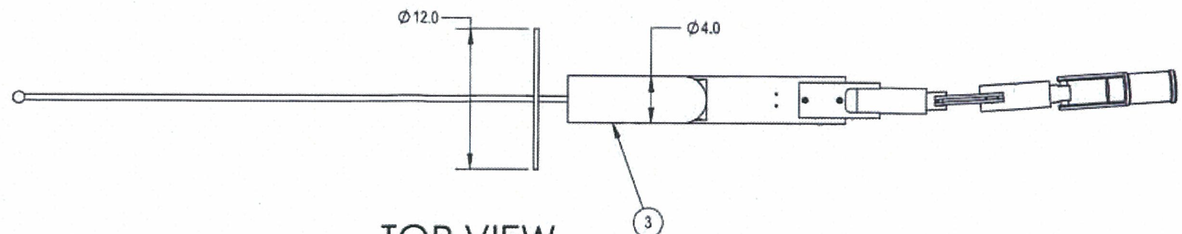
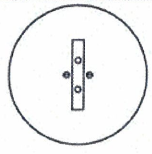
ANGULAR:
± .5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE INC
PART#: REC-9600-000
WT: 19.69 Lbs
MATERIAL: Material <not specified>
FINISH: -

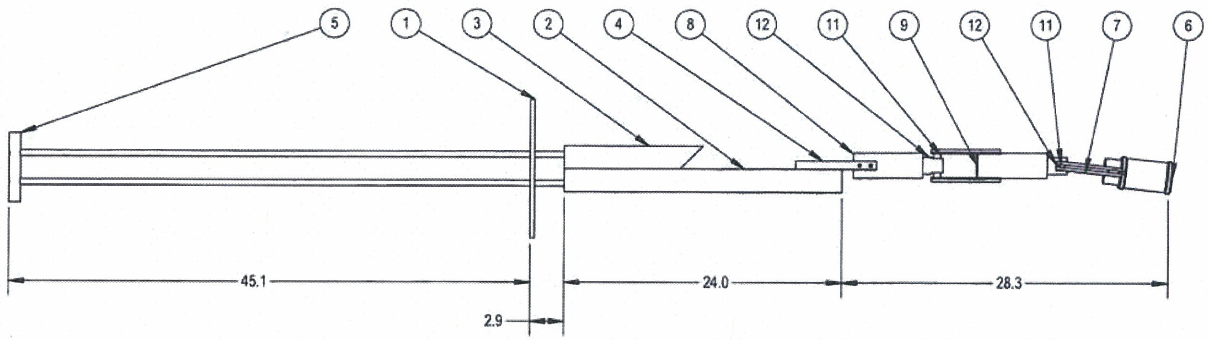
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	REC-9120-001	THRU WALL CAMERA MOUNT PLATE	1
2	REC-9120-002	THRU WALL CAMERA LOWER SPLIT PLUG & SLIDE BAR	1
3	REC-9120-003	THRU WALL CAMERA TOP PLUG AND SLIDE BAR	1
4	REC-9120-004	SPLIT PLUG/PAN MOTOR INTERFACE PLATE	1
5	REC-9120-005	OPERATOR HANDLE	1
6	REC-9100-001	CAMERA RCS 2100	1
7	REC-9100-002	PAN & TILT ARM	4
8	REC-9100-003	PAN & TILT MOTOR HOUSING	2
9	REC-9100-004	PAN & TILT END CAP (WIRE END)	2
10	REC-9100-004	PAN & TILT END CAP (MOTOR END)	2
11	REC-9100-005	PAN & TILT SHAFT	2
12	REC-9100-006	PAN & TILT GEAR BOX	2



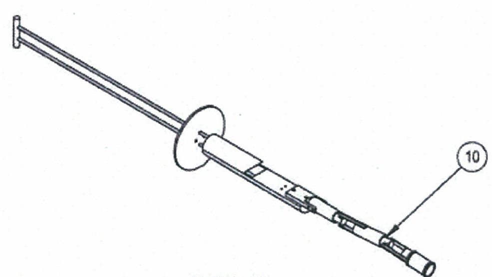
TOP VIEW



END VIEW



SIDE VIEW



SCALE 1 : 20

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" XXXmm = ±.1mm
.XX" = ±.010" XXmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE
PART#: -
WT: 84.19 Lbs
MATERIAL: Material <not specified>
FINISH: -

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges
103806 E Tripple Vista Drive
Kennewick, Washington 99338
ph: 509 438 9949

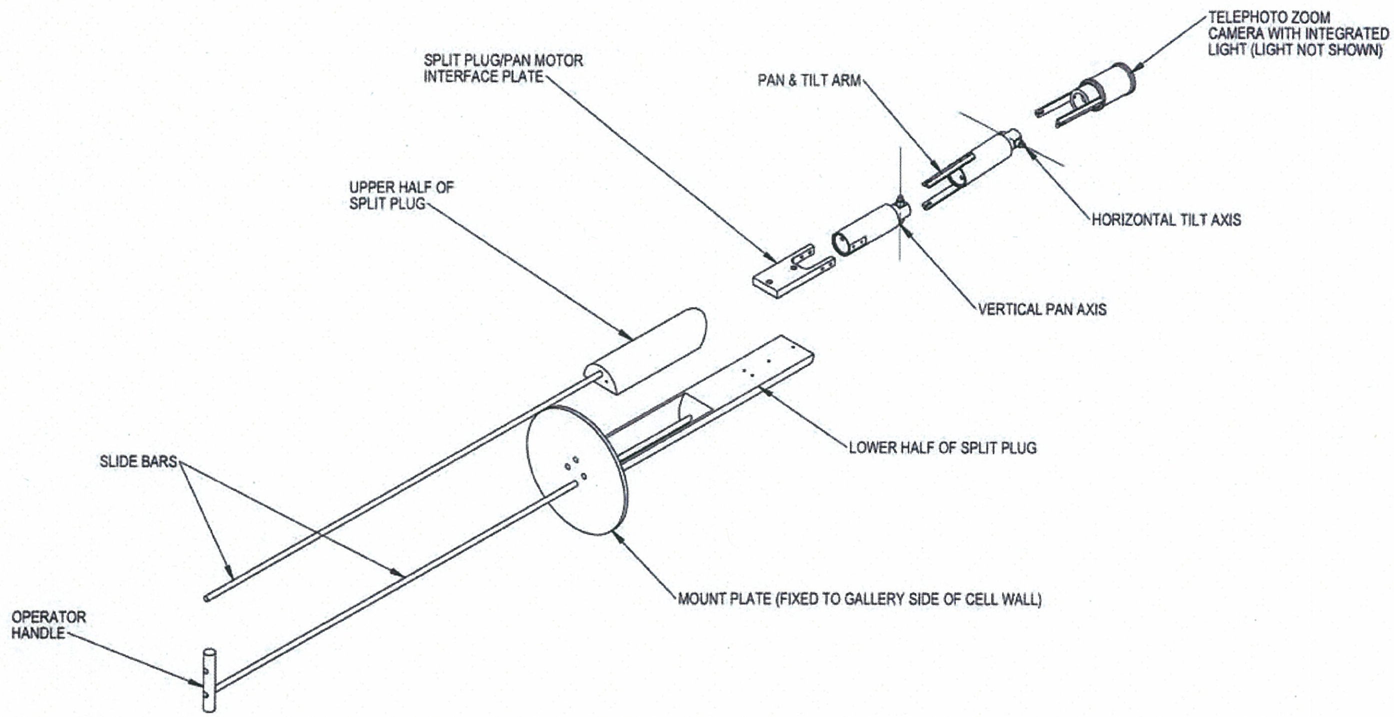
NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ.ENG	PM	DATE
A	30% Design							

REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL

THRU WALL VISION & LIGHTING ASSEMBLY

CAD FILE: REC-9100-000
DRAWN: VER
DFT CHK:
ENG: VER
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED: 5-22-14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:10
VER SCALE: 1:10
DWG NO.:
KUR-1782F-DWG-I-REC-9100-000
SHEET 1 OF 2
REV A



REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges
103804 E Nipple Vista Drive
Kennewick, Washington 99338
ph: 509.426.9149

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	2016 Design							

REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL

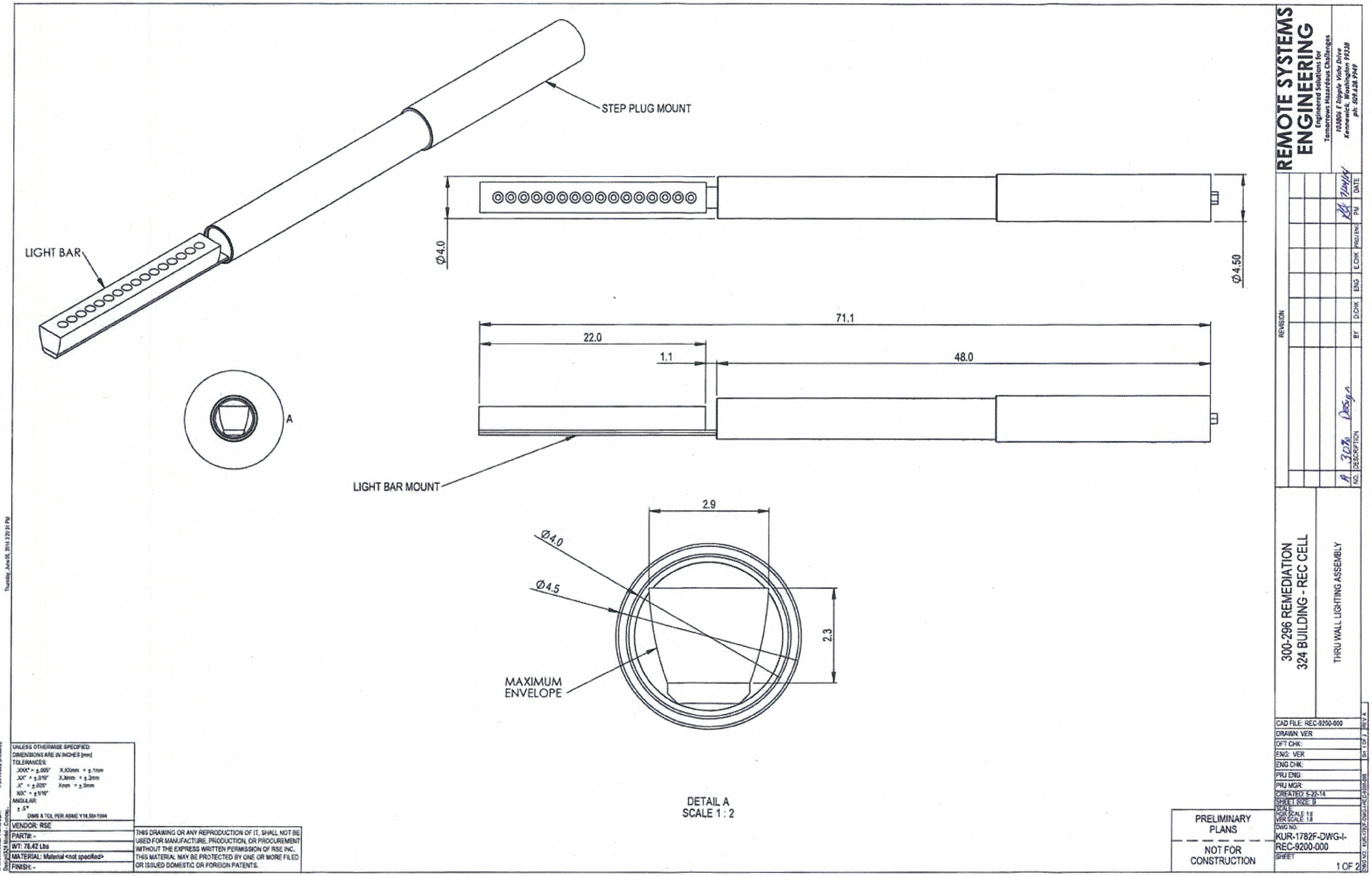
THRU WALL VISION & LIGHTING ASSEMBLY

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

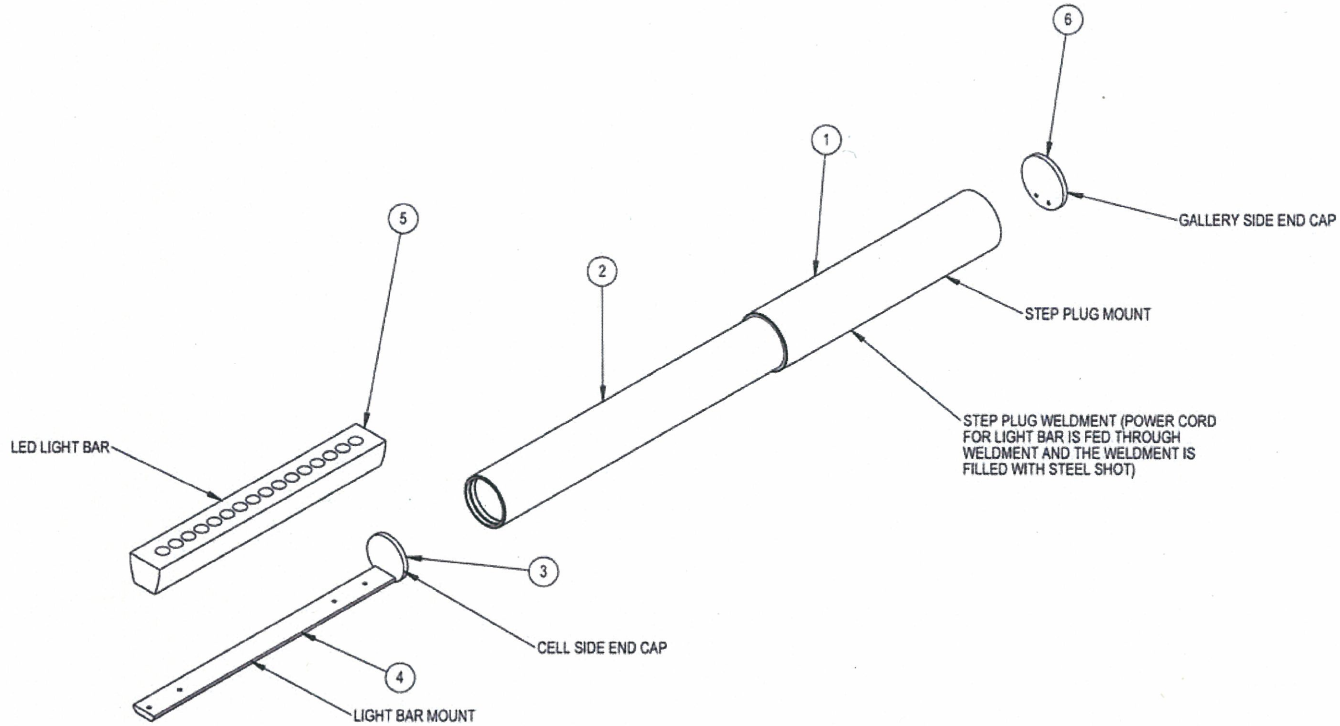
VENDOR: RSE
PART#: -
WT: 84.19 Lbs
MATERIAL: Material <not specified>
FINISH: -

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

CAD FILE: REC-9100-000
DRAWN: VER
DFT CHK:
ENG: VER
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED: 5-22-14
SHEET SIZE: B
SCALE: HOR SCALE: 1:10 VER SCALE: 1:10
DWG NO.: KUR-1782F-DWG-I-REC-9100-000
SHEET 2 OF 2
REV A


STEP PLUG MOUNT
LIGHT BAR
Ø4.0
Ø4.50
71.1
22.0
1.1
48.0
A
LIGHT BAR MOUNT
2.9
Ø4.0
Ø4.5
2.3
MAXIMUM ENVELOPE
DETAIL A
SCALE 1 : 2
REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges
103806 E Tripple Vista Drive
Kennewick, Washington 99338
ph: 509.438.9949
REVISION
NO. DESCRIPTION BY D.CHK ENG E.CHK PROJ.ENG PM DATE
A 30% Design
300-296 REMEDIATION
324 BUILDING - REC CELL
THRU WALL LIGHTING ASSEMBLY
CAD FILE: REC-9200-000
DRAWN: VER
DFT CHK:
ENG: VER
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED: 5-22-14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:8
VER SCALE: 1:8
DWG NO.:
KUR-1782F-DWG-I-REC-9200-000
SHEET
1 OF 2
REV A
SH 1 OF 2
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994
VENDOR: RSE
PART#: -
WT: 78.42 Lbs
MATERIAL: Material <not specified>
FINISH: -
THIS DRAWING OR ANY REPRODUCTION OF IT, SHALL NOT BE USED FOR MANUFACTURE, PRODUCTION, OR PROCUREMENT WITHOUT THE EXPRESS WRITTEN PERMISSION OF RSE INC. THIS MATERIAL MAY BE PROTECTED BY ONE OR MORE FILED OR ISSUED DOMESTIC OR FOREIGN PATENTS.

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-9220-001	1	-TUBE	RSE	-001	Plain Carbon Steel	-125
2	REC-9220-002	1	-TUBE	RSE	-001	Plain Carbon Steel	-125
3	REC-9210-005	1	LIGHT BAR MOUNT PLUG				
4	REC-9210-004	1	LIGHT SUPPORT BAR				
5	REC-9210-003	1	LIGHT BAR	RSE INC	-	Plain Carbon Steel	-
6	REC-9210-005	1	LIGHT BAR MOUNT PLUG				



REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design							

REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL

THRU WALL LIGHTING ASSEMBLY

CAD FILE: REC-9200-000
DRAWN: VER
DFT CHK:
ENG: VER
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED: 5-22-14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:6
VER SCALE: 1:6
DWG NO.:
KUR-1782F-DWG-I-REC-9200-000
SHEET 2 OF 2
REV A

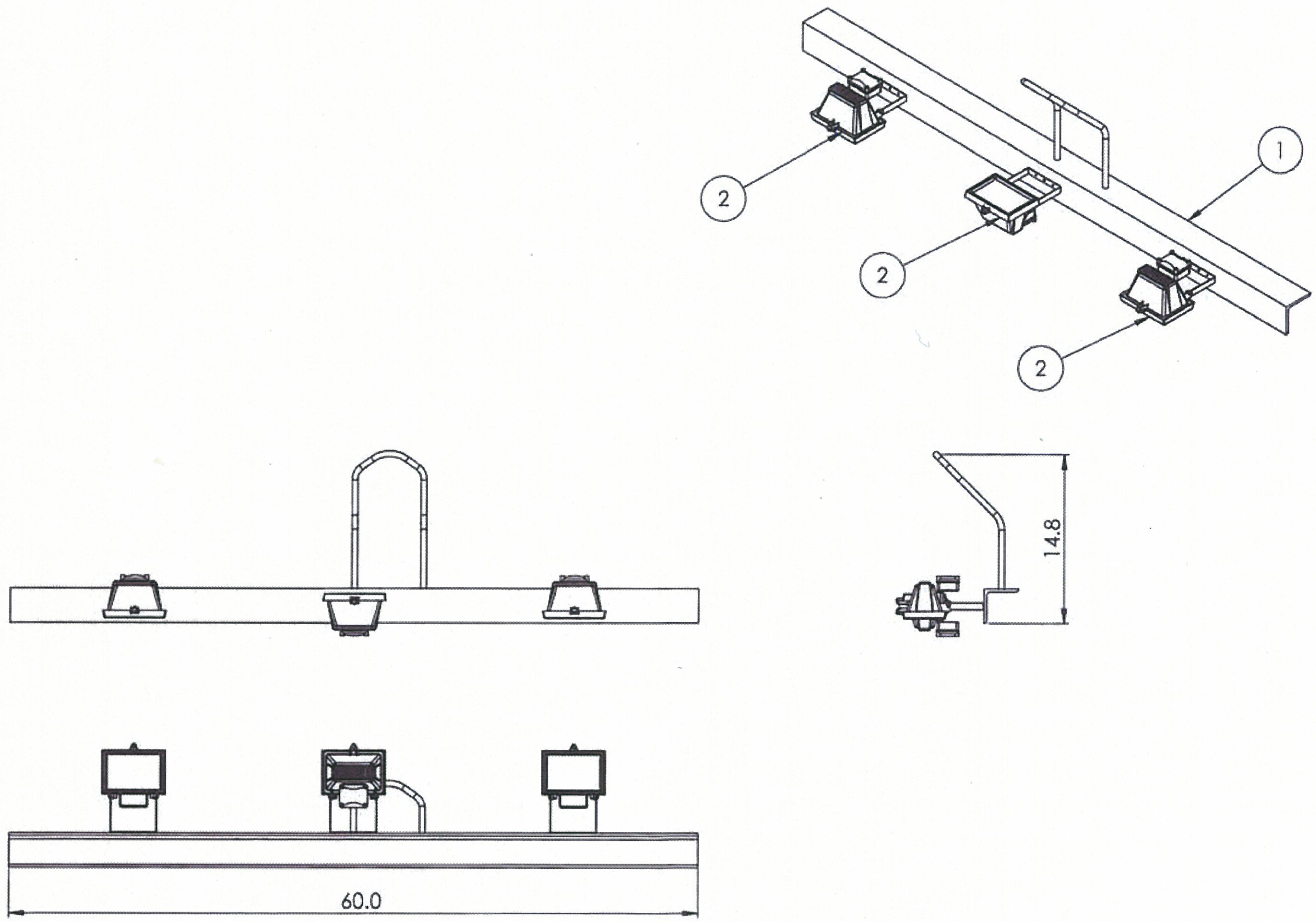
PRELIMINARY PLANS

NOT FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE
PART#: -
WT: 78.42 Lbs
MATERIAL: Material <not specified>
FINISH: -

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-9290-001	1	CUSTOM WELDMENT- MOUNT BAR & LIFT BAIL				
2	OTS-MCM-1549K13	3	HALOGEN FLOOD LIGTHS				



REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges
103806 E Tripple Vista Drive
Kennewick, Washington 99338
ph: 509.438.9949

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design						KD	7/24/14

REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL

CELL WINDOW LIGHT ARRAY

CAD FILE: REC-9290-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE 1:10
VER SCALE 1:10
DWG NO.:
KUR--1782F-DWG-I-REC-9290-000
SHEET
1 OF 1

REV A
SH 1 OF 1
DWG NO. KUR-1782F-DWG-I-REC-9290-000

PRELIMINARY PLANS

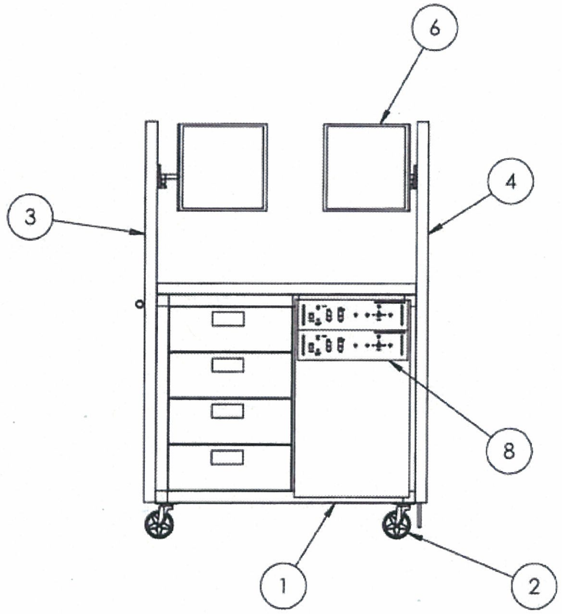
NOT FOR CONSTRUCTION

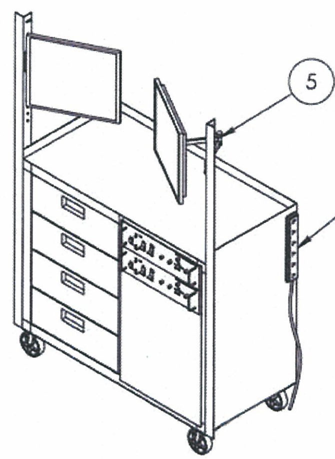
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Remote Systems Engineering
PART#: -
WT: 27.44 Lbs
MATERIAL: Material <not specified>
FINISH: -

Thursday, June 05, 2014 2:21:58 PM

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	OTS-MCM-4874T17-001	1	CABINET				
2	OTS-MCM-4874T17-002	4	CASTERS				
3	REC-9300-001	1	angle Iron Supports_Left				
4	REC-9300-002	1	angle Iron Supports_Right				
5	Sanus VM3b Vision Mount	2	Sanus VM3b Vision Mount				
6	OTS-17 Monitor	2	17 Monitor				
7	OTS-MCM-4874T17-003	1	POWER STRIP				
8	OTS - CAMERA CONTROLLER	2	COLOR CAMERA CONTROL UNIT				





UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE
PART#: OTS-4874T17
WT: 615.82 Lbs
MATERIAL: Material <not specified>
FINISH: -

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges
103806 E Tripple Vista Drive
Kennewick, Washington 99338
ph: 509 438 9949

REVISION

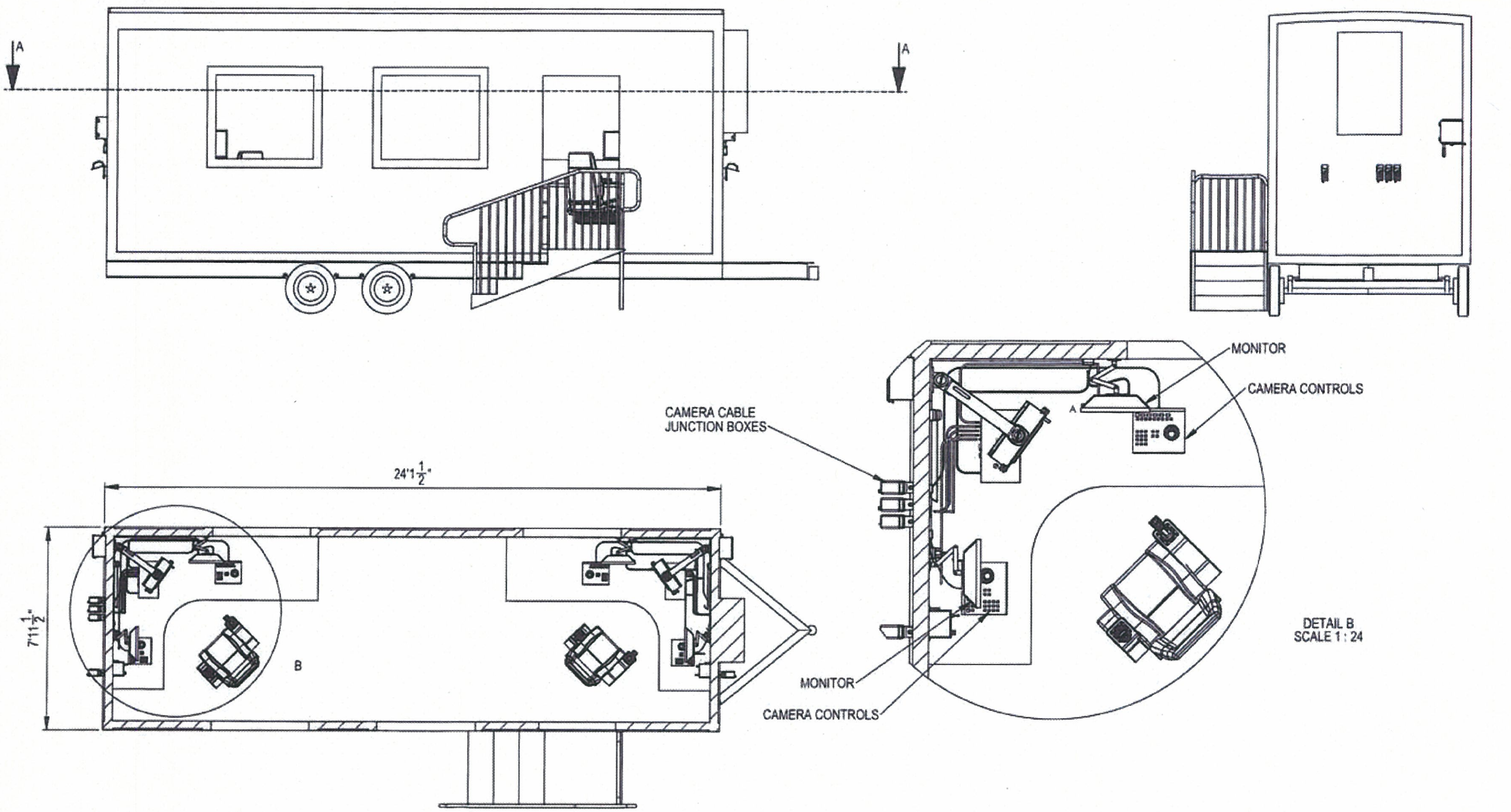
NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PRJ ENG	PM	DATE
A	30% Design						[illegible]	7/21/14

300-296 REMEDIATION
324 BUILDING - REC CELL

LOCAL LIGHTING & VISION CONTROL STATION

CAD FILE: REC-9300-000
DRAWN: VER
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED: 5-29-20
SHEET SIZE: B
SCALE:
HOR SCALE: 1:20
VER SCALE: 1:20
DWG NO.:
KUR-1782F-DWG-I-REC-9300-000
SHEET
1 OF 1

REV A



SECTION A-A

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE INC
PART#: -
WT: 33916.22 Lbs
MATERIAL: Material <not specified>
FINISH: SEE SUBASSEMBLY

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges
103606 E Tripple Vista Drive
Kennewick, Washington 99338
ph: 509.628.9949

REVISION

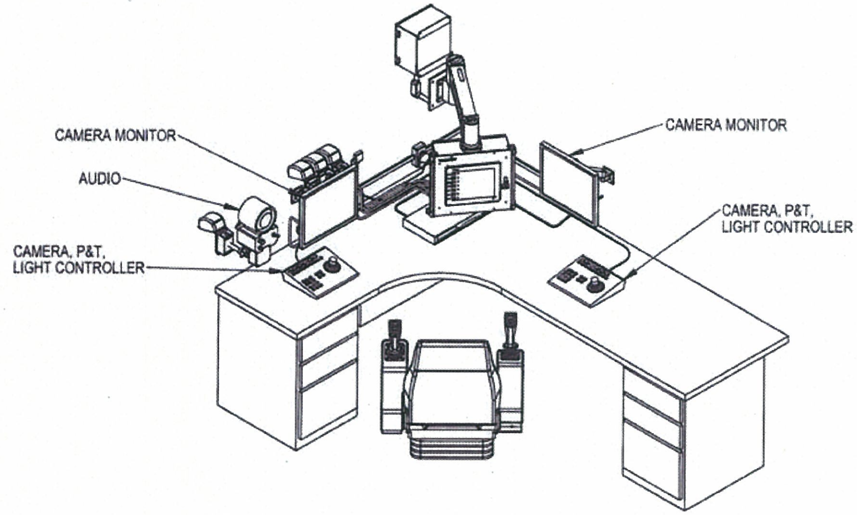
NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design						KW	7/2/14

300-296 REMEDIATION
324 BUILDING-REC CELL

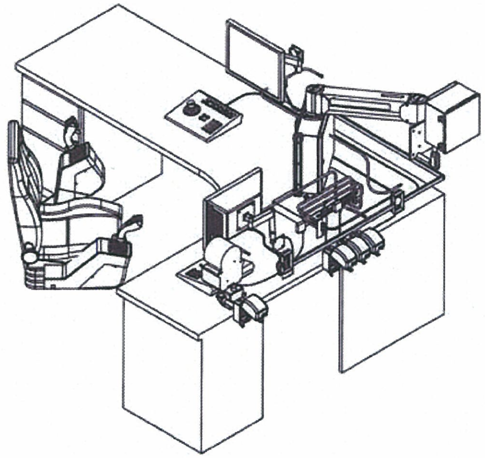
REMOTE LIGHTING & VISION CONTROL LAYOUT

CAD FILE: REC-9500-000
DRAWN: VER
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED: 5-15-14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:48
VER SCALE: 1:48
DWG NO.:
KUR-1782F-DWG-I-REC-9500-000
SHEET
1 OF 2
SH 1 OF 2 | REV A

NOTE: TRAILER IS HIDDEN FOR CLARITY



REMOTE LIGHTING & VISION CONTROL STATION 1



REMOTE LIGHTING & VISION CONTROL STATION 2

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005"   X.XXmm = ±.1mm
.XX" = ±.010"   X.Xmm = ±.2mm
.X" = ±.020"   Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: RSE INC
PART#: -
WT: 33916.22 Lbs
MATERIAL: Material <not specified>
FINISH: SEE SUBASSEMBLY

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

REMOTE SYSTEMS ENGINEERING
Engineered Solutions for Tomorrows Hazardous Challenges
103804 E Hippie Vista Drive
Kennewick, Washington 99338
ph: 509.628.9949

REVISION

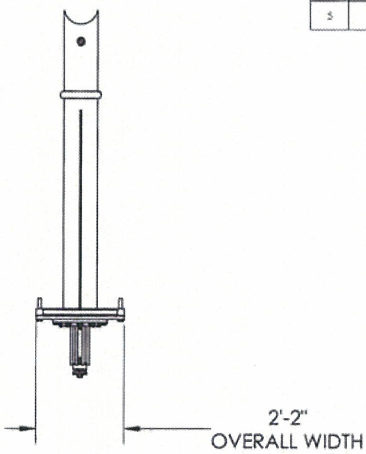
NO	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ.ENG	PM	DATE
A	30% Design						KK	7/21/14

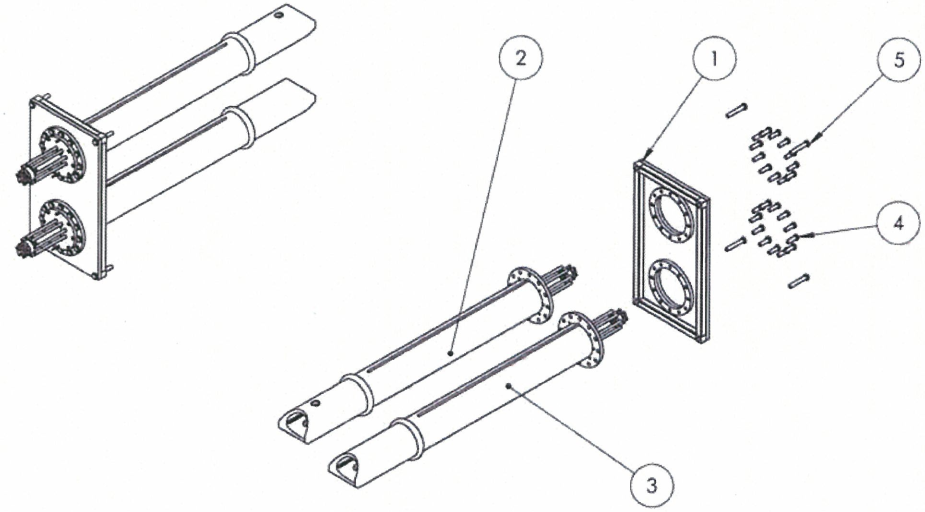
300-296 REMEDIATION
324 BUILDING-REC CELL

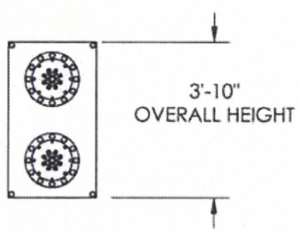
REMOTE LIGHTING & VISION CONTROL LAYOUT

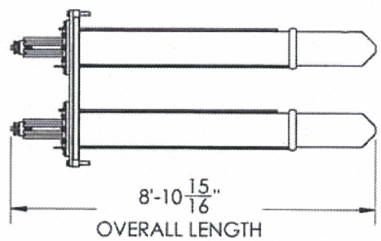
CAD FILE: REC-9500-000
DRAWN: VER
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED: 5-15-14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:24
VER SCALE: 1:24
DWG NO.:
KUR-1782F-DWG-I-REC-9500-000
SHEET
2 OF 2
REV A

#	PART NUMBER	NO POLE/QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-1110-000	1	THRU PORT ALIGNMENT FIXTURE	Kurion	-	SEE SUB ASSY	Powder Coat
2	REC-1120-000	1	THRU SUPPORT - TOP	Kurion	-	SEE SUB ASSY	Per Sub
3	REC-1130-000	1	THRU SUPPORT LOWER	Kurion	-	SEE SUB ASSY	Per Sub
4	HHCS-IN-CS-1-8x3000-Gr8	24	Hex Head, Inch, Grade 8, Yellow Zinc	MCM	92620A957	Plain Carbon Steel	Yellow Zinc
5	HHCS-IN-CS-1-8x6000-Gr8	4	Hex Head, Inch, Grade 8, Yellow Zinc	MCM	92620A966	Plain Carbon Steel	Yellow Zinc









UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
X.XX" = ±.005" X.XXmm = ±.1mm
X.X" = ±.010" X.Xmm = ±.2mm
X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
± .5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: KURION
PART#: -
WT: 2385.83 Lbs
MATERIAL: Material <not specified>
FINISH: Per Sub

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p.509.737.1377

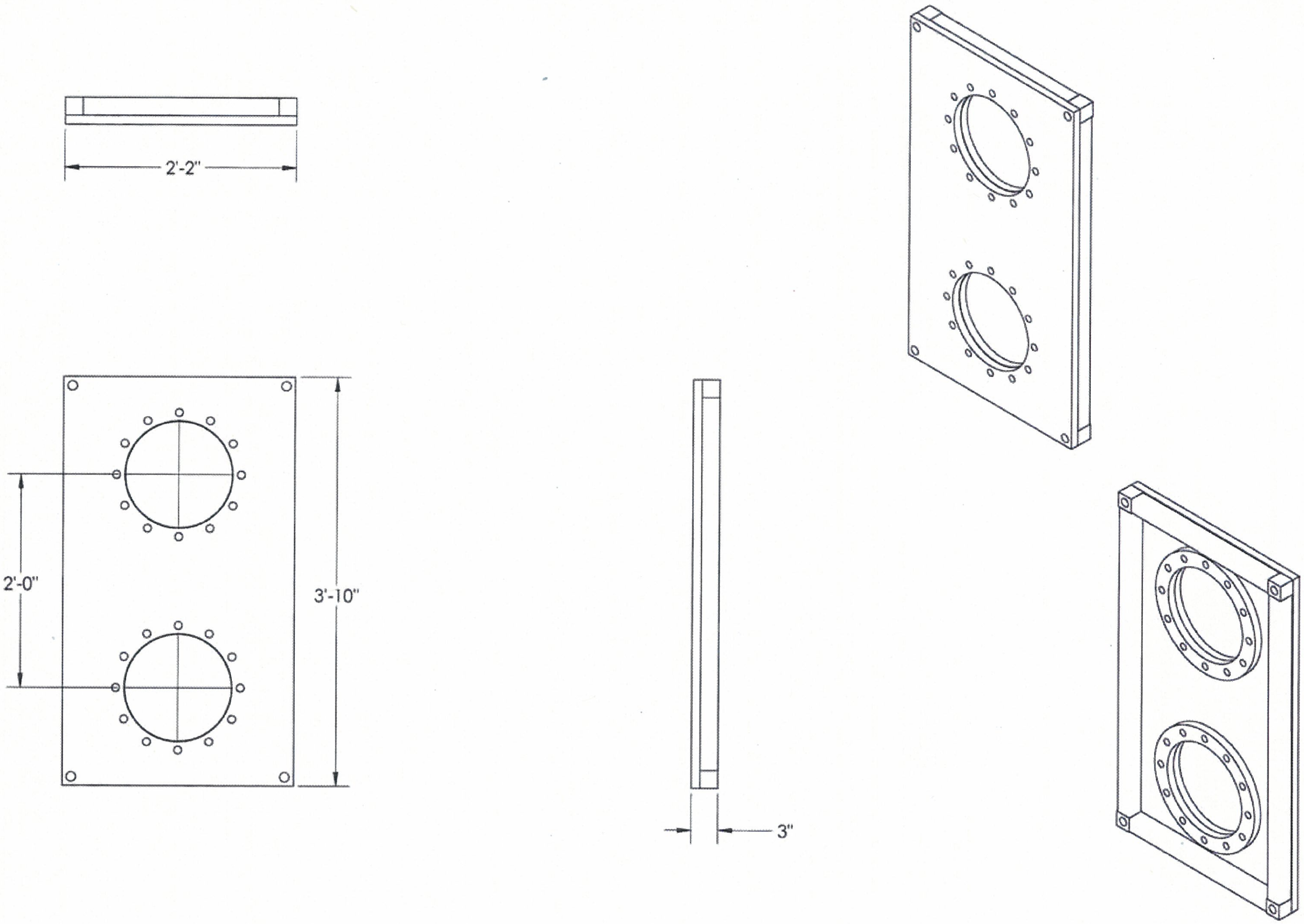
REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ.ENG	PM	DATE

300-296 REMEDIATION
324 BUILDING - REC CELL

Upper and Lower REA
REA Through Support

CAD FILE: REC-1100-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED: 6 - 2 - 2014
SHEET SIZE: B
SCALE:
HOR SCALE: 1:50
VER SCALE: 1:50
DWG NO.:
KUR-1782F-DWG-M
REC-1100-000
SHEET 1 OF 1
REV: A



KURION
Isolating Waste from the Environment

1355 Columbia Park Trail
Richland, Washington 99352
p.502.737.1377

NO.	DESCRIPTION	BY	D CHK	ENG	E CHK	PROJ ENG	PM	DATE
	REVISION							

300-296 REMEDIATION
324 BUILDING - REC CELL

Through Support Anchor Plate

CAD FILE: REC-1110-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:12
VER SCALE: 1:12
DWG NO.:
KUR-1782F-DWG-M-REC-1110-000
SHEET
1 OF 1

SH: 1 OF 1 | REV: A
DWG NO.: KUR-1782F-DWG-M-REC-1110-000

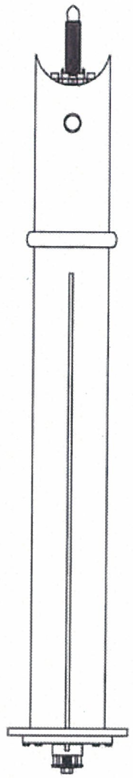
PRELIMINARY PLANS

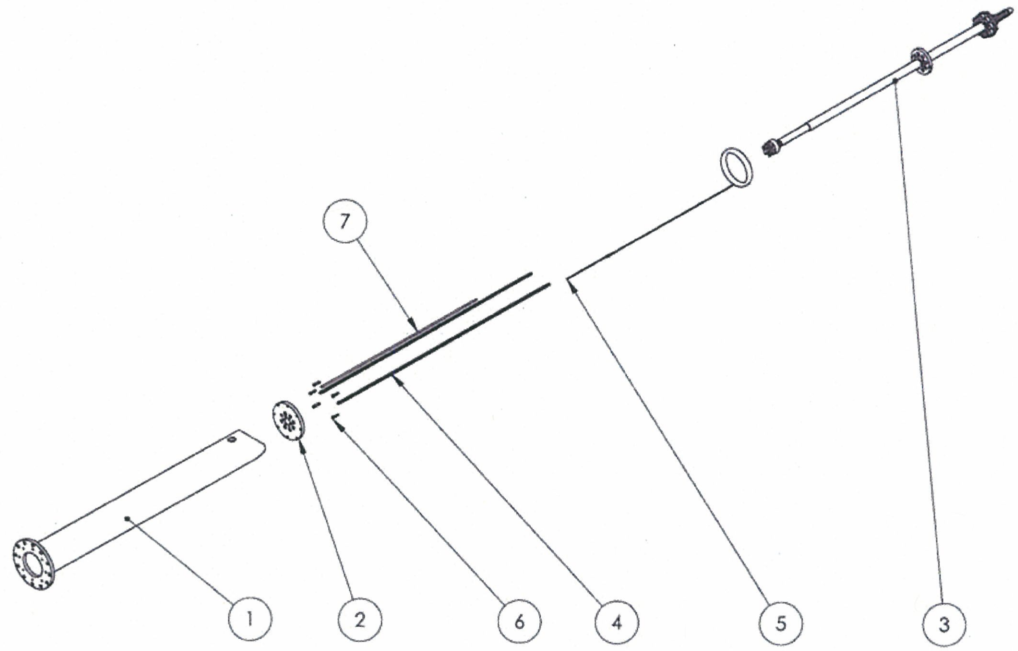
NOT FOR CONSTRUCTION

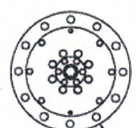
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
± .5°
DIMS & TOL PER ASME Y14.5M-1994

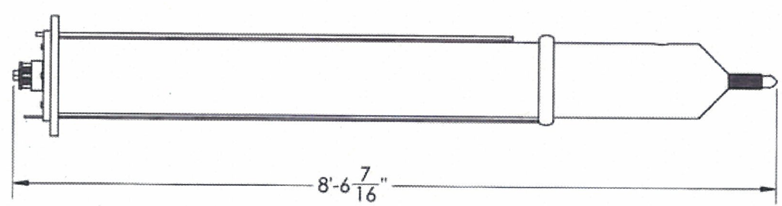
VENDOR: Kurion
PART#: -
WT: 382.53 Lbs
MATERIAL: Material <not specified>
FINISH: Powder Coat

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-1121-000	1	Thru Support - Upper Weldment	Kurion	-	SEE SUB ASSY	Powder Coat
2	REC-1120-001	1	Thru Support Top Blank Plate	Kurion	-	Plain Carbon Steel	Powder Coat
3	REC-1122-000	1	Thru Support Top Bolt	Kurion	-	SEE SUB ASSY	Per Sub
4	REC-1120-004	2	Thru Support Key Way	Kurion	-	Plain Carbon Steel	Zinc
5	REC-1120-005	1	Thru Tube Inflatable Seal	TBD	-	Rubber	-
6	HHCS-IN-CS-1-2-13x2000-Gr8	6	Hex Head, Inch, Grade 8, Yellow Zinc	MCM	92620A720	Plain Carbon Steel	Yellow Zinc
7	REC-1122-006	1	Thru Support Grout Tube	Kurion	-	Plain Carbon Steel	NONE REQUIRED









KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p.502.737.1377

REVISION

NO	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
							KL	6/25/14

300-296 REMEDIATION
324 BUILDING - REC CELL

Through Support - Upper

CAD FILE: REC-1120-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:16
VER SCALE: 1:16
DWG NO.:
KUR-1782F-DWG-M
REC-1120-000
SHEET
1 OF 1

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
± .5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 986.02 Lbs
MATERIAL: Material <not specified>
FINISH: Per Sub

Friday, July 11, 2014 2:58:36 PM

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-1131-000	1	Thru Support - Upper Weldment	Kurion	-	SEE SUB ASSY	Powder Coat
2	REC-1120-001	1	Thru Support Top Blank Plate	Kurion	-	Plain Carbon Steel	Powder Coat
3	REC-1132-000	1	Thru Support Top Bolt	Kurion	-	SEE SUB ASSY	Per Sub
4	REC-1120-004	2	Thru Support Key Way	Kurion	-	Plain Carbon Steel	Zinc
5	HHCS-IN-CS-1-2-13x2000-Gr8	6	Hex Head, Inch, Grade 8, Yellow Zinc	MCM	92620A720	Plain Carbon Steel	Yellow Zinc
6	REC-1120-005	1	Thru Tube Inflatable Seal	TBD	-	Rubber	-
7	REC-1122-006	1	Thru Support Grout Tube	Kurion	-	Plain Carbon Steel	NONE REQUIRED

KURION
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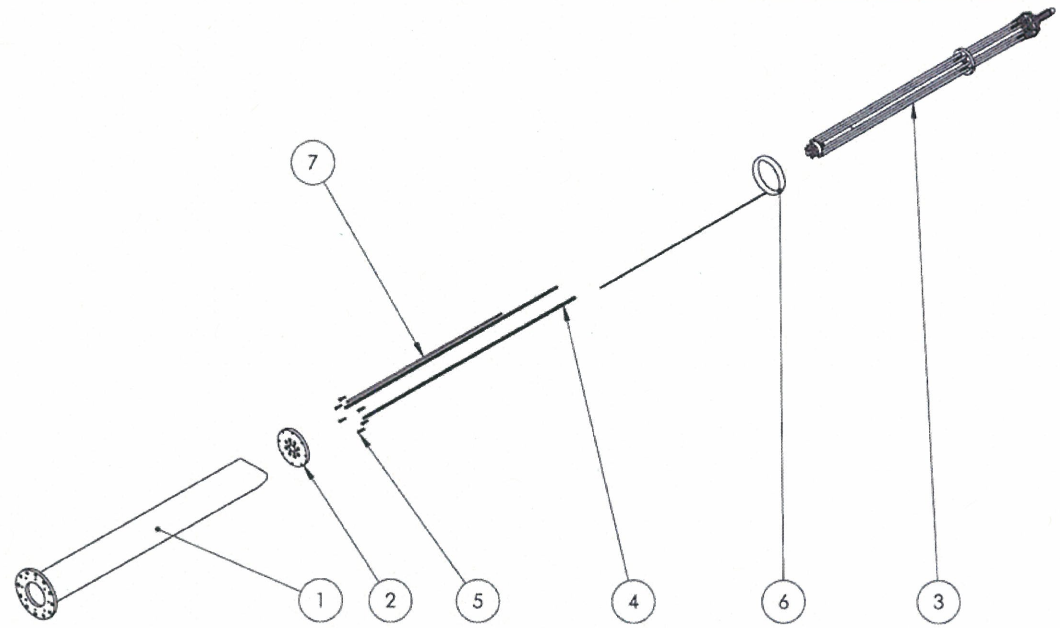
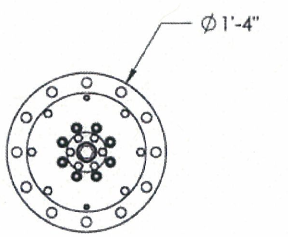
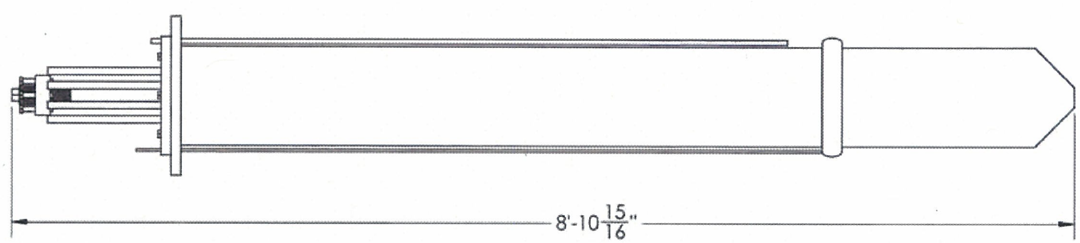
1355 Columbia Park Trail
Richland, Washington 99352
p.509.737.1377







NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE

REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL

Through Support - Lower

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
XXX" = ±.005" X.XXmm = ±.1mm
XX" = ±.010" X.Xmm = ±.2mm
X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 986.93 Lbs
MATERIAL: Material <not specified>
FINISH: Per Sub

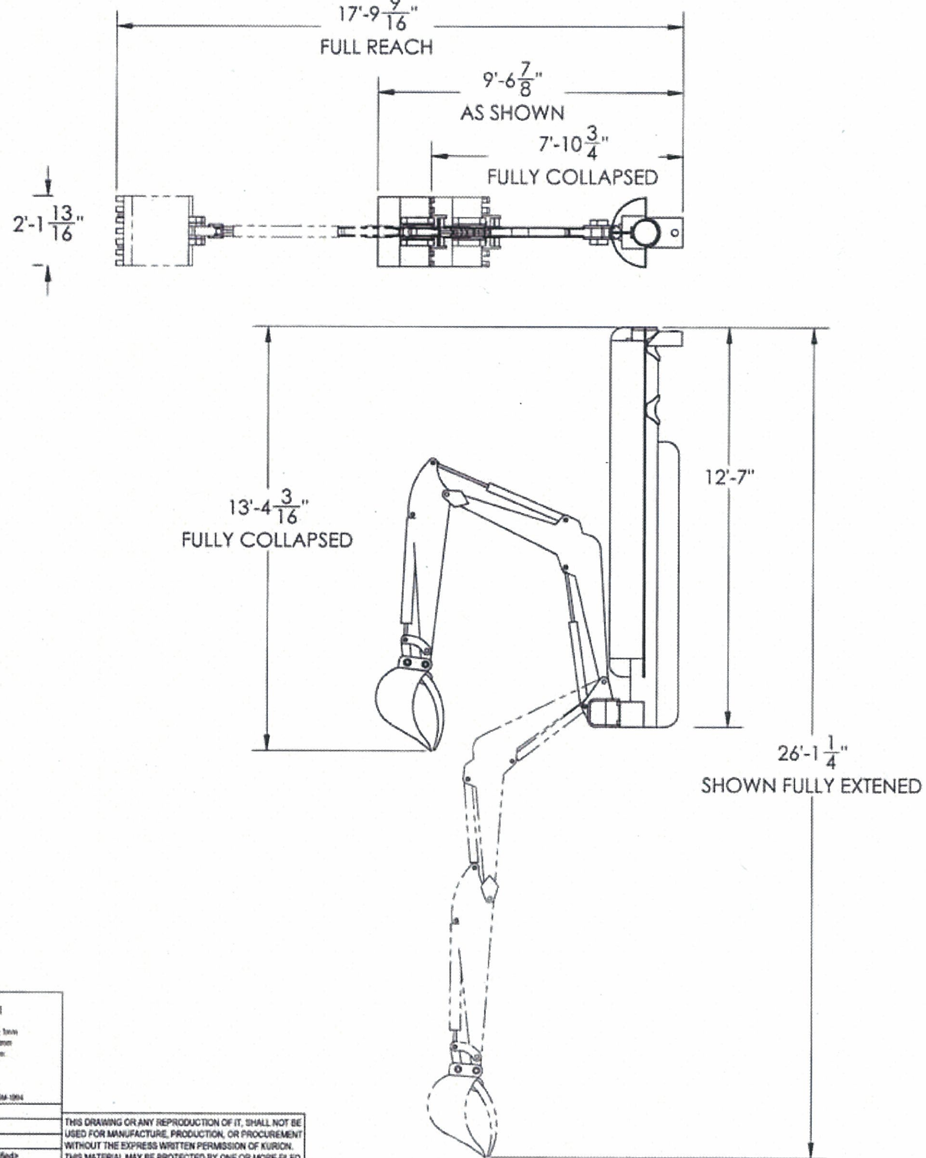
PRELIMINARY PLANS

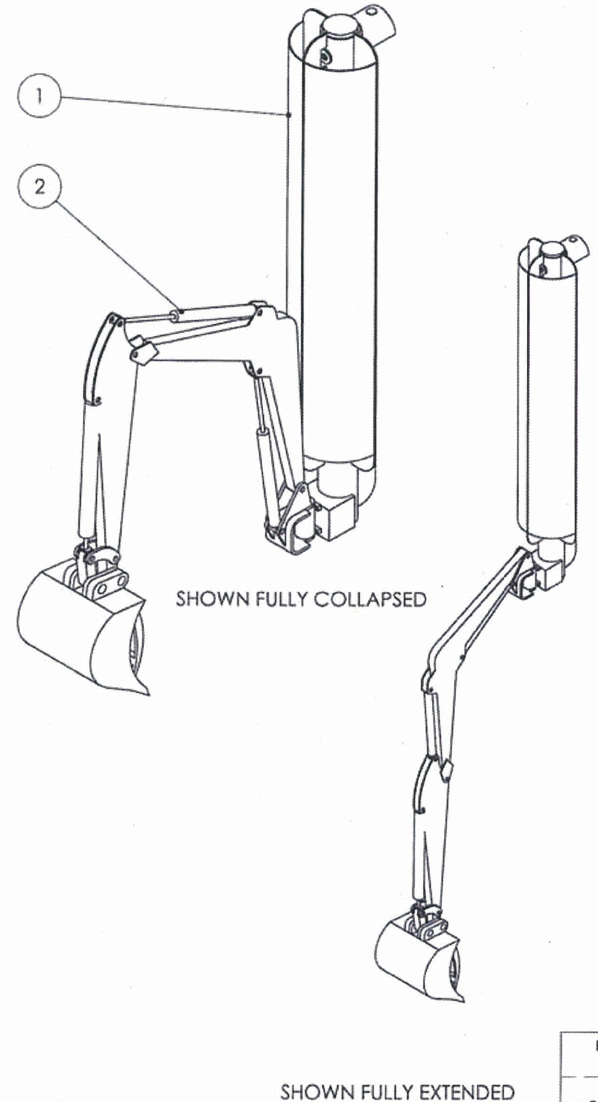
NOT FOR CONSTRUCTION

CAD FILE: REC-1130-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:12
VER SCALE: 1:12
DWG NO.:
KUR-1782F-DWG-M
REC-1130-000
SHEET
1 OF 1

REV. A
SH. 1 OF 1
DWG NO.: KUR-1782F-DWG-M-REC-1130-000

#	PART NUMBER	Default/QTY	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-1210-000	1	Lower REA Post	Kurion	-	SEE SUB ASSY	PER SUB
2	RE-JD35G	1	35G BOOM ARM ASSEMBLY	John Deere	-	OEM	OEM





UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" .X.XXmm = ± 1mm
.XX" = ±.010" .X.Xmm = ± 2mm
.X" = ±.020" Xmm = ± 5mm
X/X" = ±1/16"
ANGULAR:
± .5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 2668.45 Lbs
MATERIAL: Material <not specified>
FINISH: Per Sub

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 502.737.1377

REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ.ENG	PM	DATE
							KG	6/25/14

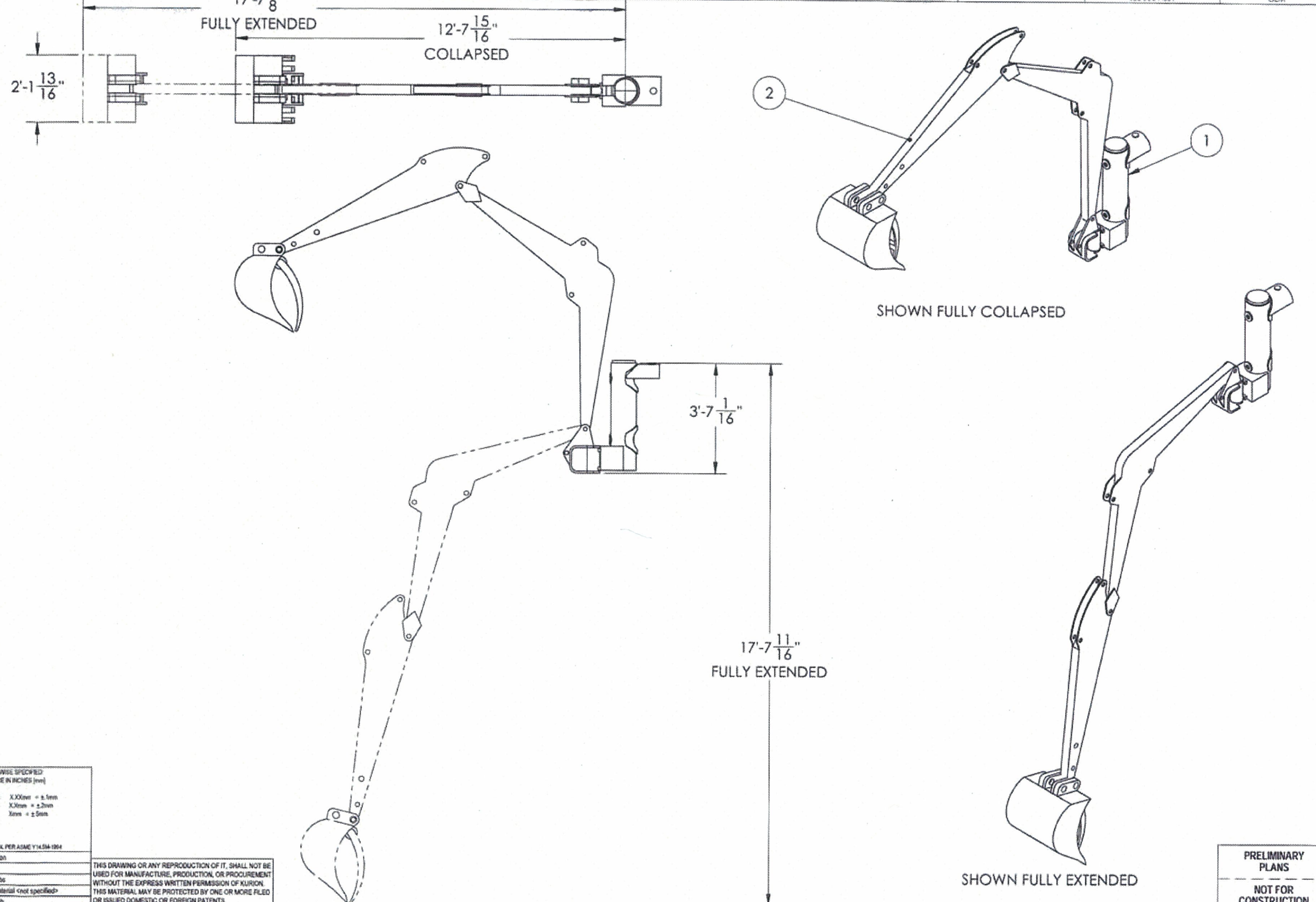
300-296 REMEDIATION
324 BUILDING - REC CELL

Overall Assembly
Lower REA

CAD FILE: REC-1200-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:45
VER SCALE: 1:45
DWG NO.:
KUR-1782F-DWG-M
REC-1200-000
SHEET
1 OF 1

REV. A
SH 1 OF 1
DWG NO.: KUR-1782F-DWG-M/REC-1200-000

#	PART NUMBER	Detail It/QTY	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-1310-000	1	Lower REA Post	Kurion	-	SEE SUB ASSY	Per Sub
2	RE-JD50G	1	50G BOOM ARM ASSEMBLY	John Deere	-	SEE SUB ASSY	OEM



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
X.XXX" = ±.005" X.XXmm = ±.1mm
X.XX" = ±.010" X.Xmm = ±.2mm
X.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
± .5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 4255.57 Lbs
MATERIAL: Material <not specified>
FINISH: Per Sub

PRELIMINARY PLANS
NOT FOR CONSTRUCTION

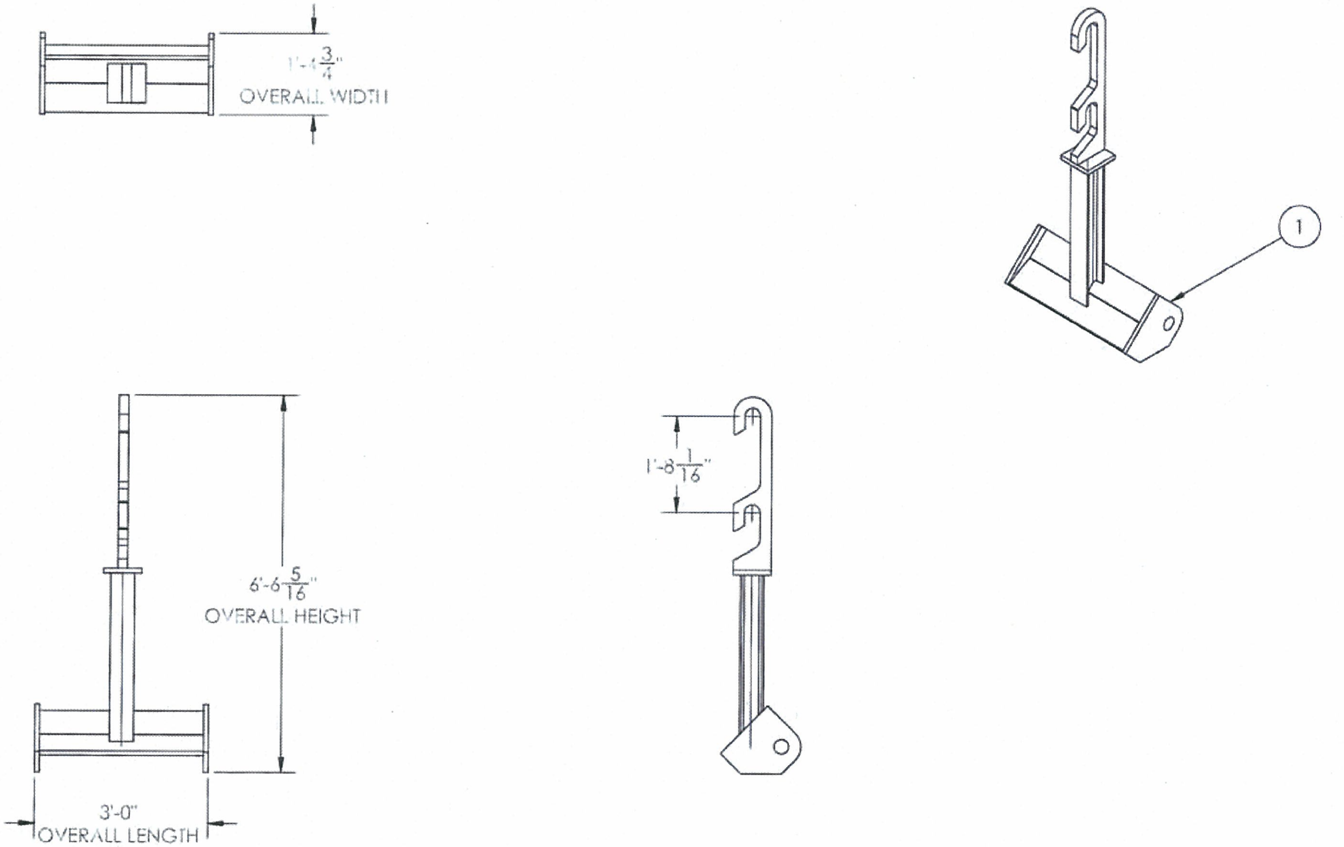
KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p.509.737.1377

REVISION | NO. | DESCRIPTION | BY | D.CHK | ENG | E.CHK | PROJ ENG | PM | DATE

300-296 REMEDIATION
324 BUILDING - REC CELL
Overall Assembly
Upper REA

CAD FILE: REC-1300-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
DWG NO
KUR-1782F-DWG-M
REC-1300-000
SHEET
1 OF 1
REV: A

#	PART NUMBER	NO TOOL/QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-1401-000	1	TOOL HOLDER	Kurion	-	SEE SUB ASSY	SEE SUB ASSY



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 435.49 Lbs
MATERIAL: Material <not specified>
FINISH: -

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
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REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design						[illegible]	[illegible]

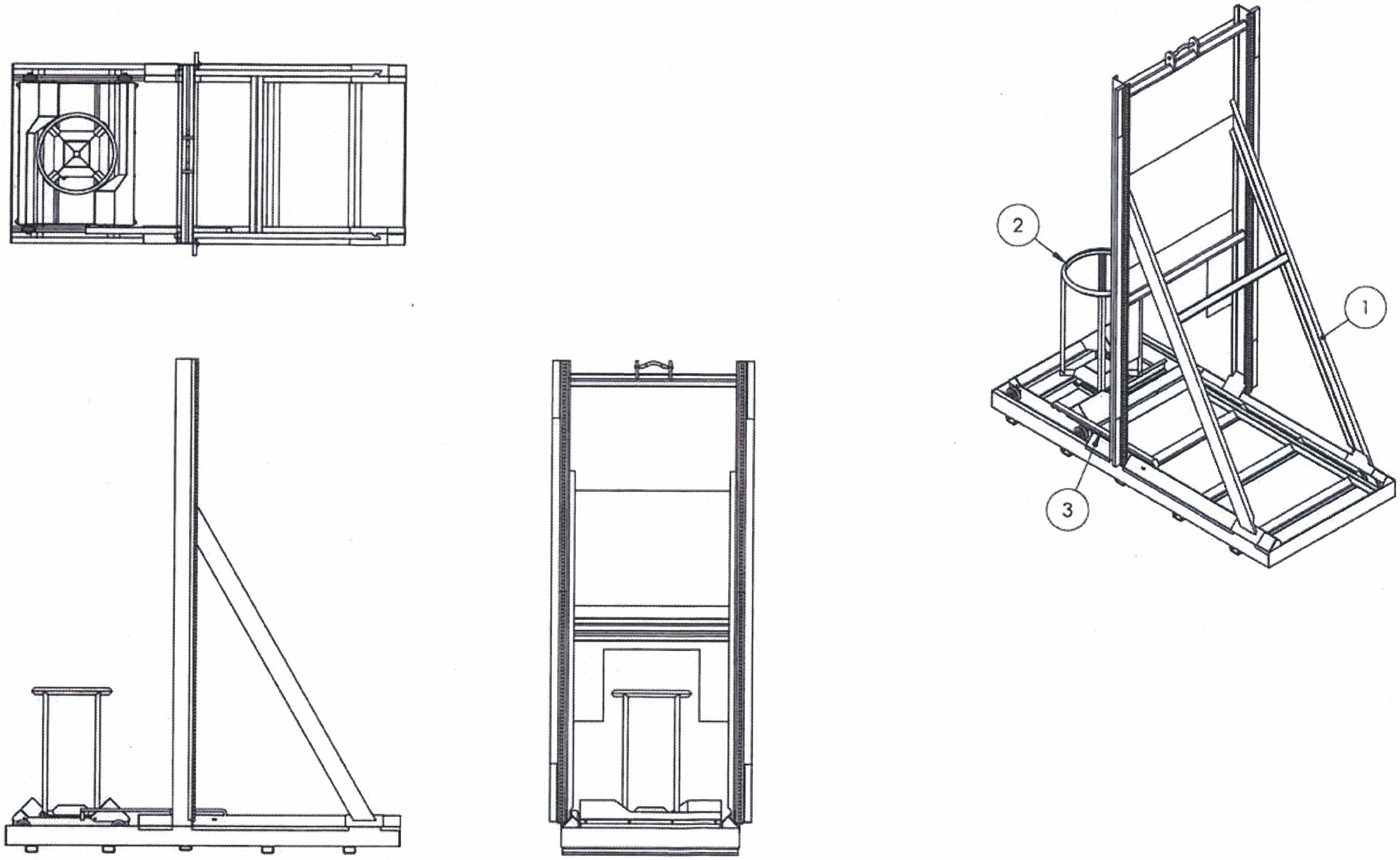
300-296 REMEDIATION
324 BUILDING - REC CELL

TOOL HOLDER

CAD FILE: REC-1400-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:24
VER SCALE: 1:24
DWG NO.:
KUR-1782F-DWG-M
REC-1400-000
SHEET
1 OF 1

REV: A
SH: 1 OF 1
DWG NO.: KUR-1782F-DWG-M REC-1400-000

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-2100-000	1	TRANSFER BARRIER FRAME	Kurion	-	Material <not specified>	PAINT
2	REC-2200-000	1	TRANSFER BARRIER CART	Kurion	-	Material <not specified>	POWDER COAT
3	OTS-IGUS-E4-21-050-038-0-1677.5mm	1	ENERGY TRACK	IGUS	E4-21-050-038-0-1677.5MM		-



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1355 Columbia Park Trail
Richland, Washington 99352
509.737.1377

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PRJ.ENG	PM	DATE
A	30% DESIGN						KQ	7/21/14

REVISION

300-296 SOIL REMEDIATION

TRANSFER BARRIER

CAD FILE: REC-2000-000
DRAWN: J. RIESENWEBER
DFT CHK:
ENG: J. RIESENWEBER
ENG CHK:
PRJ ENG:
PRJ MGR: K. QUIGLEY
CREATED: 7/17/14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:1
VER SCALE: 1:1
DWG NO.:
KUR-1782F-DWG-M-REC-2000-000
SHEET
1 OF 1

REV:
SH: 1 OF 1
DWG NO.: KUR-1782F-DWG-M-REC-2000-000

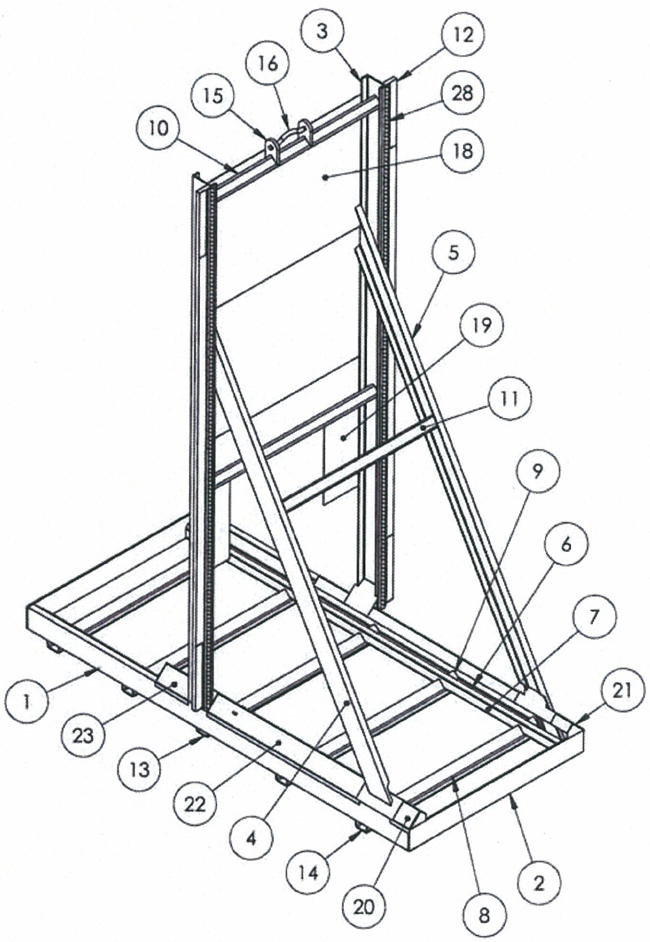
PRELIMINARY PLANS

NOT FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
XXX" = ±.005" X.XXmm = ±.1mm
XX" = ±.010" X.Xmm = ±.2mm
±.030" Xmm = ±.5mm
±1/16"
±1/8"
± .5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 4889.25 Lbs
MATERIAL: Assembly
FINISH: -

C:\Users\...\REC-2000 Transfer Barrier\Detailed Design
Friday, July 18, 2014 6:47:24 AM



#	PART NUMBER	WINGS OPEN/QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-2100-001	2	SIDE CHNL	Kurion	-	ASTM A500 GR. B Steel	PER ASSY
2	REC-2100-002	2	END BAR	Kurion	-	ASTM A500 GR. B Steel	PER ASSY
3	REC-2100-003	2	VERTICAL CHNL	Kurion	-	ASTM A500 GR. B Steel	PER ASSY
4	REC-2100-004	1	ANGLE BRACE #1	Kurion	-	ASTM A500 GR. B Steel	PER ASSY
5	REC-2100-005	1	ANGLE BRACE #2	Kurion	-	ASTM A500 GR. B Steel	PER ASSY
6	REC-2100-006	2	RAIL	Kurion	-	ASTM A36 Steel	NONE
7	REC-2100-007	2	RAIL SUPPORT	Kurion	-	ASTM A36 Steel	PER ASSY
8	REC-2100-008	5	RAIL BRACE TOP	Kurion	-	ASTM A36 Steel	PER ASSY
9	REC-2100-009	10	RAIL BRACE TOP #2	Kurion	-	ASTM A36 Steel	PER ASSY
10	REC-2100-010	2	RAIL BRACE	Kurion	-	ASTM A500 GR. B Steel	PER ASSY
11	REC-2100-011	1	ANGLE BRACE CROSS MEMBER	Kurion	-	ASTM A36 Steel	PER ASSY
12	REC-2100-012	2	WING / DOOR BRACE	Kurion	-	ASTM A36 Steel	PER ASSY
13	REC-2100-013	1	BASE TUBE #1	Kurion	-	ASTM A36 Steel	PER ASSY
14	REC-2100-014	4	BASE TUBE #1	Kurion	-	ASTM A36 Steel	PER ASSY
15	REC-2100-015	2	LIFTING CLVS	Kurion	-	ASTM A36 Steel	PER ASSY
16	REC-2100-016	1	LIFTING HRR	Kurion	-	ASTM A36 Steel	PER ASSY
17	REC-2100-017	1	ENERGY TRACK MOUNT	Kurion	-	ASTM A36 Steel	PER ASSY
18	REC-2100-018	2	SHEET #1	Kurion	-	Plain Carbon Steel	PER ASSY
19	REC-2100-019	1	SHEET #2	Kurion	-	Plain Carbon Steel	PER ASSY
20	REC-2110-001	1	RAIL COVER #1	Kurion	-	Plain Carbon Steel	PER ASSY
21	REC-2110-002	1	RAIL COVER #2	Kurion	-	Plain Carbon Steel	PER ASSY
22	REC-2110-003	2	RAIL COVER #3	Kurion	-	Plain Carbon Steel	PER ASSY
23	REC-2110-004	2	RAIL COVER #4	Kurion	-	Plain Carbon Steel	PER ASSY
24	REC-2110-005	2	RAIL COVER #5	Kurion	-	Plain Carbon Steel	PER ASSY
25	REC-2110-006	2	RAIL COVER #6	Kurion	-	Plain Carbon Steel	PER ASSY
26	REC-2110-007	2	RAIL COVER #7	Kurion	-	Plain Carbon Steel	PER ASSY
27	REC-2110-008	4	RAIL COVER #3	Kurion	-	Plain Carbon Steel	PER ASSY
28	OTS-MCM-15665A521	4	PIANO HINGE Ø5/8"	MCM	15665A521	Material <not specified>	PER ASSY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
±.030" Xmm = ±.5mm
±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 4199.77 Lbs
MATERIAL: Assembly
FINISH: PAINT

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
509.737.1377

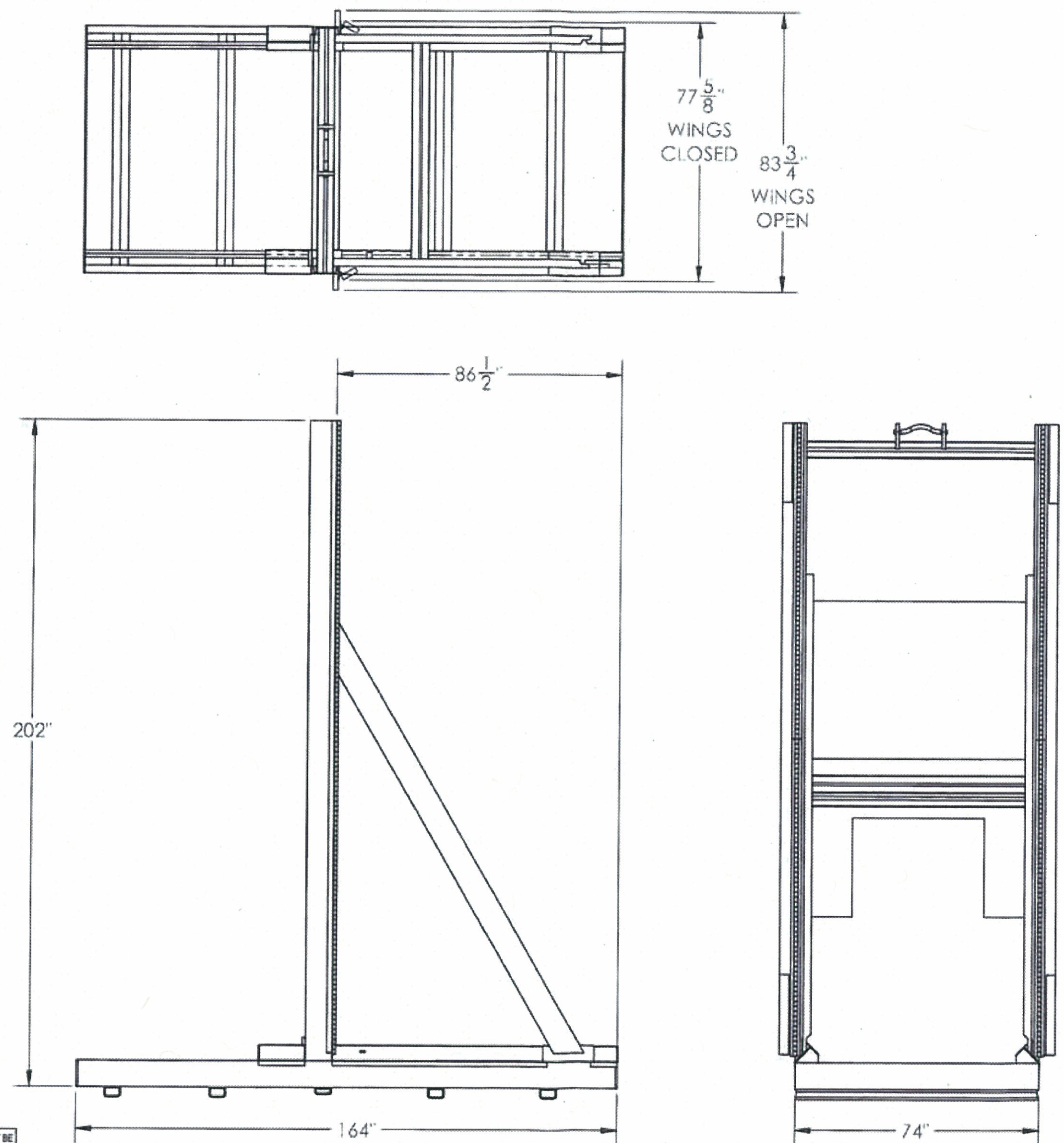
REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ.ENG	PM	DATE
A	30% DESIGN							7/24/14

300-296 SOIL REMEDIATION

TRANSFER BARRIER
TRANSFER BARRIER FRAME

CAD FILE: REC-2100-000
DRAWN: J. RIESENWEBER
DFT CHK:
ENG: J. RIESENWEBER
ENG CHK:
PRJ ENG:
PRJ MGR: K. QUIGLEY
CREATED: 7/17/14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:48
VER SCALE: 1:48
DWG NO.:
KUR-1782F-DWG-M-REC-2100-000
SHEET 1 OF 2
REV.



KURION
Isolating Waste from the Environment

1355 Columbia Park Trail
Richland, Washington 99352
509.737.1377

REVISION

NO	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% DESIGN						KC	7/24/14

300-296 SOIL REMEDIATION

TRANSFER BARRIER
TRANSFER BARRIER FRAME

CAD FILE: REC-2100-000
DRAWN: J. RIESENWEBER
DFT CHK:
ENG: J. RIESENWEBER
ENG CHK:
PRJ ENG:
PRJ MGR: K. QUIGLEY
CREATED: 7/17/14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:48
VER SCALE: 1:48
DWG NO.:
KUR-1782F-DWG-M-REC-2100-000
SHEET 2 OF 2

REV. A | SH. 2 OF 2 | DWG NO.: KUR-1782F-DWG-M-REC-2100-000

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
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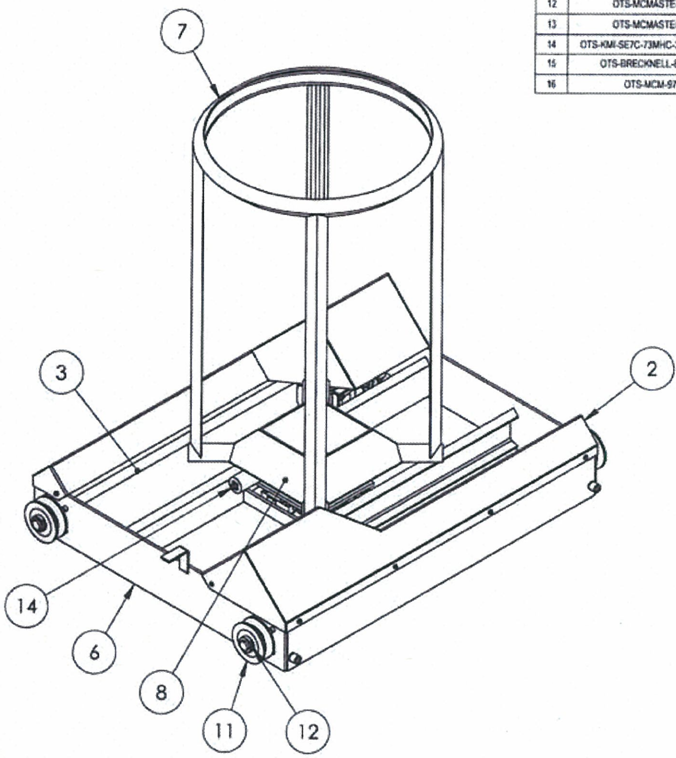
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
±.030" Xmm = ±.5mm
1/16"
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 4199.77 Lbs
MATERIAL: Assembly
FINISH: PAINT

Friday, July 18, 2014 8:12:11 AM

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-2200-001	1	AXLE SHAFT 1	Kurion	-	AISI 1045 Steel, cold drawn	CHROME PLATED
2	REC-2200-002	2	DRIVE COVER	Kurion	-	Plain Carbon Steel	POWDER COAT
3	REC-2200-003	1	AXLE SHAFT 2	Kurion	-	AISI 1045 Steel, cold drawn	CHROME PLATED
4	REC-2200-004	1	TT MOUNT	Kurion	-	ASTM A36 Steel	PER ASSY
5	REC-2200-005	4	LOAD CELL SPACER	Kurion	-	ASTM A36 Steel	POWDER COAT
6	REC-2210-000	1	CART FRAME	Kurion	-	Material <not specified>	PER ASSY
7	REC-2220-000	1	SACK HOLDER	Kurion	-	Material <not specified>	POWDER COAT
8	REC-2230-000	1	TT COVER	Kurion	-	Material <not specified>	POWDER COAT
9	OTS-SEW-FA47GDRS71S4	2	GEARMOTOR	SEW	FA47GDRS71S4	Material <not specified>	PAINTED
10	OTS-SKF-FY 1 3-8 WF	4	FLANGED BEARING	SKF	FY 1 3/8 WF	Plain Carbon Steel	-
11	OTS-SUNRAY-6X2VGRVWHL	4	Ø6X2 V-GROOVE DRIVE WHEEL	SUNRAY INC.	QUOTE 32702	Plain Carbon Steel	-
12	OTS-MCMASTER-2380K33	4	Ø1-3/8" SHAFT COLLAR	MCM	2380K33	Plain Carbon Steel	ZINC PLATED
13	OTS-MCMASTER-2380K31	4	Ø1-1/4" SHAFT COLLAR	MCM	2380K31	Plain Carbon Steel	ZINC PLATED
14	OTS-KMI-SE7C-73MHC-24LH01ARC-REV.B	1	SLEW DRIVE ASSY	KMI GROUP	SE7C-73MHC-24LH01ARC		PAINT
15	OTS-BRECKNELL-816965005697	4	SCALE KIT, (4) LOAD CELLS	BRECKNELL	816965005697	Material <not specified>	-
16	OTS-MCM-9732K130	4	PLASTIC CONPRESSION SPRING / BUMPER	MCM	9732K130		N/A



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.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
= ±.020" Xmm = ±.5mm
±1/16"
.AR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 886.34 Lbs
MATERIAL: Assembly
FINISH: POWDER COAT

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p.502.737.1377

REVISION: A — 30% DESIGN

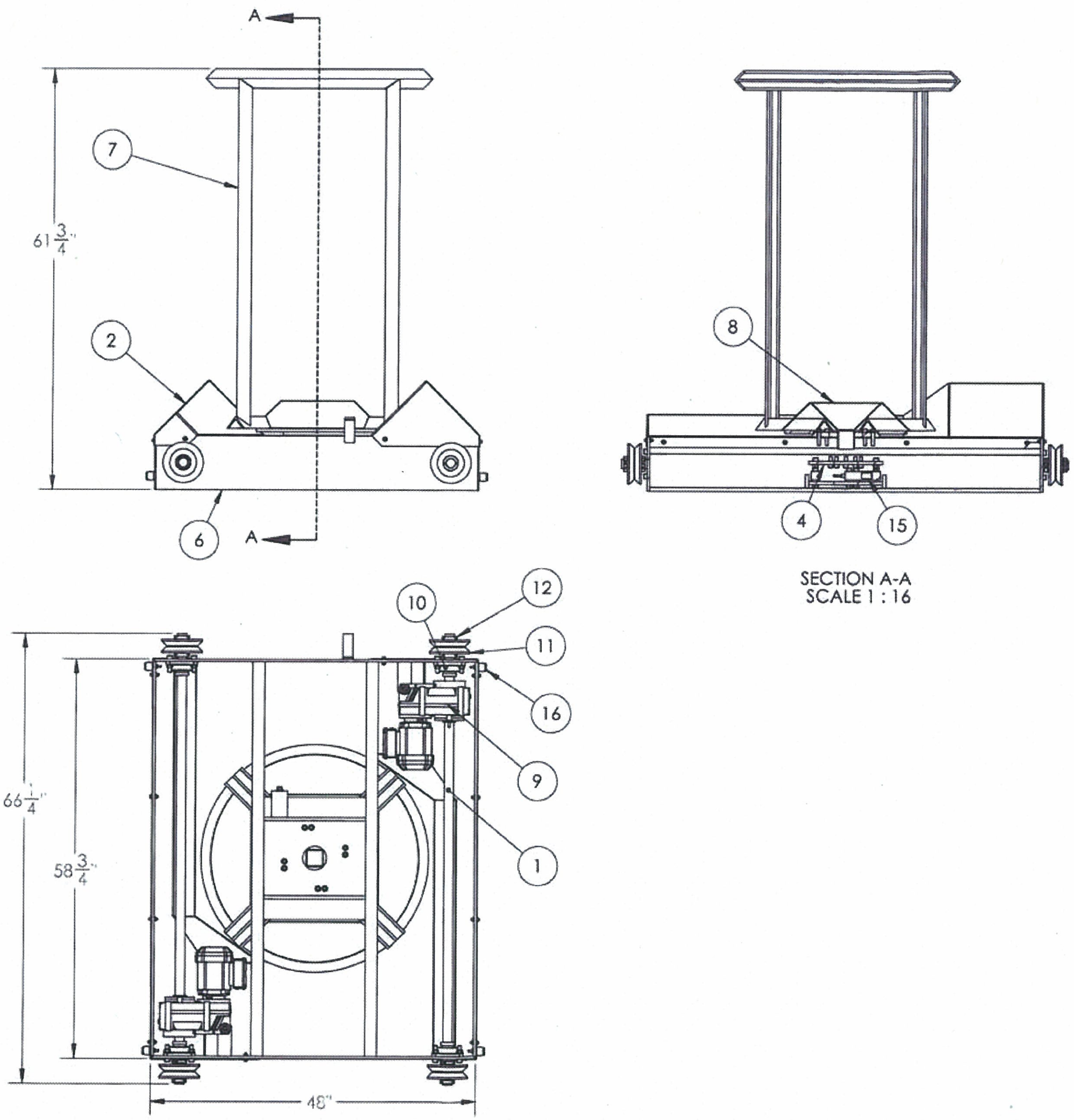
300-296 SOIL REMEDIATION

TRANSFER BARRIER
TRANSFER BARRIER CART

CAD FILE: REC-2200-000
DRAWN: J. RIESENWEBER
DFT CHK:
ENG: J. RIESENWEBER
ENG CHK:
PRJ ENG:
PRJ MGR: K. QUIGLEY
CREATED: 7/17/14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:24
VER SCALE: 1:24
DWG NO.: KUR-1782F-DWG-M-REC-2200-000
SHEET 1 OF 2

PRELIMINARY PLANS

NOT FOR CONSTRUCTION



SECTION A-A
SCALE 1 : 16

KURION
Isolating Waste from the Environment

1355 Columbia Park Trail
Richland, Washington 99352
509.737.1377

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% DESIGN							

REVISION

300-296 SOIL REMEDIATION

TRANSFER BARRIER
TRANSFER BARRIER CART

CAD FILE: REC-2200-000
DRAWN: J. RIESENWEBER
DFT CHK:
ENG: J. RIESENWEBER
ENG CHK:
PRJ ENG:
PRJ MGR: K. QUIGLEY
CREATED: 7/17/14
SHEET SIZE: B
SCALE:
HOR SCALE: 1:24
VER SCALE: 1:24
DWG NO.:
KUR-1782F-DWG-M-REC-2200-000
SHEET
2 OF 2

REV. A

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED:
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TOLERANCES:
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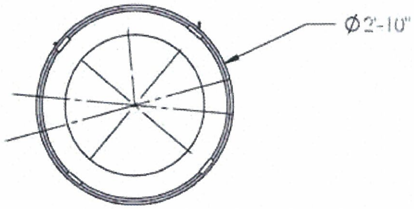
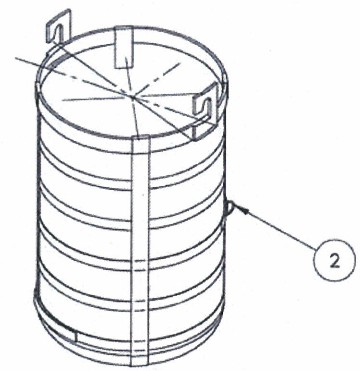
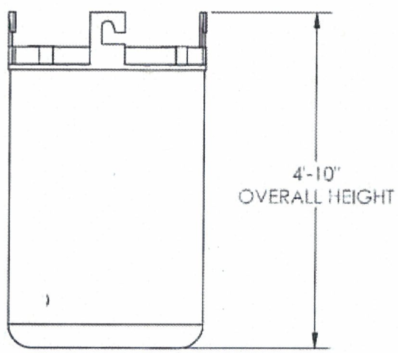
XX" = ±.010" X.Xmm = ±.2mm
= ±.020" Xmm = ±.5mm
±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

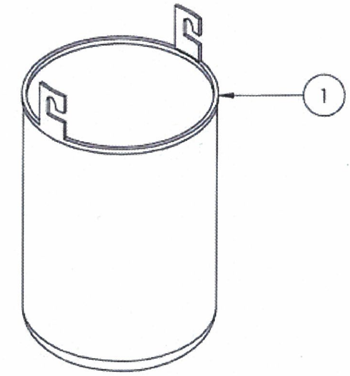
VENDOR: Kurion
PART#: -
WT: 686.34 Lbs
MATERIAL: Assembly
FINISH: POWDER COAT

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	Bag Outer	1	OUTER BAG	KURION		OTS	NONE
2	Bag Assembly	1	INNER BAG	KURION		OTS	NONE









KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p.502.737.1377

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design						KL	3/3/14

REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL

BAG ASSEMBLY

CAD FILE: REC-4100-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:24
VER SCALE: 1:24
DWG NO.:
KUR-1782F-DWG-M
REC-4100-000
SHEET 1 OF 1

REV A | SH 1 OF 1 | DWG NO.: KUR-1782F-DWG-M REC-4100-000

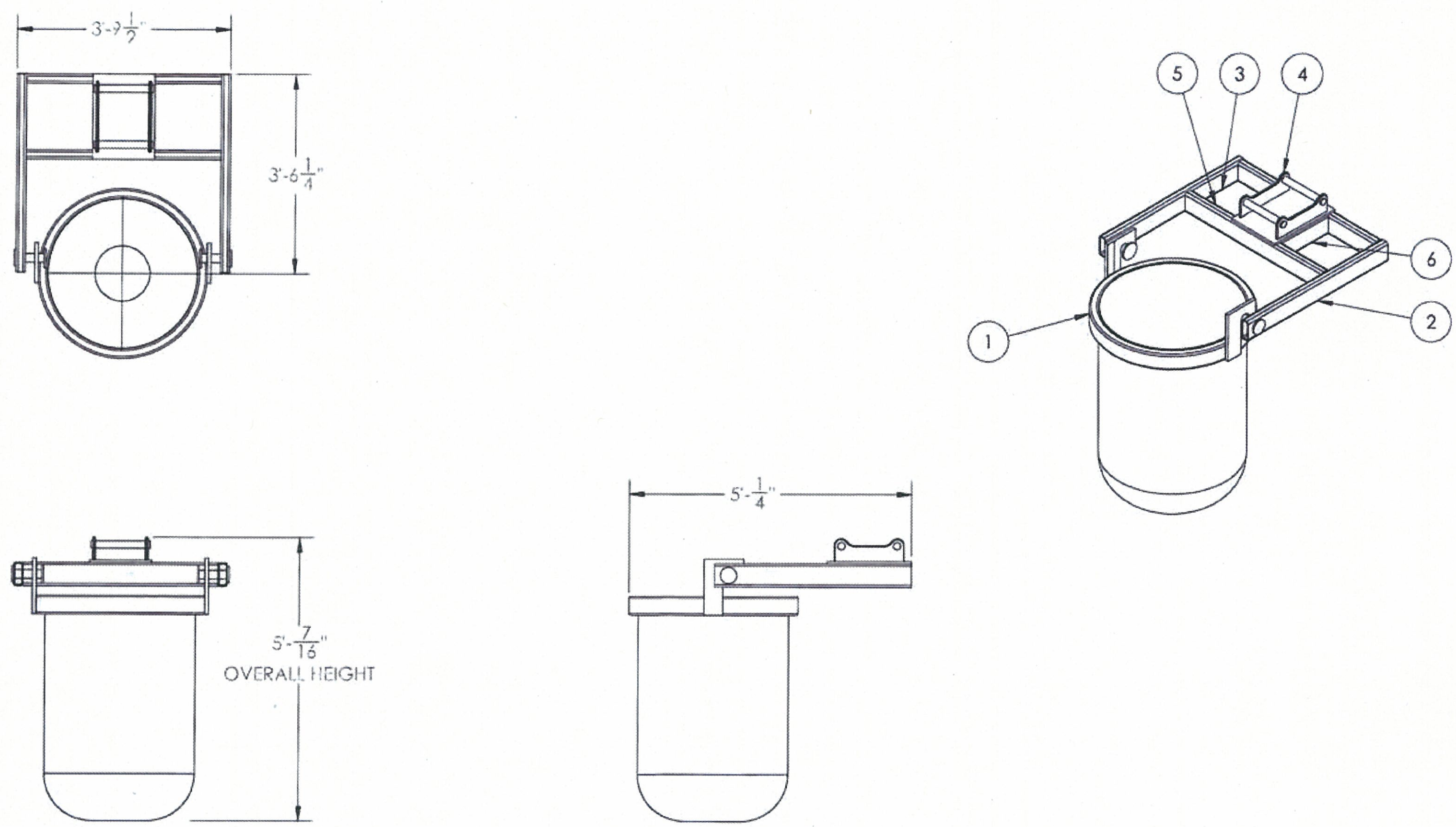
PRELIMINARY PLANS

NOT FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005"   X.XXmm = ±.1mm
.XX" = ±.010"   X.Xmm = ±.2mm
.X" = ±.020"   Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 70.07 Lbs
MATERIAL: Material <not specified>
FINISH: -

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-4100-000	1	BAG ASSSEMBLY SUPPORT	KURION		SEE SUB ASSY	SEE SUB ASSY
2	REC-4200-004	1	SUPPORT ARM - RIGHT MEMBER	KURION		SEE SUB ASSY	SEE SUB ASSY
3	REC-4200-005	1	SUPPORT ARM - LEFT MEMBER	KURION		SEE SUB ASSY	SEE SUB ASSY
4	REC-4200-001	1	SUPPORT ARM - 50G INTERFACE	KURION		SEE SUB ASSY	SEE SUB ASSY
5	REC-4200-003	2	SUPPORT ARM - HORIZONTAL MEMBER	KURION		SEE SUB ASSY	SEE SUB ASSY
6	REC-4200-002	2	SUPPORT ARM - VERTICAL MEMBER	KURION		SEE SUB ASSY	SEE SUB ASSY



KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p.502.737.1377

NO.	DESCRIPTION	BY	ENG	D.CHK	E.CHK	PROJ ENG	PM	DATE
A							[signature]	7/24/14

REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL

BAG STAND

CAD FILE: REC-4200-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:24
VER SCALE: 1:24
DWG NO.:
KUR- -DWG-M
REC-4200-000
SHEET
1 OF 1

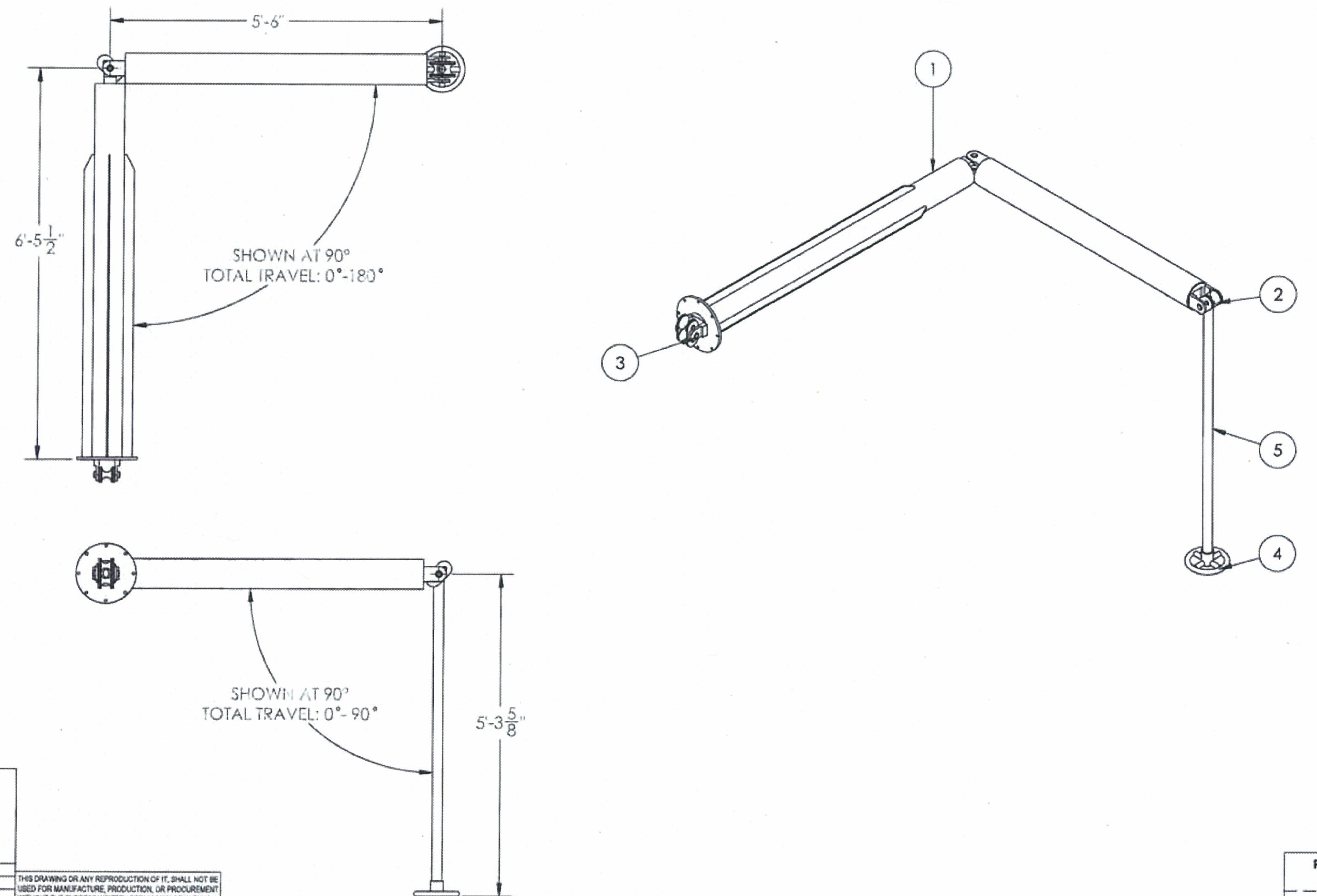
PRELIMINARY PLANS

NOT FOR CONSTRUCTION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
.XX" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 67.96 Lbs
MATERIAL: Material <not specified>
FINISH: -

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-5100-000	1	Grout Tube Rear	Kurion	-	SEE SUB ASSY	Per Sub Assy
2	REC-5200-000	1	Grout Tube Front	Kurion	-	SEE SUB ASSY	Per Sub Assy
3	REC-5300-000	3	Grout Hose Pulley Pivot	Kurion	-	SEE SUB ASSY	Per Sub
4	REC-5400-000	1	Hose Mount	Kurion	-	SEE SUB ASSY	Per Sub Assy



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.030" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 347.36 Lbs
MATERIAL: Material <not specified>
FINISH: Per Sub Assy

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p.502.737.1377

REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design						KC	7/24/14

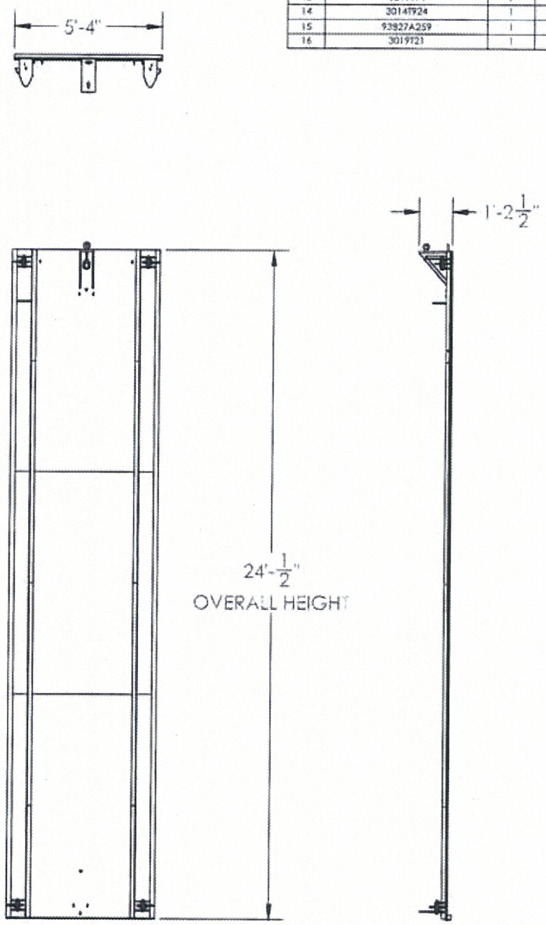
300-296 REMEDIATION
324 BUILDING - REC CELL

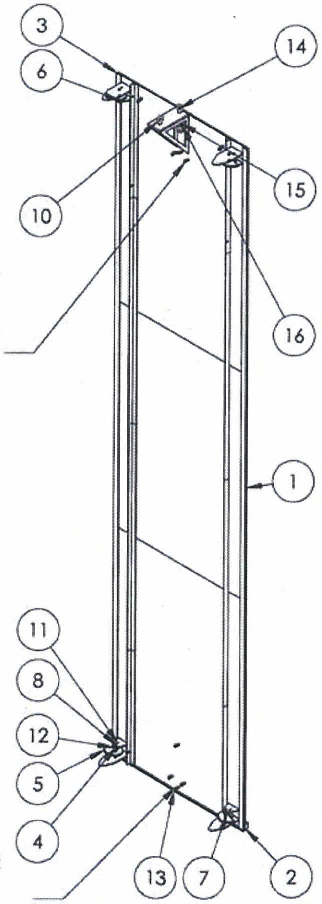
Grout Tube
Grout Tube

CAD FILE: REC-5000-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:20
VER SCALE: 1:20
DWG NO.:
KUR-1782F-DWG-M
REC-5000-000
SHEET
1 OF 1
REV. A

BOM Table

#	PART NUMBER	Default/QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-8110-000	1	DAM WELDEMENT	Kurion	-	SEE SUB ASSY	PAINT/POWDER COAT
2	REC-8100-002	1	BAR	Kurion	-	Rubber	-
3	REC-8100-003	2	SUPPORT BAR	Kurion	-	Rubber	-
4	OTS_MCM_6391K4	16	BUSHING	MCMASTER	6391K4	Aluminum Bronze	-
6	9271K131	8	TORSION SPRING	McMaster	9271K131	1023 Carbon Steel Sheet (SS)	OTS
7	9271K132	8	Left Hand Torsion Spring	McMaster	9271K132	1023 Carbon Steel Sheet (SS)	OTS
10	3014T531	1	LIFTING EYE	Kurion	-	Plain Carbon Steel	OTS
11	91274A178	32	SHCS 1/4-20 1/2" long	McMaster	91274A156	Plain Carbon Steel	OTS
12	91274A176	16	SHCS 1/4"-20 1-1/4" Lg	McMaster	91274A176	Plain Carbon Steel	OTS
13	3019T14	9	Oval 1/4" Threaded Eye	McMaster	3019T140	Plain Carbon Steel	OTS
14	3014T924	1	Release Lifting Eye	McMaster	3014T924	Plain Carbon Steel	OTS
15	93827A259	1	3/4"-10 Hex Nut	McMaster	93827A259	Plain Carbon Steel	OTS
16	3019T21	1	3/4" Threaded Lifting Eye	McMaster	3019T210	Plain Carbon Steel	OTS





1/8" WIRE ROPE SHALL BE ATTACHED TO EACH ENGAGING GEAR, ROUTED THRU APPROPRIATE LIFTING EYES AND CONNECTED TO CENTRAL RELEASE WIRE ROPE THAT CONNECTS TO BOM#

A SPRING SHALL BE CONNECTED BETWEEN THE CENTRAL RELEASE WIRE AND THIS EYE WHICH WILL HOLD THE CENTRAL RELEASE WIRE TIGHT DURING NORMAL OPERATIONS, THUS ALLOWING THE ENGAGING GEARS TO PROPERLY ACTUATE AND LOCK.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

VENDOR: Kurion
PART#: -
WT: 2923.48 Lbs
MATERIAL: Material <not specified>
FINISH: -

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p.502.737.1377

REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ.ENG	PM	DATE
A	30% Design						KC	7/31/14

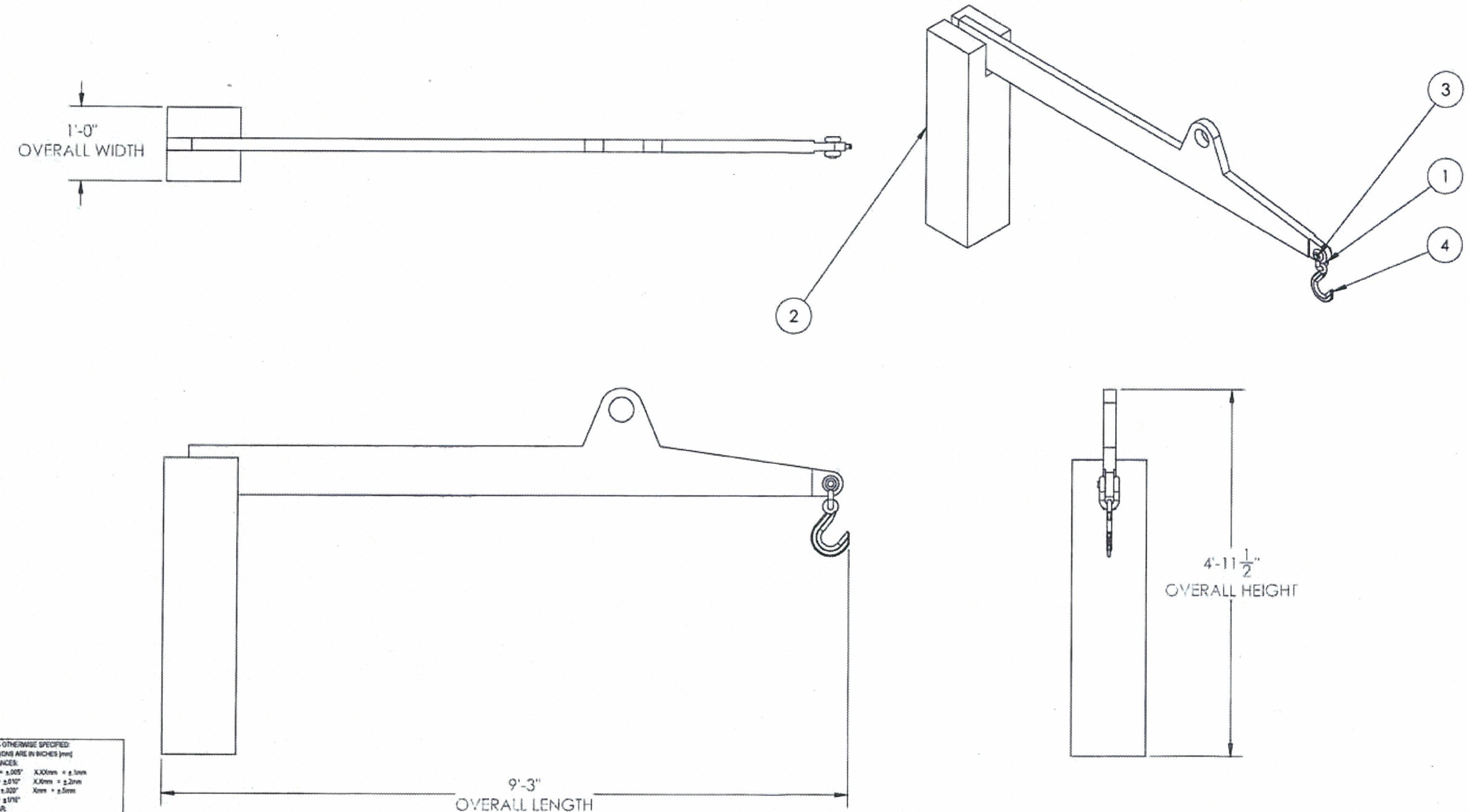
300-296 REMEDIATION
324 BUILDING - REC CELL

A CELL DAM

CAD FILE: REC-8100-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:1
VER SCALE: 1:1
DWG NO.:
KUR-1782F-DWG-M
REC-8100-000
SHEET 1 OF 1
SH. 1 OF 1 REV. A

#	PART NUMBER	QTY.	DESCRIPTION	SUPPLIER	PART #	MATERIAL	FINISH
1	REC-8200-001	1	REA Offset Hook Plate	Kurion	-	Plain Carbon Steel	Powder Coat
2	REC-8200-002	1	REA Offset Counterweight	Kurion	-	Plain Carbon Steel	Powder Coat
3	OTS-MCM-3560T52	1	7t D-Shackle	MCM	3560T52	Plain Carbon Steel	OTS-Zinc
4	OTS-MCM-3814T17	1	HOOK-	MCM	3814T17	Plain Carbon Steel	OTS

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p.509.737.1377



NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design							

REVISION

300-296 REMEDIATION
324 BUILDING - REC CELL

Overall
REA Offset Hook

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES [mm]
TOLERANCES:
.XXX" = ±.005" X.XXmm = ±.1mm
.XX" = ±.010" X.Xmm = ±.2mm
.X" = ±.020" Xmm = ±.5mm
X/X" = ±1/16"
ANGULAR:
±.5°
DIMS & TOL PER ASME Y14.5M-1994

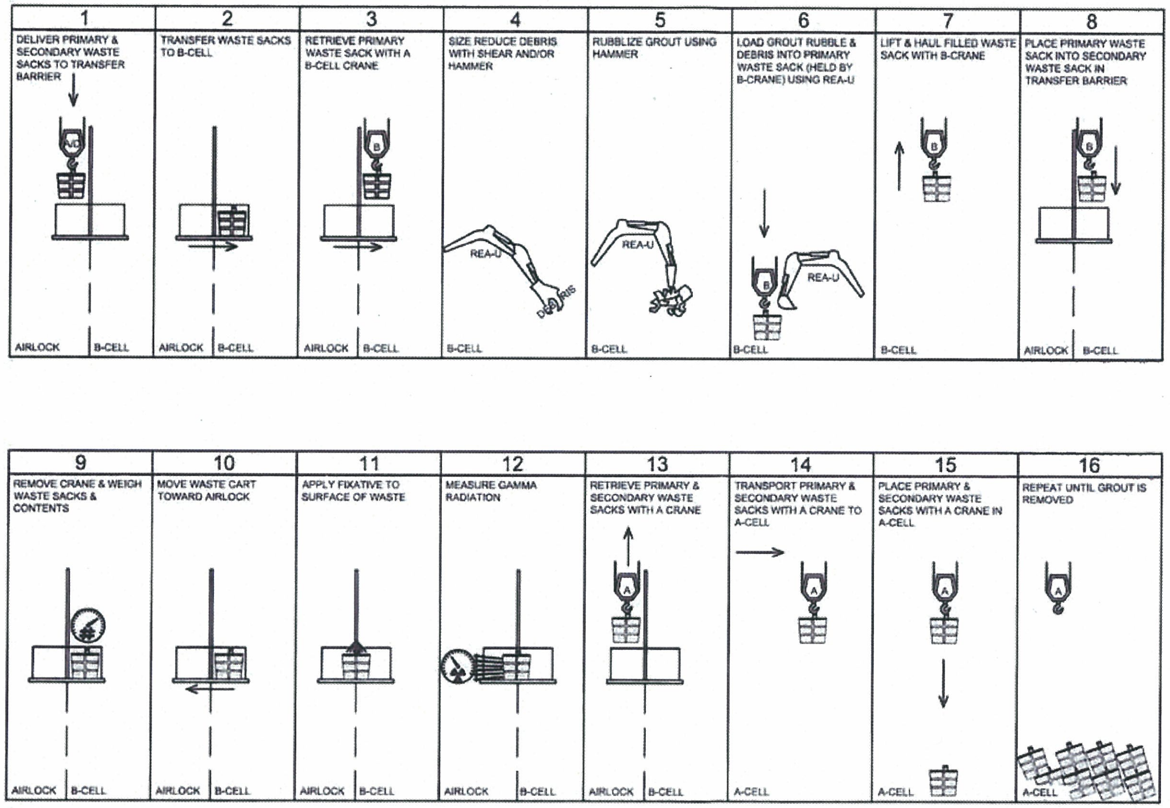
VENDOR: Kurion
PART#: -
WT: 2375.32 Lbs
MATERIAL: Material <not specified>
FINISH: Per Sub

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

CAD FILE: REC-8200-000
DRAWN:
DFT CHK:
ENG:
ENG CHK:
PRJ ENG:
PRJ MGR:
CREATED:
SHEET SIZE: B
SCALE:
HOR SCALE: 1:16
VER SCALE: 1:16
DWG NO.:
KUR-1782F-DWG-M
REC-8200-000
SHEET
1 OF 1

REV: A
SH 1 OF 1



GENERAL NOTES:

1. THIS DIAGRAM DEPICTS THE PRINCIPLE PROCESS FLOW. OTHER CRANES OR MANIPULATORS MAY BE USED AS NECESSARY.

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377

REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design							7/14/14

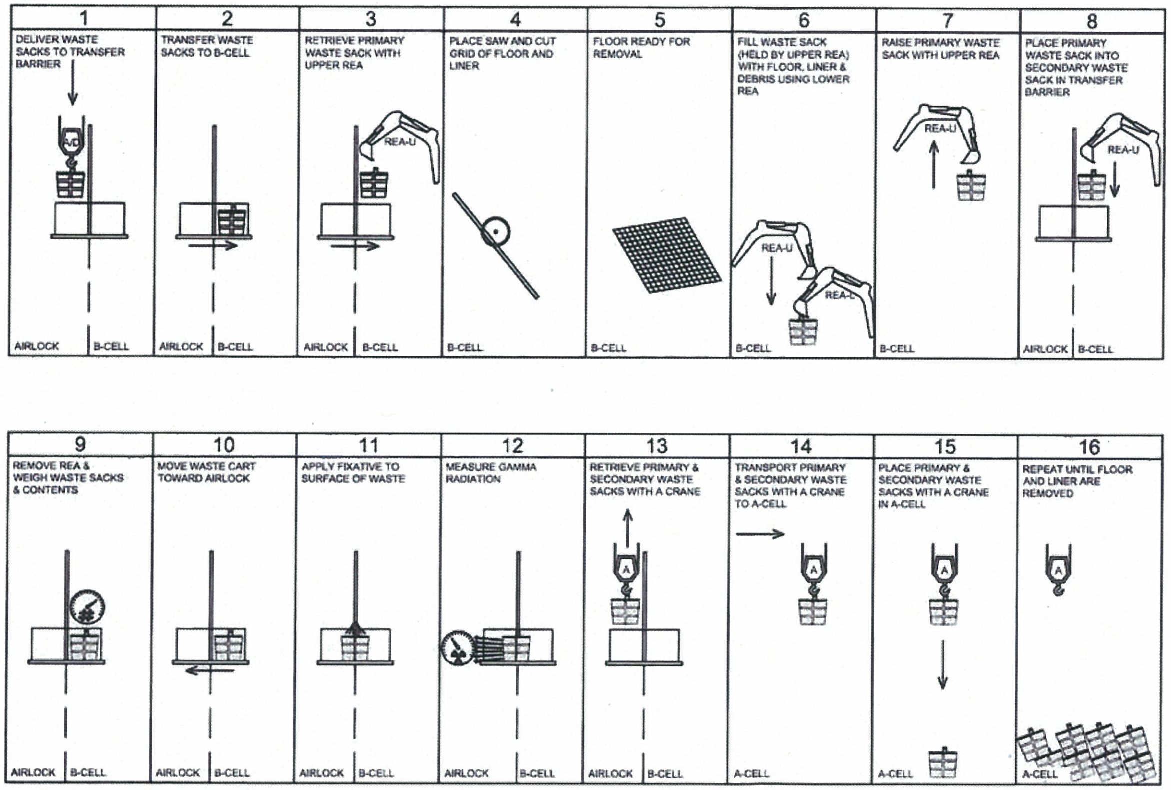
300-296 SOIL REMEDIATION
30% DESIGN

SOIL REMEDIATION
PROCESS FLOW DIAGRAM
GROUT REMOVAL

CAD FILE: KUR-1782F-DWG-P001-1
DRAWN: J KIENHOLZ
DFT CHK: S CLARK
ENG: H SHUMAKE
ENG CHK: K JONES
PROJ ENG: B CARPENTER
PROJ MGR: K QUIGLEY
CREATED: 6/4/2014
SHEET SIZE: B
SCALE:
HOR SCALE: NONE
VER SCALE: NONE
DWG NO.:
KUR-1782F-DWG-P001
SHEET
01

PRELIMINARY PLANS

NOT FOR CONSTRUCTION



GENERAL NOTES

1. THIS DIAGRAM DEPICTS THE PRINCIPLE PROCESS FLOW. OTHER CRANES OR MANIPULATORS MAY BE USED AS NECESSARY.
2. A-CELL SHOULD NOT HAVE FINAL GROUT PLACED UNTIL AFTER REMEDIATION OF B-CELL IS COMPLETE.

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	Design 30%						KA	7/2/14

REVISION

300-296 SOIL REMEDIATION
30% DESIGN

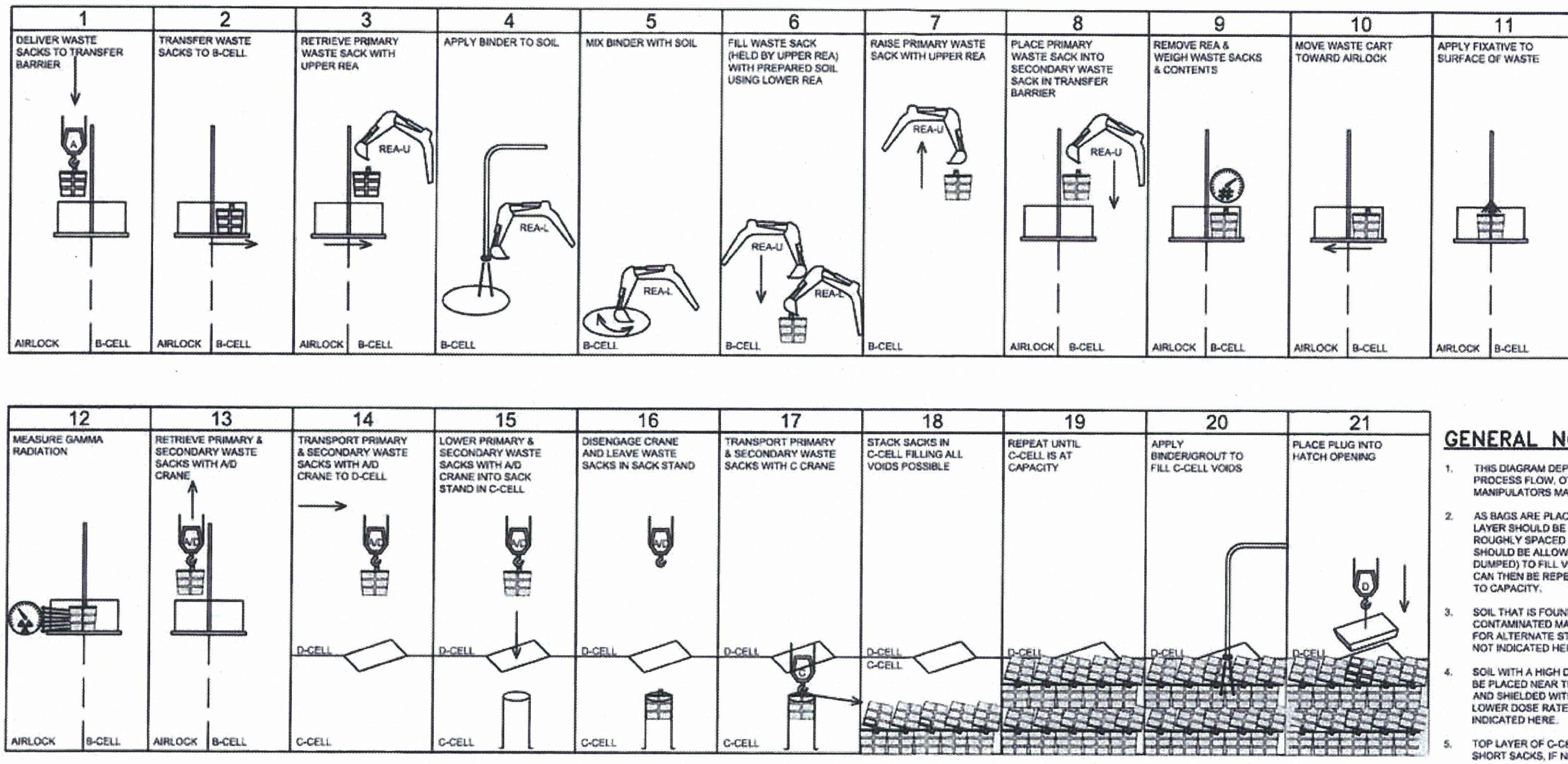
SOIL REMEDIATION
PROCESS FLOW DIAGRAM
FLOOR/LINER REMOVAL

CAD FILE: KUR-1782F-DWG-P001-2
DRAWN: J KIENHOLZ
DFT CHK: S CLARK
ENG: H SHUMAKE
ENG CHK: K JONES
PROJ ENG: B CARPENTER
PROJ MGR: K QUIGLEY
CREATED: 6/4/2014
SHEET SIZE: B
SCALE:
HOR SCALE: NONE
VER SCALE: NONE
DWG NO.:
KUR-1782F-DWG-P001
SHEET
02

REV: A
SH: 02

PRELIMINARY PLANS

NOT FOR CONSTRUCTION



GENERAL NOTES

1. THIS DIAGRAM DEPICTS THE PRINCIPLE PROCESS FLOW. OTHER CRANES OR MANIPULATORS MAY BE USED AS NECESSARY.
2. AS BAGS ARE PLACED IN C-CELL THE FIRST LAYER SHOULD BE PLACED IN A SINGLE, ROUGHLY SPACED LAYER. THE NEXT LAYER SHOULD BE ALLOWED TO SLUMP (OR BE DUMPED) TO FILL VOID SPACES. THE PROCESS CAN THEN BE REPEATED UNTIL C-CELL IS FILLED TO CAPACITY.
3. SOIL THAT IS FOUND TO BE LIGHTLY CONTAMINATED MAY BE PACKAGED AND SENT FOR ALTERNATE STORAGE. THAT PROCESS IS NOT INDICATED HERE.
4. SOIL WITH A HIGH DOSE RATE IS INTENDED TO BE PLACED NEAR THE CENTER OF THE ROOM AND SHIELDED WITH MATERIAL THAT HAS A LOWER DOSE RATE. THAT PROCESS IS NOT INDICATED HERE.
5. TOP LAYER OF C-CELL MAY BE FILLED WITH SHORT SACKS, IF NECESSARY.

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377

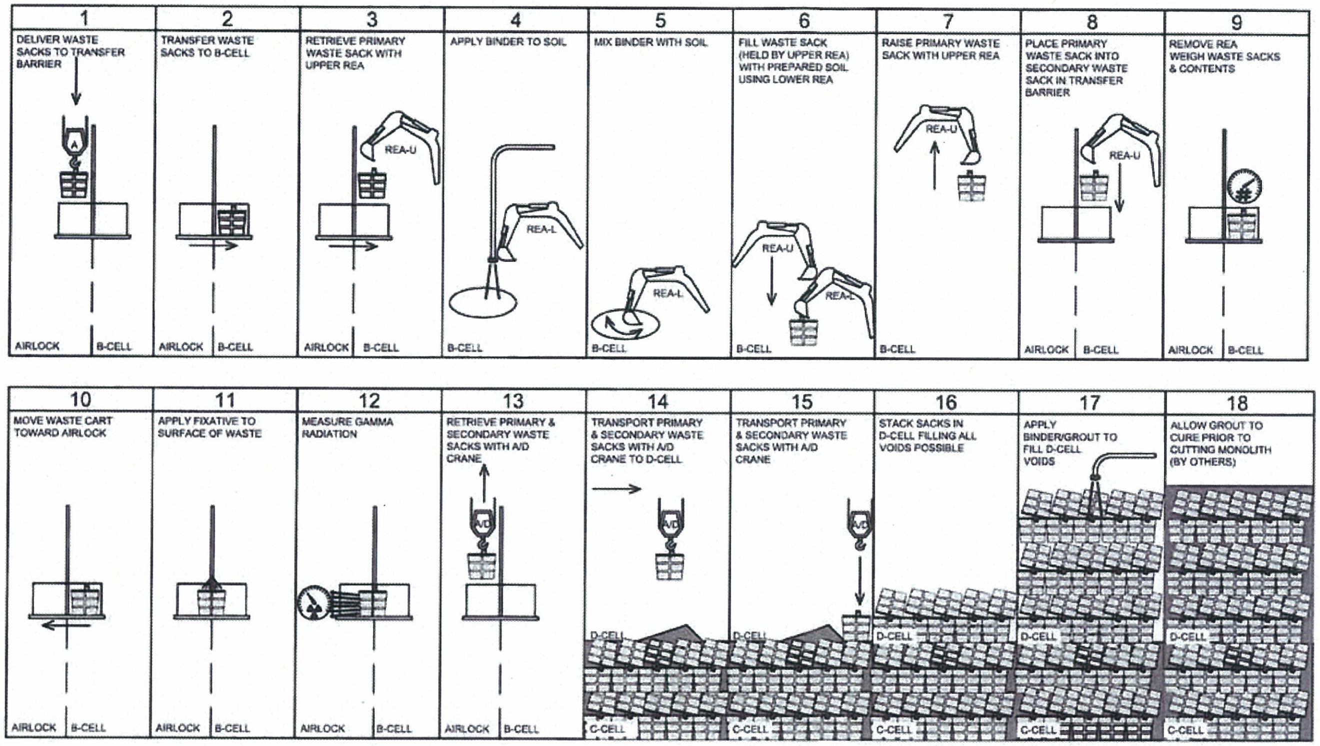
NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A	30% Design							

REVISION

300-296 SOIL REMEDIATION
30% DESIGN

SOIL REMEDIATION
PROCESS FLOW DIAGRAM
PRIMARY SOIL TO C-CELL

DRAWN: J KIENHOLZ
DFT CHK: S CLARK
ENG: H SHUMAKE
ENG CHK: K JONES
PROJ ENG: B CARPENTER
PROJ MGR: K QUIGLEY
CREATED: 6/4/2014
SHEET SIZE: B
SCALE:
HOR SCALE: NONE
VER SCALE: NONE
DWG NO.: KUR-1782F-DWG-P001
SHEET 03



GENERAL NOTES

1. THIS DIAGRAM DEPICTS THE PRINCIPLE PROCESS FLOW. OTHER CRANES OR MANIPULATORS MAY BE USED AS NECESSARY.
2. AS BAGS ARE PLACED IN D-CELL THE FIRST LAYER SHOULD BE PLACED IN A SINGLE, ROUGHLY SPACED LAYER. THE NEXT LAYER SHOULD BE ALLOWED TO SLUMP (OR BE DUMPED) TO FILL VOID SPACES. THE PROCESS CAN THEN BE REPEATED UNTIL D-CELL IS FILLED TO CAPACITY.
3. SOIL THAT IS FOUND TO BE LIGHTLY CONTAMINATED MAY BE PACKAGED AND SENT FOR ALTERNATE STORAGE. THAT PROCESS IS NOT INDICATED HERE.
4. SOIL WITH A HIGH DOSE RATE IS INTENDED TO BE PLACED NEAR THE CENTER OF THE ROOM AND SHIELDED WITH MATERIAL THAT HAS A LOWER DOSE RATE. THAT PROCESS IS NOT INDICATED HERE.

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377

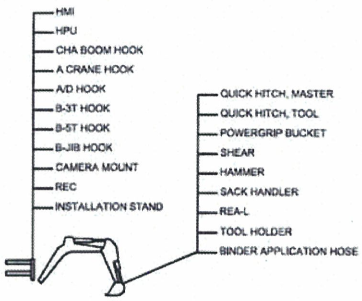
REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ.ENG	PM	DATE
A	30% Design						KB	7/2/14

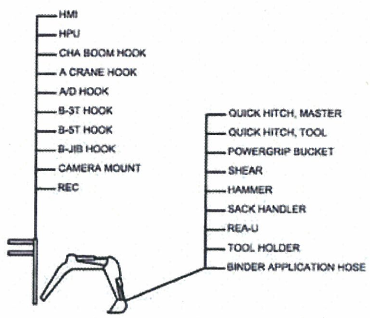
300-296 SOIL REMEDIATION
30% DESIGN

SOIL REMEDIATION
PROCESS FLOW DIAGRAM
PRIMARY AND SECONDARY SOIL TO D-CELL

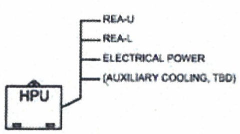
CAD FILE: KUR-1782F-DWG-P001-4
DRAWN: J KIENHOLZ
DFT CHK: S CLARK
ENG: H SHUMAKE
ENG CHK: K JONES
PROJ ENG: B CARPENTER
PROJ MGR: K QUIGLEY
CREATED: 6/4/2014
SHEET SIZE: B
SCALE:
HOR SCALE: NONE
VER SCALE: NONE
DWG NO.: KUR-1782F-DWG-P001
SHEET 04
REV: A



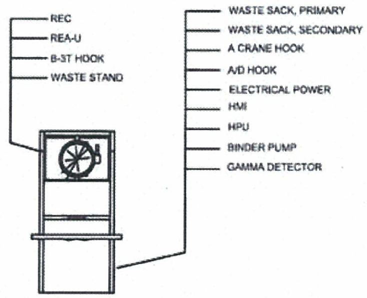
REA - UPPER



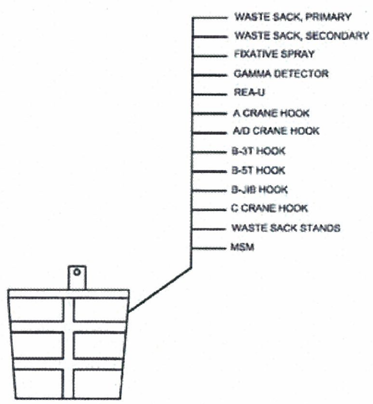
REA - LOWER



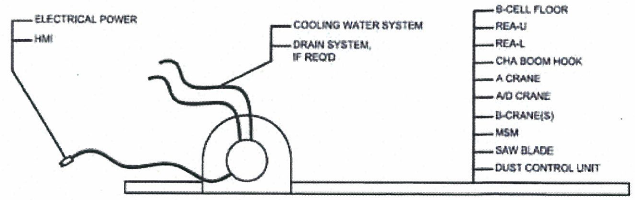
HPU



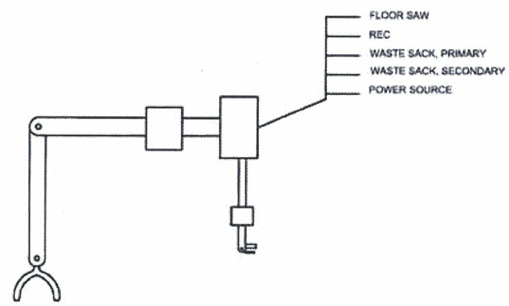
TRANSFER BARRIER



WASTE SACK SYSTEM



FLOOR SAW



MASTER SLAVE MANIPULATOR

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ.ENG	PM	DATE
A	30% Design							

REVISION

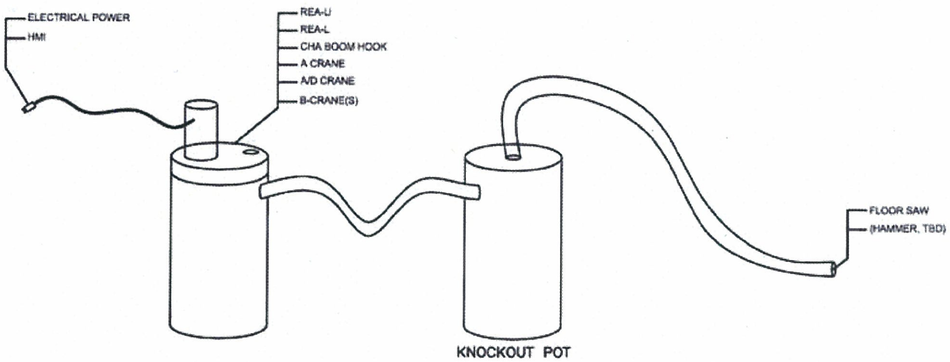
300-296 SOIL REMEDIATION
30% DESIGN

SOIL REMEDIATION
EQUIPMENT INTERFACE DIAGRAM

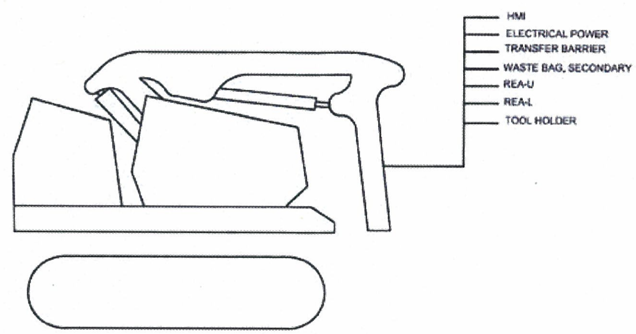
CAD FILE: KUR-1782F-DWG-P002-1
DRAWN: J KIENHOLZ
DFT CHK: S CLARK
ENG: H SHUMAKE
ENG CHK: K JONES
PROJ ENG: B CARPENTER
PROJ MGR: K QUIGLEY
CREATED: 6/4/2014
SHEET SIZE: B
SCALE:
HOR SCALE: NONE
VER SCALE: NONE
DWG NO.: KUR-1782F-DWG-P002
SHEET 01
REV: A

PRELIMINARY PLANS

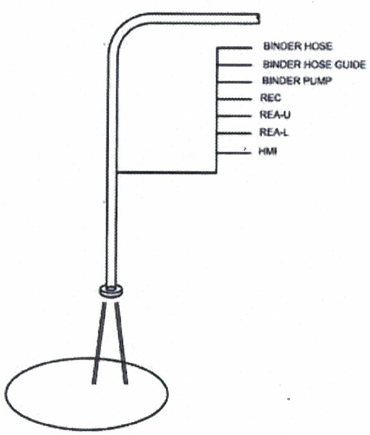
NOT FOR CONSTRUCTION



DUST CONTROL SYSTEM



BROKK60/100



BINDER APPLICATION SYSTEM

KURION
Isolating Waste from the Environment
1355 Columbia Park Trail
Richland, Washington 99352
p. 509.737.1377

REVISION

NO.	DESCRIPTION	BY	D.CHK	ENG	E.CHK	PROJ ENG	PM	DATE
A								

300-296 SOIL REMEDIATION
30% DESIGN

SOIL REMEDIATION
EQUIPMENT INTERFACE DIAGRAM

CAD FILE: KUR-1782F-DWG-P002
DRAWN: J KIENHOLZ
DFT CHK: S CLARK
ENG: H SHUMAKE
ENG CHK: K JONES
PROJ ENG: B CARPENTER
PROJ MGR: K QUIGLEY
CREATED: 6/4/2014
SHEET SIZE: B
SCALE:
HOR SCALE: NONE
VER SCALE: NONE
DWG NO.:
KUR-1782F-DWG-P002
SHEET 02
REV. A

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

Appendix G: Recovery and Backup Matrix

	Failure	Initial Response	Option A	Option B	1st Backup	2nd Backup
Existing Cell Equipment						
Cranes						
A-Crane (important)	Any External Control	Trouble Shoot Externally and Repair	-		-	-
*note assumes cable	Bridge Drive	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A/D Crane to Push North, use A/D Crane	A/D Crane	-
mgmt. improvements	Trolley Drive	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A/D Crane to Push North, use A/D Crane	A/D Crane	-
	Hoist Drive (no dose)	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A/D Crane to Push North, use A/D Crane	A/D Crane	-
	Hoist Drive (w/ dose load)	Trouble Shoot if possible	Design lift fixture to take load from A Crane with A/D Crane	After Load Removal, Evaluate Repair and if not then Use A/D Crane to Push North, use A/D Crane	A/D Crane	-
	Damaged Wire	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A/D Crane to Push North, use A/D Crane	A/D Crane	-
	Cable Management	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A/D Crane to Push North, use A/D Crane	A/D Crane	-
A/D Crane (critical)	Any External Control	Trouble Shoot Externally and Repair	-		-	-
	Bridge Drive	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A Crane to Push South, use A Crane	A Crane	Wall Crane
	Trolley Drive	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A Crane to Push South, use A Crane	A Crane	Wall Crane
	Hoist Drive (no dose)	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A Crane to Push South, use A Crane	A Crane	Wall Crane
	Hoist Drive (w/ dose load)	Trouble Shoot if possible	Design lift fixture to take load from A/D Crane with A Crane	After Load Removal, Evaluate Repair and if not then Use A Crane to Push South, use A Crane	A Crane	Wall Crane
	Damaged Wire	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A Crane to Push South, use A Crane	A Crane	Wall Crane
	Cable Management	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Internal Repair - Plan Man-entry	Use A Crane to Push South, use A Crane	A Crane	Wall Crane
B-Cell 3 Ton (important)	Any External Control	Trouble Shoot Externally and Repair	-	-	-	-
	Bridge Drive	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Drag to Airlock with B 10 T, Internal Repair - Plan Man-entry	Use 10 Ton to push to West, use 10 Ton	B-Cell 10 Ton	-
	Trolley Drive	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Drag to Airlock with B 10 T, Internal Repair - Plan Man-entry	Use 10 Ton to push to West, use 10 Ton	B-Cell 10 Ton	-
	Hoist Drive (no dose)	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Drag to Airlock with B 10 T, Internal Repair - Plan Man-entry	Use 10 Ton to push to West, use 10 Ton	B-Cell 10 Ton	-
	Hoist Drive (w/ dose load)	Trouble Shoot if possible	Design lift fixture to take load from 3 T with 10 T	Drag to Airlock with B 10 T, Internal Repair - Plan Man-entry, if not use 10 Ton	B-Cell 10 Ton	-
	Damaged Wire	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Drag to Airlock with B 10 T, Internal Repair - Plan Man-entry	Use 10 Ton to push to West, use 10 Ton	B-Cell 10 Ton	-
	Cable Management	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Drag to Airlock with B 10 T, Internal Repair - Plan Man-entry	Use 10 Ton to push to West, use 10 Ton	B-Cell 10 Ton	-
B-Cell Jib (Not Important)	Any External Control	Trouble Shoot if possible	-	-	-	-
	Rotation Drive	Fix in N-S Position, Abandon	-	-	-	-
	Hoist Drive (no dose)	Fix in N-S Position, Abandon	-	-	-	-
	Hoist Drive (w/ dose load)	Fix in N-S Position, Abandon	-	-	-	-
	Damaged Wire	Fix in N-S Position, Abandon	-	-	-	-
B-Cell 10 Ton (Important)	Any External Control	Trouble Shoot Externally and Repair	-	-	-	-
	Bridge Drive	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Push to Airlock with B 3 T, Internal Repair - Plan Man-entry	Use 3 Ton to push to East, use 3 Ton	B-Cell 3 Ton	-
	Trolley Drive	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Push to Airlock with B 3 T, Internal Repair - Plan Man-entry	Use 3 Ton to push to East, use 3 Ton	B-Cell 3 Ton	-
	Hoist Drive (no dose)	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Push to Airlock with B 3 T, Internal Repair - Plan Man-entry	Use 3 Ton to push to East, use 3 Ton	B-Cell 3 Ton	-
	Hoist Drive (w/ dose load)	Trouble Shoot if possible	Design lift fixture to take load from 10 T with 3 T	Push to Airlock with 3 T, Internal Repair - Plan Man-entry, if not use 3 Ton	B-Cell 3 Ton	-
	Damaged Wire	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Push to Airlock with B 3 T, Internal Repair - Plan Man-entry	Use 3 Ton to push to East, use 3 Ton	B-Cell 3 Ton	-
	Cable Management	Trouble Shoot if possible, Perform ALARA Assessment on Internal Repair	Push to Airlock with B 3 T, Internal Repair - Plan Man-entry	Use 3 Ton to push to East, use 3 Ton	B-Cell 3 Ton	-
Doors (Critical)						
All Doors	Any External Control	Trouble Shoot Externally and Repair	-	-	Repair	Engineered Recovery
All Standard	Cylinders (open)	Trouble Shoot Externally and Repair	Use Brokk or Cranes to close door, Perform External Repair	Use Brokk or Cranes to close door, Perform Internal Repair	Repair	Engineered Recovery
	Cylinders (closed)	Trouble Shoot Externally and Repair	Perform External/Remote Repair	Internal Repair - Plan Man-entry	Repair	Engineered Recovery
	Pins	Trouble Shoot Externally and Repair	Perform External/Remote Repair	Internal Repair - Plan Man-entry	Repair	Engineered Recovery
All Crane	Hoist	Trouble Shoot Externally and Repair	Perform External/Remote Repair	Internal Repair - Plan Man-entry	Repair	Engineered Recovery
	Limits	Trouble Shoot Externally and Repair	Perform External/Remote Repair	Internal Repair - Plan Man-entry	Repair	Engineered Recovery
MSMs (Important)	External	Trouble Shoot	Repair Externally if Possible	Remove and Replace with Unused MSM	Other REC MSMs	Mock MSMs
	Internal	Trouble Shoot	Remove and Replace with Unused MSM		Other REC MSMs	Mock MSMs
New Equipment						
REAs (Critical)	External (any)	Trouble Shoot	Perform External Repair	Replace External Item with Spare	Spare	-
	Tool (any)	Trouble Shoot	Perform External/Remote Repair if Simple	Remove and Replace with New Tool	New Tool	-
	Excavator (any)	Trouble Shoot	Perform External/Remote Repair if Simple	Remove and Replace with New REA	New REA	New REA
	Hydraulic Quick Connect (REA Side)	Trouble Shoot	Perform External/Remote Repair if Simple	Remove and Replace with New REA	New REA	New REA
	Hydraulic Quick Connect (Thru Side)	Trouble Shoot	Perform External/Remote Repair if Simple	Remove REA, Replace Thru-Tube, Replace REA	Spare	Spare
	Thru-Port (any)	Trouble Shoot	Perform External/Remote Repair if Simple	Remove REA, Replace Thru-Tube, Replace REA	Spare	Spare
Floor Saw	External (any)	Trouble Shoot	Perform External Repair	Replace with Spare	Spare	Hammer/Shear
	Blade	Trouble Shoot	Perform MSM Blade Change	Replace with Spare	Spare	Hammer/Shear
	Any Drive	Trouble Shoot	Perform External/Remote Repair if Simple	Replace with Spare	Spare	Hammer/Shear
Transfer Barrier (Important)	External (any)	Trouble Shoot	Perform External Repair	Replace External Item with Spare	Spare	Spare
	Airlock Cables	Trouble Shoot, Remove Waste with Crane/Brokk	Perform External/Remote Repair if Simple	Perform ALARA and Consider Man-Entry	Spare (Mockup)	Transfer with Crane
	Rail System	Trouble Shoot, Remove Waste with Crane/Brokk	Perform External/Remote Repair if Simple	Perform ALARA and Consider Man-Entry	Spare (Mockup)	Transfer with Crane
	Turn-table	Trouble Shoot, Remove Waste with Crane/Brokk	Perform External/Remote Repair if Simple	Perform ALARA and Consider Man-Entry	Spare (Mockup)	Transfer with Crane
Brokk (Not Important)	Any	Trouble Shoot	Perform External/Remote Repair if Simple	Perform ALARA and Consider Man-Entry if simple, otherwise abandon in A-Cell	-	-

Appendix H: AREVA 30% Design Review Meeting

AREVA

MEETING MINUTES

AFS PROJECT NO.: 01932.00.W324 **DOCUMENT NO.:** A-300-296-00169

CLIENT CONTRACT NO.: C036502A00

SUBJECT: 30% Design Review Meeting

MEETING DATE: June 19, 2014 **LOCATION**: Kurion main office, Richland

FROM:
Bryan Flanagan

ATTENDEES:
Bob Watkins – AFS
Roger Trullinger- AFS
Bryan Flanagan – AFS
Doug Chenault – AFS
Wade Singleton – Kurion
Keith Quigley – Kurion
Adrian Cornish - Kurion

RECORD OF MEETING:

Item	Discussion	Action By	Required Date
1	**Safety** – Heat Stress – Reminder that summer is approaching and to remain hydrated and try to stay out of the sun. When in the sun use sun screen. Factors of heat stress: high temp and humidity, direct sun or heat, limited air movement, physical exertion, some medicines, low tolerance. Bryan reminded everyone to carry water in their vehicle.	N/A	
2	Reviewed RCR comments. Read and discussed each reviewer comments and Kurion disposition. A few minor changes were noted. No new actions were identified.	Info	
3	Editorial comments from M. St.Germaine were identified but not reviewed.	Info	
4	Attached are the RCR forms (in process forms).	Info	

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REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782F-RPT-005 Rev A / 300-296 Soil Remediation Project Phase I & II, 30% Design Report	Date: 6-9-14 Project No.: 01932.01.W324	Review No.: 30% Page: 1 of 2
Document Reviewer: Scott Bear	Organization: Packaging	Location/Phone: 253-552-1334

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	page 17, figure 17, is there any seals required between the hard tubing and the Thru Support or are small leaks permissible?	The annulus between Through support and wall be grouted. Other tubing will be handled with fittings.		
2	page 18, figure 18, is the alignment hole oversized or slotted to allow tightening of the REA to the Thru Support?	Yes.		
3	page 20, first sentence and figure 28, could clarify by adding "the shoulder on the threaded internal bolt forces the tool plate toward the REA tool plate when tightened"	Design Development		
4	page 24, is removal or REA replacement performed using the revearse procedure? or are there additional tools required?	Design Development		
5	page 29, will the sacks retain the cylindrical shape while loaded with sharp rocks or equipment?	TBD @ POP / Mockup		
6	page 41, probably the 60% design will include the HPU horsepower, flow & pressure rating, cooling required, hydraulic fluid, quick disconnect fittings	Yes.		
7	page 42, is any leakage expected from changing the hydraulic tools?	No.		
8	page 54, missing figure 62	Agree.		

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):

AREVA

AREVA Federal Services LLC

REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. A-300-296-00045 Rev 0 / Facility Design Basis Requirements 300-296 Soil Remediation Project Phase I & II	Date: 6-9-14	Review No.: 30%
	Project No.: 01932.01.W324	Page: 1 of 1
Document Reviewer: Scott Bear	Organization: Packaging	Location/Phone: 253-552-1334

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	The signature sheet does not include signatures from the Functional Engineering Manager, the Project Manager, the Director of Engineering Services (or delegate), and Quality Assurance - per AFS-EN-PRC-001, Design Control, Section 6.2.2	Document to be revised		
2	Section 2.0, Codes and Standards - may want to include any hydraulic design code requirements (e.g., National Fluid Power Association (NFPA) NFPA T3.5.1 Valves, Mounting Services, or NFPA T2.13.2 Fire Resistant Fluids)	Comment noted, will consider during document revision		

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):

AREVA	AREVA Federal Services LLC
	REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. A-300-296-00045 Rev 0 / Facility Design Basis Requirements 300-296 Soil Remediation Project Phase I & II	Date: 6-9-14	Review No.: 30%
	Project No.: 01932.01.W324	Page: 1 of 1
Document Reviewer: Scott Bear	Organization: Packaging	Location/Phone: 253-552-1334

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	The signature sheet does not include signatures from the Functional Engineering Manager, the Project Manager, the Director of Engineering Services (or delegate), and Quality Assurance - per AFS-EN-PRC-001, Design Control, Section 6.2.2	Document to be revised		
2	Section 2.0, Codes and Standards - may want to include any hydraulic design code requirements (e.g., National Fluid Power Association (NFPA) NFPA T3.5.1 Valves, Mounting Services, or NFPA T2.13.2 Fire Resistant Fluids)	Comment noted, will consider during document revision		

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):

AREVA

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REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782F-DWG-E010 Rev Preliminary 30% / 300-296 Remediation 324 Building - REC Cell - Single Line Diagram	Date: 6-11-14	Review No.: 30%
	Project No.: 01932.01.W324	Page: 1 of 1
Document Reviewer: Scott Bear	Organization: Packaging	Location/Phone: 253-552-1334

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	sheet 2, The typical axis valve stack includes the counterbalance valve. There may be a requirement to direct mount the counterbalance valve onto the cylinder to prevent the equipment from dropping the load or unintentional lowering in the event of a hose breakage.	This will be evaluated as the design progresses.		

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):

AREVA Federal Services LLC

REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782F-DWG-E010 Rev Preliminary 30% / 300-296 Remediation 324 Building - REC Cell - Single Line Diagram	Date: 6-11-14	Review No.: 30%
	Project No.: 01932.01.W324	Page: 1 of 1
Document Reviewer: Scott Bear	Organization: Packaging	Location/Phone: 253-552-1334

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	sheet 2, The typical axis valve stack includes the counterbalance valve. There may be a requirement to direct mount the counterbalance valve onto the cylinder to prevent the equipment from dropping the load or unintentional lowering in the event of a hose breakage.	This will be evaluated as the design progresses.		

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):

AREVA

AREVA Federal Services LLC

REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782F-DWG-M REC 8200-000 Preliminary 30% / 300-296 Remediation 324 Building - REC Cell - REA Offset Hook	Date: 6-11-14	Review No.: 30%
	Project No.: 01932.01.W324	Page: 1 of 1
Document Reviewer: Scott Bear	Organization: Packaging	Location/Phone: 253-552-1334

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	sheet 1, There may be a requirement for a safety hook.	Comment noted, no change made..		
2	sheet 1, picking up the tool without a load may cause the tool with hook to rotate making the installation difficult.	Comment noted, no change made..		

Comment Reviewer (sign and date):

Agreement with Comment Resolution (sign and date):

Unresolved Comment Disposition (sign and date):

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

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REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782F-RPT-005 30% Design KUR-1782P-CALC-C001, KUR-1782F-CALC-C001, KUR-1782F-CALC-C003	Date: 6/13/14	Review No.: 30%
	Project No.: 01932.01.W324	Page: 1 of 3
Document Reviewer: Doug Chenault	Organization: AFS - Civil Eng.	Location/Phone: HRR / 509-378-9912

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	KUR-1782P-CALC-C001 This calculation not in 324 Project Calculation List	1782P indicates Proof Of Principal (POP) Calculation.		
2	KUR-1782P-CALC-C001: This report uses 4000 psi (fc) whereas the stability report “KUR-1782F-CALC-C001” uses 3000 psi, justify the difference.	1782P-Calc-C001 is calculation for POP test wall. Not related to 1782F.		
3	KUR-1782P-CALC-C001: Placement of the Geometry names such as LLREA (page 8) on the sketches on pages 5-7 will make the review much more straightforward.	POP calc.		
4	KUR-1782P-CALC-C001: Show check or conclusion for wall shear on page 15, also double check values for Mu_LREA.	POP calc.		

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):
Unresolved Comment Disposition (sign and date):	

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

AREVA	AREVA Federal Services LLC
	REVIEW COMMENT RECORD (RCR) (Continued)

Document No(s) / Title(s)/Rev. 30% Design KUR-1782P-CALC-C001, KUR-1782F-CALC-C001, KUR-1782F-CALC-C003	Date: 6/13/2014	Review No.: 30%
Document Reviewer: Doug Chenault	Project No.: 01932.01.W324	Page: 2 of 3

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
5	Calculation "KUR-1782P-CALC-C001" is a report for structural analysis and design to support the testing of the Remote Excavator Arm (REA) and found to be satisfactory when the above comments are incorporated.	POP calc.		
6	KUR-1782F-CALC-C001: pg. 6, Section 5.1. What is basis for ratio of High & Low density concrete for 1/3 and ½ HD.	Comment noted, no change made.		
7	KUR-1782F-CALC-C001 pg.7, Section 5.2. Under Snow Loads, it is not clear what "Is" is for PC-2 SSCs.	Importance factor, snow.		
8	Calculation "KUR-1782F-CALC-C001" is a report establishing a structural model using the code SAP2000 and no further comments are warranted for the 30% review.	OK		
9	KUR-1782F-CALC-C003 is a report for 30% Design Review of the Radiochemical Engineering Cells (REC) of the 324 Building floor structural evaluation. This report uses 3000 psi (f_c) concrete as does "KUR-1782F-CALC-C001" which is different than "KUR-1782P-CALC-C001" which uses 4000 psi. Reason why is noted in Section 5.1, however it is confusing to use both without justification.	To be verified.		

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

	REVIEW COMMENT RECORD (RCR) (Continued)		
Document No(s) / Title(s)/Rev. 30% Design KUR-1782P-CALC-C001, KUR-1782F-CALC-C001, KUR-1782F-CALC-C003		Date: 6/13/2014	Review No.: 30%
Document Reviewer: Doug Chenault		Project No.: 01932.01.W324	Page: 3 of 3

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
10	KUR-1782F-CALC-C003 Note in Section 7.1 refers to Section 2.1.1 which is incorrect and should be Section 2.	ACCEPT. 60%		
11	KUR-1782F-CALC-C003 Page A13 under Check Shear, the Demand to Capacity ratio for shear is labeled bending and should be shear. Same on page B21 and B24.	ACCEPT. 60%		
12	KUR-1782F-CALC-C003 Could not verify debris weight = 125218 lbs from Section 3 of KUR-1782F-RPT-005 as shown on Page A6 of report. Found values in the referenced report in Section 2, Table 1 these weights do not include any soil weight from overflow of other cells being placed in Cell A.	60%		

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

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REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. 30% Design Review Package – Constructability Review	Date: 6/16/2014	Review No.: 30%
	Project No.: 300-296	Page: 1 of 1
Document Reviewer: DeVerne Dunnum	Organization: FE&C	Location/Phone:

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	It looks like the through support holes for mounting the REA's are located such that the through wall light with step sleeve cannot be installed as shown in figure 67 page 59 verses figure 6 page 12. Without dimensions, this comment is indeterminate.	Will evaluate @ next design stage.		
2				

Comment Reviewer (sign and date):

Agreement with Comment Resolution (sign and date):

Unresolved Comment Disposition (sign and date):

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

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REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. 30% Design Review Package	Date: 6/16/2014	Review No.: 30%
	Project No.: 300-296	Page: 1 of 1
Document Reviewer: Bryan Flanagan	Organization: Engineering	Location/Phone: HRR / 509-371-1950

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	KUR-1782F-CALC-M001: Calculation should identify acceptance criteria and design basis (such as done in other calcs).	Design Progression	Accepted	Closed
2	For the 60% Design, the package should include the implementation of design requirement configuration management. For example the compliance matrix and tracking system.	Agree	Accepted	Closed

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):
Unresolved Comment Disposition (sign and date):	

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

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REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782M-PLN-001 Rev A / Mock Up and Testing Plan	Date: 6/13/2014	Review No.: 30% Design Review
	Project No.: 300-296	Page: 1 of 1
Document Reviewer: Matt St. Germaine, james.st-germaine@areva.com	Organization: AFS	Location/Phone: 509.371.1872

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1.	Remote Vision/Monitoring Systems – The design media and 30% design report do not validate the statement that "The remediation process will use existing facility systems as much as possible to avoid the various costs associated with installation of new systems." From what I can tell, all new vision systems will be incorporated for the remediation work. Please revise this section to accurately depict the work that will be conducted.	Comment noted, no change made.		

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):
Unresolved Comment Disposition (sign and date):	

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

AREVA

AREVA Federal Services LLC

REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782F-RPT-005 / 30% Design Report / Rev A.	Date: 6/12/2014 Project No.: 300-296	Review No.: 30% Independent Page: 1 of 4
Document Reviewer: Matt St. Germaine, james.st-germaine@areva.com	Organization: AFS	Location/Phone: 509.371.1872

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1.	The items below are a summary of the comments made directly on the document, please refer to marked up PDF attachment. Address Global tech editing issues in document per attached previously sent mark-up as applicable.	Not Required	Not Required	Closed - M. St. Germaine 6/12/2014
2.	Section 2.1.1 - Please add who the responsible parties are for each activity and when it will be completed.	Remove "...and be adjusted"		
3.	Section 2.1.1 (B-Cell) Who is packaging the Duct sprayers? They should be included in the Debris volume until a plan is in place to remove them to ERDF.	RPT-001 12.9-WCH is responsible for shipping & transport.		
4.	Section 2.1.1 (Airlock) Televator even when size reduced will not = 0 cubic meters. Provide estimate in table 1.	Remove televator from table.		
5.	Table 2 - Until transport of items to ERDF has been approved, they should be included in table 1.	Comment noted, no change made.		
6.	Installation of the Brokk does not appear in 30% design drawings. Please add to general arrangment drawing DWG-M001	Brokk is used in off nomal circumstances & will not be "installed"		
7.	2.1.3 - The discussion on the tool holder should be removed from this section, causes confusion.	OK.		
8.	Section 2.1.3 - a loose connection on the lower thru support should be considered befor the upper arm is fully engaged. This may be the intent but is not well described.	Comment noted, no change made. 60%		
9.	Section 2.1 - Add new subsection for discussion of tool rack and transfer barrier.	Agree		

10.	Section 2.5 - Please add who is responsible for the analysis described in paragraph 3?	monolith contractor		
11.	Section 2.5.2 - Paragraph 2 described a major design issue and should be added to the major design issue list.	Agree		
12.	Section 2.5.4 The testing being performed in paragraph 2 needs to state who, when, and where it will be performed. A tie directly to the project schedule would be ideal.	Comment noted, no change made.		
13.	Section 2.6.3 - Does not appear to describe all 324 building modifications (grout curtains, Dam installation in D-Cell, etc. Please add and make references to other sections as required.	Not building modifications		
14.	Section 3.3 - Does not address basic electrical requirements. Which 480 panels service the loads, where will the control trailer/hydraulic skid, air compressor skid, etc get their power. These can be changed down the road if necessary but should be provided for 30%.	60%		
15.	Section 3.3.2 - Paragraph 4. Will the cell be able to maintain a negative pressure with with the partial block and the transfer barrier in place. This is a key ALARA feature.	60%		
16.	Section 3.3.2 - Based on the discussion here, HVAC should be on the major design issues list.	Agree		
17.	Section 4.1.8 - Delete. REA mounting is described in detail in section 2.1.2	Yes		
18.	Section 4.2 - Paragraph 2 makes it sound like the scale is part of the spray location. I imagine this is part of the table. Please fix.	Agree		
19.	Section 4.4 - Paragraph 3 states the inert gas will be used to push the pig through the delivery hose. Does it need to be inert?? Consider changing to compressed gas.	Change 'inert' to 'compressed'.		
20.	Section 4.4 - will there be a binder skid? Not addressed in drawings or write-up	60%		
21.	Section 4.5.1 (PLC Control) - What is meants by "system control?" Is this purely a connection between the user chair and the HPU or are their other features it is going to control. binder addition, table movement, etc. This section needs additional substance.	60%		
22.	Section 4.5.1 (Operator Interfaces) - Safety needs to be a design consideration.	Agree		

23.	Section 4.5.2 – Will the arm have interlocks to keep it from hitting walls, colliding with the transfer barrier etc.	60%		
24.	Section 4.5.2 Paragraph 2. The maximum speed will not be controlled by the excavator but by the hydraulic manifold and the proportional control provided through the PLC. Please revise.	60%		
25.	Section 4.5.2 (Equipment Power-up/Equipment Shutdown) – What is meant by "motive safe state?" holds is place, returns to a set position, resets naturally on floor….Please clarify	Define in 60%		
26.	Section 4.5.2 (Alarms and Annuciations) – Alarms for what (Hydraulic high temp, high pressure, position, etc?)	60%		
27.	Section 4.5.2 – Interlocks. Please describe for each type of interlock if they will be hardwired or software.	60%		
28.	Section 4.6 Paragraph 2. Will there be any audio feedback? If no, please remove from paragraph 2 and the block diagrams.	60%		
29.	Section 4.7 – What about the cell window light arrays. No discussion of use here, but they show up in the design drawings.	60%		
30.	Figure 65 – Crane cameras are controlled from local control stations. Please fix.	Consistent use of word 'control' will be defined in 60%.		
31.	Section 4.7 Paragraph 4 states that the ATC cameras will be deployed in sleeves. Above it says they will be deployed by the crane, which is it?	2 types of cameras		
32.	Section 5.1.1 makes reference to Ref1 but I don't think that is the appropriate reference as it is for debri tracking, please fix or clarify.	Agree		
33.	Section 5.1.1 – Who is doing the geotech, when will it be completed.	Design Progression		
34.	Section 5.2 – A-Cell loading only references debris being relocated, what about the additional soil being added?	Design Progression		
35.	Section 5.3.2 – A sonde may not work once you are under the edge of the foundation. Please confirm a sonde will work for your intended use.	60%		
36.	Section 8.3 – Paragraph 2 makes reference to the Action Tracking System which I do not believe exists. Is this the major design issues list?	Change 'Action Tracking System' to 'Action Item List'.		

37.	Appendix A – KUR-1782F-DWG-E001 has not been included. Please uncheck for 30% design.	Agree		
38.	Appendix A – Specification list – Not complete/not correct – please revise.	Agree, will remain partially incomplete.		

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):
Unresolved Comment Disposition (sign and date):	

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

AREVA

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REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782F-RPT-005 Attachment G (Kurion Drawings)	Date: 6/12/2014	Review No.: 30% Design Review
	Project No.: 300-296	Page: 1 of
Document Reviewer: Matt St. Germaine, james.st-germaine@areva.com	Organization: AFS	Location/Phone: 509.371.1872

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1.	Global Comment: Title Blocks need to be filled out as completely as possible for this phase. Sheet Scale, sheet No, and SHEET are all inconsistant at this point. Please fix	Correct for 60%		
2.	Global Comment: Tolerance Blocks and part number blocks should be checked for accurance and removed where not appropriate.	Correct for 60%		
3.	KUR-1782F-DWG-M001, Sheet 3 Camera callouts do not match DWG-I-REC-9000-000. Suggest calling out camera locations but not camera numbers.	60%		
4.	KUR-1782F-DWG-M001, Sheet 3 REA cameras are not called out on DWG-I-REC-9000-000. Will there be REA cameras or not?	There will be REA Cameras.		
5.	KUR-1782F-DWG-M-REC-1100-000 Sheet 1 Parts list: NO POLE/QTY Column text has formatting issues. Fix.	Correct for 60%		
6.	KUR-1786F-DWG-M-REC-2000-000 Sheet 1 How will the transfer barrier be attached? Please show scale and Binder addition or add notes that they are removed for clarity or something.	No attached. 60%		
7.	KUR-1782F-DWG-M-REC-5000-000 Sheet 1 Control drawing shows a motor for hose release/retract. Is this part of the assembly, where is it located?	Design progression, motor may not be needed.		
8.	KUR-1782F-DWG-P001 all sheets Steps 2 and 10: please add "using transfer barrier"	60%		

9.	KUR-1782F-DWG-P001 all sheets Consider moving the step where the contents are weighed to after the fixative is applied to the waste. This will give a more accurate basis for material moved into each cell.	60% if applicable still		
10.	KUR-1782F-DWG-P002 Sheets 1 and 2 Change HMI to Control System in all locations. Change Camera Mount to CCTV in all locations	60%		
11.	KUR-1782F-DWG-P002 Sheet 1 HPU should also interface with the Control System	60%		
12.	KUR-1782F-DWG-P002 Sheet 1 Transfer Barrier – Delete Gamma detector, this is integral to transfer barrier.	60%		
13.	KUR-1782F-DWG-P002 Sheet 1 Waste Sack System – Should add the scale as an interface	60%		
14.	KUR-1782F-DWG-P002 Sheet 1 Will the MSM interface with the REA-U, REA-L, and binder application hose? If so consider adding	No.		
15.	KUR-1782F-DWG-P002 Sheet 2 Is there going to be a binder/fixative skid?	60%		
16.	KUR-1782F-DWG-E010 Sheet 1 This really should not be an electrical drawing. This is more of a control block diagram and should be moved to the control section.	Agree 60%		
17.	KUR-1782F-DWG-E010 Sheet 1 Would expect to see a simple One-Line drawing here for the power system. This should be included for the 30% design package.	60%		
18.	KUR-1782-DWG-E010 Sheet 2 Again, consider moving to the controls or even potentially the mechanical section. This is not an electrical drawing.	60%		
19.	KUR-1782-DWG-E010 Sheet 3 Consider moving to the controls section	60%		
20.	KUR-1782-DWG-E010 Sheet 3 Fixative valves are shown as part of the transfer barrier, what about the binder pump?	60%		
21.	KUR-1782-DWG-E010 Sheet 3 For the saw, is there a motor that drives cut depth? Is so please include.	60%		
22.	KUR-1782-DWG-E010 Sheet 3 For the grout hanger, if the hose is going to be actuated by the REA, may only want to use the	Comment noted, no change made.		

	motor for hose retract and eliminate hose feed.			
23.	KUR-1782-DWG-E010 Sheet 4 Consider moving to the controls section.	60%		
24.	KUR-1782F-DWG-I-REC-9000-000 Sheet 2 General Note 3. Please clarify to the reader that this is not included for 30% design or delete until the cable schedule is added.	60%		
25.	KUR-1782F-DWG-I-REC-9000-000 Sheet 2 Please delete dimensions for this drawing. Drawing is diagrammatic in nature.	60%		
26.	KUR-1782F-DWG-I-REC-9000-000 Sheet 3 Remote operator stations should each have access to all 8 cameras in B Cell	60%		
27.	KUR-1782F-DWG-I-REC-9000-000 Sheet 3 Air Traffic Control Station is the primary oversight, should this station not at least have the ability to view all cameras? This seems like the most reasonable location for Network Video recording as well.	60%		
28.	KUR-1782F-DWG-I-REC-9000-000 Sheet 3 Local crane operator station does not match the logic described in the 30% design report. See section 4.6.1 item 2.b	60%		
29.	KUR-1782F-DWG-I-REC-9000-000 Sheet 3 Video recording in the 30% design report states that it will be at a central location (See 4.6.1 item 3) which does not match what is displayed here.	60%		
30.	KUR-1782F-DWG-I-REC-9000-000 Sheet 4 A block diagram depicting the control/networking for the cameras would be very useful for the reviewer. Consider adding for 60% design.	Agree		
31.	KUR-1782F-DWG-I-REC-9100-000 Format parts list like the rest of the package. Parts callouts should be on sheet 2	60%		
32.	KUR-1782F-DWG-I-REC-9290-000 Where is this light bar being used? If it is not planning on being used, delete.	60% It is needed.		
33.	KUR-1782F-DWG-I-REC-9300-000. Rolling cart should have 2 crazy wheels and 2 locking wheels for easy of movement and stability when placed. Please ensure cart has a push handle and cameras have a top mounted PTZ controller.	60%		

34.	KUR-1782F-DWG-I-REC-9500-000 Where is the Air Traffic Controller? Will there be a video rack? Will there be a pc station for PLC manual control?	60%		

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):
Unresolved Comment Disposition (sign and date):	

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

AREVA

AREVA Federal Services LLC

REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782-RPT-005 Rev A 30% Design Report	Date: 6/12/2014	Review No.: 1
	Project No.: 300-296	Page: 1 of
Document Reviewer: Roger Trullinger 6/12/14	Organization: QA	Location/Phone: 2101 HRR Room 643

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	ENG-1-3.3 "Engineering Configuration Management" requires a Baseline Document List be created to control Configuration Items during design.Kurion has not provided a process to control the configuration of the design.	Baseline is "List of Documents..." in App A.		
2	Contract C036502A00 Exhibit D "Scope of Work" section 2.2.1.2.1 30% design package deliverables requires a "preliminary equipment list", and no such list was attached.	Accept.		
3	KUR-ENG-PRO-03-06 "Caluculations" Rev 1, section 5.5. requires assumptions to have an assigned traking numbers, no tracking numbers were present KUR-1782F-CALC-C001 & C003, section 3 KUR-1782P-CALC-C001 & C003, section 3 KUR-1782F-CALC-M001, section 4	Tracking number to be assigned in 60%.		
4	KUR-1782F-CALC-M001, states on page 2 "contains assumptions and/or inputs that require verification" No. Section 4 Assumptions list two asssumptions that require verification. KUR-1782F-CALC-C001 & C003, section 3 KUR-1782P-CALC-C001 & C003, section 3 KUR-1782F-CALC-M001, section 4	Comment noted. Tracking numbers to be assigned in 60%.		
5	KUR-1782F-M001 section 6.1 excludes computer software verification. This is not consistent wot KUR-ENG-PRO-03-06	60%		
6	Test plans do not address upset conditions during testing, recommend including both	Include in future test plans, as applicable.		

	programatic and hardware conditions in the plan or procedure governing the test.			

Comment Reviewer (sign and date):	Agreement with Comment Resolution (sign and date):
Unresolved Comment Disposition (sign and date):	

AFS-EN-FRM-001 Rev 01 (Issued August 20, 2008)
Reference: AFS-EN-PRC-001 Design Control

AREVA

AREVA Federal Services LLC

REVIEW COMMENT RECORD (RCR)

Document No(s) / Title(s)/Rev. KUR-1782F-RPT-005 30% Design Report and all attachments	Date: 6/12/14	Review No.: 30%
	Project No.: 01932.01.W324	Page: 1 of
Document Reviewer: Bob Watkins	Organization: AFS - PM	Location/Phone: MO-779, 509.344.9877

Item No.	Comments / Discrepancy(s)	Disposition	Comment Reviewer Concurrence	Status
1	For 60% design, prepare to-scale plan view and cross sections of contaminated soil plume under B-Cell from best available borehole data (civil dwgs). If possible, show iso-lines of gross activity readings. This should be done in 3D model for best results.	Accept. Will determine capabilities for 60%.		

Comment Reviewer (sign and date):

Agreement with Comment Resolution (sign and date):

Unresolved Comment Disposition (sign and date):

Attachment A

Specifications

SECTION 03 6000

GROUT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Portland cement grout.
2. Non-shrink epoxy grout.
3. Non-shrink cementitious grout.

B. Related Sections:

1. Section 03 3001 -- Reinforced Concrete: [Formwork Products] [, and] [Joining existing concrete with new concrete].
2. Section 03 1534 – Post-Installed Concrete Anchors – Normal Confidence: [Use of an anchorage system consisting of grout and an anchor rod, wherein the latter consists of concrete reinforcing steel (i.e., rebar)].
3. Section 03 1512 – Post-Installed Concrete Anchors – High Confidence: [Use of an anchorage system consisting of grout and an anchor rod, wherein the latter consists of concrete reinforcing steel (i.e., rebar)].
4. Section 05 1000 – Structural Metal Framing: [grouted baseplates, bearing plates, and / or leveling plates].

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society of Testing and Materials:

1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.

3. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens).

4. ASTM C150 - Standard Specification for Portland Cement.

5. ASTM C191 - Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.

6. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.

7. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.

8. ASTM C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacings and Polymer Concretes.

9. ASTM C827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

10. ASTM C1090 - Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout.

11. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

1.3 SUBMITTALS

A. Product Data: Submit product data on grout, fine aggregate (demonstrating compliance with ASTM C33 and C40), and [________].

B. Manufacturer's Installation Instructions: Submit manufacturer's instructions for mixing, handling, surface preparation and placing epoxy type and non-shrink type grouts.

C. Manufacturer's Certificates of Compliance: Certify [non-shrink cementitious grout] and [Insert Other Products Here] meet or exceed [ASTM C 1107] and [Insert Other Specified Requirements Here].

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements related to recycled content and point of origin of materials.

1. Materials Resources Certificates:

a. Certify recycled material content for recycled content products.

b. Certify source for regional materials and distance from Project site.

1.5 QUALITY ASSURANCE

A. The work shall be subject to inspection at all times by the Owner and Owner's Independent Testing Agency for the purpose of determining that the work is properly executed in accordance with this specification. Failure to detect defective workmanship or material during any interim inspection shall not constitute acceptance of workmanship and materials.

B. Acquire all materials from same source as used to produce the specific mix design for all work. Formally notify LANL of any material source changes prior to grout placement including the test agency test documentation. The subcontractor must provide LANL a certificate of conformance prior to the initial placement that confirms the source of the constituents, that tests confirm compliance, and that these sources are the same for the mix design testing and the placed mix.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver grout in manufacturer's unopened containers with proper labels intact.

C. Store grout in a dry shelter, protected from moisture and, for prepackaged grout, if applicable, maintained at a temperature required by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 6000 - Product Requirements: Environmental conditions affecting products on site.

B. For prepackaged grout, do not perform grouting if ambient temperature exceeds that which is specified by manufacturer. In the case of non-prepackaged, Portland cement grout, comply with ACI 301.

C. For prepackaged grout, maintain minimum temperature specified by manufacturer before, during, and after grouting, until grout has set. In the case of non-prepackaged, Portland cement grout, comply with ACI 301.

PART 2 PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

A. Materials and Resources Characteristics:

1. Recycled Content Materials: Furnish manufacturers certification of production with maximum available recycled content. [including:] [.]

    a. [____________________.]

2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site [including:] [.]

    a. [____________________.]

2.2 PORTLAND CEMENT GROUT MATERIALS

A. Portland cement: ASTM C150, Type I and II.

B. Water:

1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:

    a. Corrosion of steel.

    b. Volume change increasing shrinkage cracking.

    c. Efflorescence.

    d. Excess air entraining.

C. Fine Aggregate:

1. Washed natural sand.

2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.

3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:

1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.3 RAPID CURING EPOXY GROUT

A. Manufacturers (listed in descending order of precison / performance):

1. Five Star Products, Inc.: Five Star HP Epoxy Grout.

2. Dayton Superior: Epoxy Grout J55.

3. ITW Polymer Technologies: Escoweld 7505E/7530

4. Sika Corp.: Sikadur 42, Grout-Pak

5. [____________________] Model [________].

6. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

B. Rapid Curing Epoxy Grout: Precision, high strength, minimal shrinkage, 100% solids, three-component epoxy grout. Rapid-curing, low creep, high effective bearing area, high-vibration and chemical resistance.

Property	Test	Result
Compressive Strength	ASTM C579	[14,000] psi at 7 days
Tensile Strength	ASTM C307	[2,100] psi minimum
Coefficient of Expansion	ASTM C531	[20×10^{-6}] per degree F
Linear Shrinkage	ASTM C531	[0.04%]
[Early Age Height Change (Plastic State)	ASTM C827	Minimum change in height [0.10%] Maximum change in height [0.40%]]
[Height Change of Hardened Grout	ASTM C1090	Minimum change in height [0%] Maximum change in height [0.5%]]

2.4 NON-SHRINK CEMENTITIOUS GROUT

A. Manufacturers (listed in descending order of precision / performance):

1. QUICKCRETE: Non-shrink General Purpose Grout.

2. Dayton Superior: 1107 Advantage Grout.

3. Five Star Products, Inc.: Five Star Grout,

4. L & M Construction Chemicals, Inc.: Crystex.

5. [____________________] Model [________].

6. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Non-shrink Cementitious Grout: Pre-mixed ready for use formulation requiring only addition of water; non-shrink, non-corrosive, non-metallic, non-gas forming, no chlorides.

C. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with ASTM C 1107:

Property	Test	Time	Result
Early Age Height Change (Plastic State)	ASTM C827		Minimum change in height [0.0%] Maximum change in height [4.0%]
Height Change of Hardened Grout	ASTM C1090		Minimum change in height [0%] Maximum change in height [0.3%]
Compressive Strength*	ASTM C 1107 (ASTM C109 modified)	1 day	2,000 psi
		7 days	5,000 psi
		28 days	6,500 psi

*For grouts, compressive strength is typically reported for multiple consistencies (e.g., plastic, flowable and fluid, etc.). Since the number and /or names of the consistencies can vary from manufacturer to manufacturer, the compressive strength given in the table is the lowest strength that all manufacturers report (i.e., fluid / max. water).

2.5 FORMWORK

A. Refer to Section 03 3001 for formwork requirements.

2.6 CURING

A. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or with use of wet burlap method.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify areas to receive grout.

3.2 PREPARATION

A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.

B. Rough concrete lightly, but not enough to interfere with placement of grout.

C. Remove foreign materials from metal surfaces in contact with grout.

D. Align, level, and maintain final positioning of components to be grouted.

E. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.3 INSTALLATION - FORMWORK

A. Construct leak proof forms anchored and shored to withstand grout pressures.

B. Install formwork with clearances to permit proper placement of grout.

C. For dry packing of grout, use braced backboards with sufficient strength to pack grout against.

D. Coat all formwork with approved form release agents

3.4 MIXING

A. Portland Cement Grout:

1. Use proportions of 2 parts sand and 1 part cement, measured by volume.

2. Prepare grout with water to obtain consistency to permit placing and packing.

3. Mix water and grout in two steps; pre-mix using approximately 2/3 of water; after partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing 2 to 3 minutes.

4. Mix only quantities of grout capable of being placed within 30 minutes after mixing.

5. Do not add additional water after grout has been mixed.

6. Capable of developing minimum compressive strength of [2,400] psi in 48 hours and [7,000] psi in 28 days.

B. Mix and prepare rapid curing epoxy grout in accordance with manufacturer's instructions.

1. Capable of developing compressive strength of [14,000] psi in 7 days.

2. Field proportioning of epoxy grouts shall not be permitted.

C. Mix and prepare non-shrink cementitious grout in accordance with manufacturer's instructions.

1. Capable of developing minimum compressive strength of [2,000] psi in 24 hours, [5,000] psi in 7 days, and [6500] psi in 28 days.

D. Mix grout components in proximity to work area and transport mixture quickly and in manner not permitting segregation of materials.

3.5 PLACING GROUT

A. Place grout material quickly and continuously.

B. Do not use pneumatic-pressure or dry-packing methods.

C. Apply grout from one side only to avoid entrapping air.

D. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.

E. Thoroughly compact final installation and eliminate air pockets.

F. Do not remove leveling shims for at least 48 hours after grout has been placed.

G. Where grout depth will exceed 2 inches, place grout using two pours. The first pour shall be such that the second pour can be conducted with a depth of 1 to 2 inches.

3.6 CURING

A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. After grout has attained its initial set, keep damp for minimum of 3 days.

3.7 FIELD QUALITY CONTROL

A. Field [inspection and] testing will be performed in accordance with [ACI 301] [ACI 318] and under provisions of Section 01 4000 - Quality Requirements. [______________________.]

B. Submit proposed mix design [of each class of grout] to [inspection and] testing firm for review prior to commencement of Work.

C. Tests of grout components may be performed to ensure conformance with specified requirements.

END OF SECTION

CENTRIFUGAL PUMP DATA SHEET

Company:	Process Engineering Associates, LLC	Data Sheet No.:	
Project:		Project No.:	
Rev Note:			
Service:	Reflux Pump		
Item No:	RefluxPump	Ref: 020908-C	PID No: TBD
Date:	4/2/09	Rev: TBD	Area: AREA3

PROCESS
ENGINEERING ASSOCIATES, LLC
"Excellence in Applied Chemical Engineering"

PROCESS AND PERFORMANCE DATA

Fluid:	Light Hydrocarbons				
Normal Capacity (gpm)	2.3	Design Capacity (gpm):	2.8		
% Total Solids:	0.00	% TS Dissolved: 0.00	% TS Suspended: 0.00	Max. Particle Size:	
Specific Gravity:	0.70	Viscosity (cP):	0.63		
Temperature (°F): 99.5		Vapor Pressure (psig):	30.3		

HEAD	SUCTION	DISCHARGE	DIFFERENTIAL
Static (ft of Liquid)			0.00
Pressure (ft of Liquid.)			0.00
Friction (ft of Liquid.)			0.00
Total (ft of Liquid.)	0.00	0.00	0.00
Normal Suction Press (psig):	0.00	Normal Discharge Press (psig):	0.00
NASH Available (ft of Liquid.)	-51.9	Pump Design Head (ft of Liquid.)	0 Ft.

MECHANICAL DETAILS

Included:	☑ Seal	☑ Motor	☑ Baseplate	☐ Coupling			
Type:	☐ End Suction	☐ In Line	☐ Recessed Impeller	☐ Self Priming	☐ Disc	☐ Canned Motor	☐ Mag Drive ☑ Multistage
Standard:	☑ ANSI	☐ API	☐ Other	Impeller:	☐ Open	☑ Semi Open	☐ Closed
Jacket:	☐ Full Casing	☐ Partial Casing	☐ Rear Cover/Seal Chamber	☐ None			
Jacket Fluid:				@	sig	°F	

Nozzles	Size	Rating	Face	Casing Taps	Size	Ratin	Facing
Suction:				Vent:			
Discharge:				Drain:			

Casing Support:	☐ Foot Mounted	☐ Centerline Mounted			
Baseplate:	☐ Grouted	☐ Stilt Mounted	☐ Drip Lip		
Lubrication:	☐ Oil Reservoir	☐ Oil Mist	☐ Grease		
Oil Seal:	☐ Labyrinth	☐ Lip	☐ Magnetic		
Coupling:	☐ Elastomeric	☐ Disc	☐ Taper lo bore	☐ St bore	
Coupling Guard:	OSHA APPROVED	☐ Carbon Steel	☐ St ss Steel	☐ Othe	
Mechanical Seal	☐ Single	☐ Pusher	☐ C rtrig ount		Rotating Ring:
	☐ Double	☐ Metal Bellows	☐ mponen nt		Stationary Ring:
	☐ Tandem	☐ Rubber Bellows	Se ardware		Seals/O-ring:
	MFG type, mat'l code				
Seal Flush	Flush Plan No.		☐ ANSI	☐ API	
	Flush Fluid			psig	°F
	Double Seal with Barr				
Seal Chamber	☐ Enlarged Cylin al	☐ Enlarged Ta ed	☐ Stuffing Box		
Pump --- Total BHP Required:		Efficiency:			
Motor ---- Type:		HP:		RPM:	
Electricity --- Voltage:	460	Hertz:	60	Phase:	3
Electrical Area --- Class:	I	Group:	D	Div:	II

MATERIALS OF CONSTRUCTION

Casing	316 SS or Better	Containment Shell	
Impeller	316 SS or Better	Inner Sleeve Bearing	
Shaft		Outer Sleeve Bearing	
Shaft Sleeve		Inner Magnet	
Baseplate		Outer Magnet	
Gaskets	Vendor to Determine	Jacket	

Remarks: Selected 1700 RPM due to low NPSHa
Roughly equivalent to Goulds 3196

Attachment B

Calculations

KURION
Isolating Waste from the Environment

Calc. #: KUR-1782F-CALC-C001

Revision: C

Calculation Title: 324 Building Structural Stability Evaluation (30% Design)

Project Title: 300-296 Soil Remediation

Status: ☒ **In-Process** ☐ **Final**

Contains assumptions and/or inputs which require verification: ☒ **Yes** ☐ **No**

Calculation History

Revision #	Reason for Revision	Approvals/Date
B	30% Design Review	Originator: R.S. Rast Checker: M.L. LaCome PM: K. Quigley Other:
C	Incorporate editorial comments	Originator: R.S. Rast [signature] 24 JULY 2014 Checker: M.L. LaCome [signature] 7/24/14 PM: K. Quigley [signature] 7/24/14 Other:
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:

1. Objective/Purpose

The objective of the 300-296 Soil Remediation Project is to remove the highly contaminated soils from beneath the 324 Building B-Cell to the point where the remaining contaminated soil can be excavated by conventional methods in open-air. The highly contaminated debris in the B-Cell and underlying soils will be removed remotely, transferred to other facility hot cells, and solidified in place, or transferred to the Environmental Restoration and Disposal Facility (ERDF) in approved packaging.

The objective of this calculation is to perform a structural stability evaluation of the 324 Building Radiochemical Engineering Cells (REC) superstructure. Plans to excavate soil under the B-Cell floor may result in creating a structural instability. It is anticipated that there will be a need for installation of a new reinforced concrete foundation to ensure proper structure stability. A SAP2000 model is developed for use in evaluating the existing structure to determine the effects of removing supporting soil and change in load path to a new foundation.

The results of the REC structural stability evaluation will provide demands for the design of the support structure. An iterative approach for new foundation design and structural stability is anticipated.

For 30% Design, this calculation is limited to the REC SAP2000 model development.

2. Summary of Results and Conclusions

For 30% Design, there are no results pertaining to the structural stability of the REC.

The SAP2000 model of the REC matches the geometry of the REC superstructure. Wall thicknesses and dimensions for shield and crane door openings match approximate locations for the actual REC structure.

3. Unverified Inputs or Assumptions

3.1 Concrete:

- REC concrete is structurally sound
- REC concrete strength is a minimum of 3000-psi as specified in Ref.12.9

3.2 Rebar Spacing:

- REC rebar spacing is structurally in accordance with Hanford drawings

4. Introduction/Background

The 324 Building is a non-reactor Category 2 Nuclear Facility located in the 300 Area of the U.S. Department of Energy (DOE) Hanford Site. The building is undergoing deactivation, decommissioning, decontamination, and demolition (D4) by Washington Closure Hanford (WCH) under the River Corridor Closure Contract. During the Cold War Era, the facility was used for chemical and radionuclide processing associated with nuclear weapons production.

The REC superstructure is a reinforced concrete structure that consists of four different rooms called cells and a fifth room connecting the cells. Four rooms called cells are referred to as A-Cell (Hi Bay Cell), B-Cell (Low Bay Cell), C-Cell (Pyro Cell), and D-Cell (Mechanical Cell). A fifth room referred to as the Air Lock connects the individual cells.

The general layout of the REC is shown in Figures 1 and 2. C-Cell is located beneath D-Cell, with floor elevation of 17'-0".

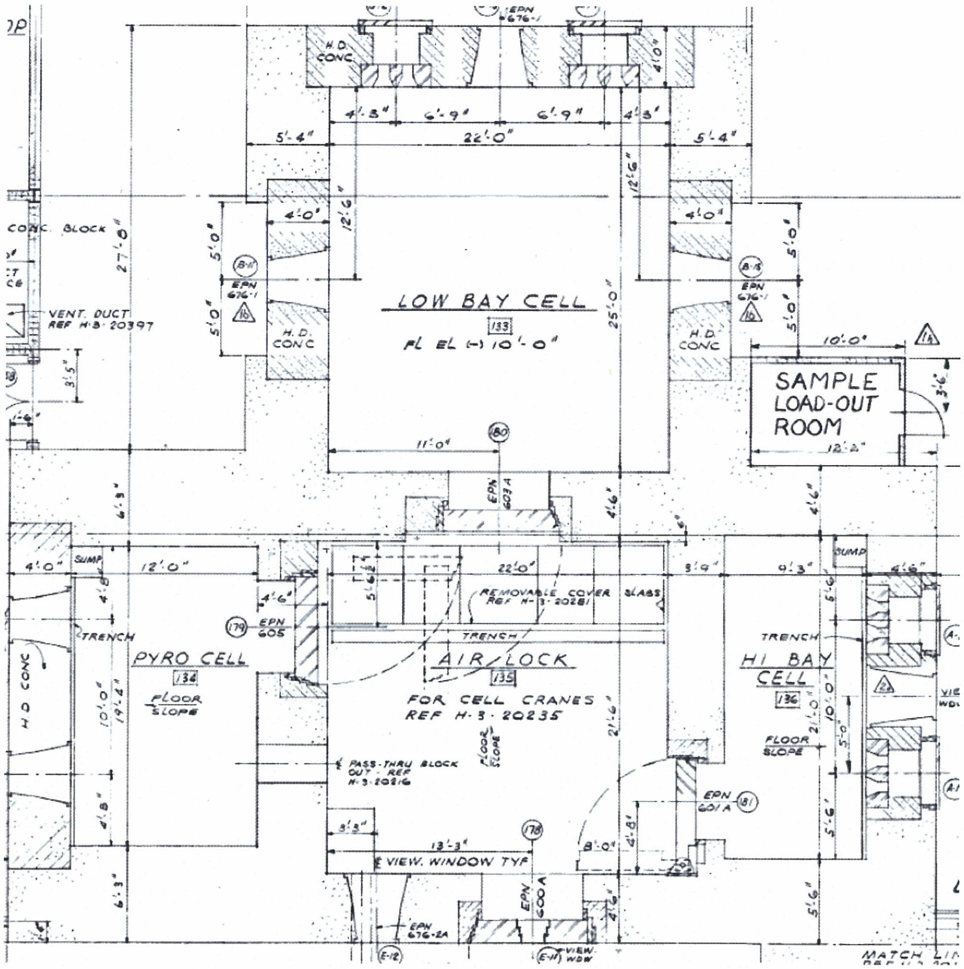

Figure 1. REC Floor Plan at 0'-0" Elevation

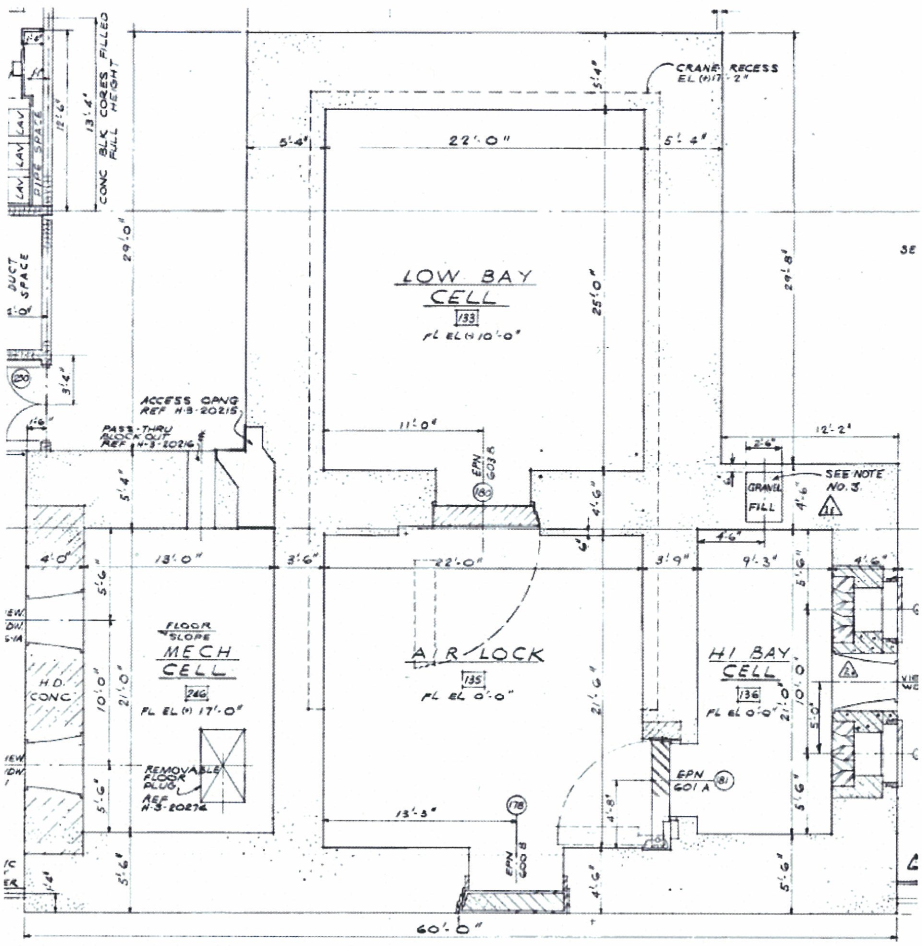

Figure 2. REC Floor Plan at 11'-6" Elevation

5. Input Data

5.1 324 Building information:

Existing Hanford drawings and specifications provide the input for the development of the REC SAP2000 model.

Hanford Drawings used are:

- H-3-20195, *Structural Concrete Foundation & Basement Plan*
- H-3-20200, *Structural Concrete Plan @ EL 0'-0" Area-3*
- H-3-20204, *Structural Concrete Plan @ EL 11'-6" Area-3*
- H-3-20205, *Structural Concrete Plan @ EL 11'-6" Area-3*
- H-3-20213, *Structural Concrete Hot Pilot Cells Area-3 Sections & Details*
- H-3-20214, *Structural Concrete Hot Pilot Cells Area-3 Sections & Details*

Additionally, the following inputs are used:

- f`c = 3000-psi (28-day concrete compressive strength specified at the time of construction) [Ref. 12.9, Section 4.d.]
- Ec = 3321-ksi (Modulus of Elasticity, $Ec = \gamma_c^{1.5}*33*(\sqrt{f`c})$ [Ref. 12.7, Section 8.5.1]
- fy = 40,000-psi (Reinforcing Bar Minimum Yield Strength) [Refs. 12.10 and 12.11]
- γ_c: = 150-pcf (normal weight reinforced concrete)
- γ_{HD}: = 230-pcf (High Density concrete) [Ref. 12.8]
  For walls where section is composed of high-density and normal weight concrete, the following are used:
  - $\gamma_{1/3HD}$: = 1/3(230-pcf) + 2/3(150pcf) = 177-pcf
  - $\gamma_{1/2HD}$: = 1/2(230-pcf) + 1/2(150pcf) = 190-pcf

5.2 Design Criteria

In accordance with the *Facility Design Basis Requirements 300-296 Soil Remediation Project Phase I&II*, the following are used when applicable:

- IBC 2009, *International Building Code*
- ASCE 7-05, *Minimum Design Loads for Buildings and Other Structures*
- ACI 318-08, *Building Code Requirements for Structural Concrete and Commentary*
- WCH-56, *General Design Criteria for River Corridor Closure Contract*

Design criteria from WCH-56, *General Design Criteria for River Corridor Closure Contract*, are as follows:

> *The minimum design loads shall be as prescribed below. In addition to the following minimum design loads, and design criteria for new and major modifications to DOE hazard category 2 and 3 facilities for the RCC project shall meet the requirements of DOE –STD-1189. See Appendix A of DOE –STD-1189 for guidance and criteria for seismic design basis and safety classification of the structures, systems and components of these facilities. Nuclear facilities must be designed to withstand Natural Phenomena Hazards (NPH) and should develop project specific seismic design guidelines based on the DOE Std-1189, ANSI 2.26 and ASCE 43.*
> *Where conflicts occur, the more restrictive requirements shall be used.*

Applicable loads for the 324 Building REC Superstructure are as follows:

- **Dead Loads *(D)*:** Uniform and concentrated dead loads shall be based upon materials of construction and fixed equipment as defined in the International Building Code IBC (2009) (Section 1606).
- **Live Loads *(L)*:** Uniform and concentrated live loads shall be based upon uses and occupancies as listed in the International Building Code IBC (2009) (Section 1607). Minimum roof live load shall be 20 psf.
- **Equipment Loads:** Equipment operating loads will be considered as live loads. Existing and newly installed equipment loads shall be based on Hanford drawings and 300-396 project drawings and equipment lists
- **Snow Loads *(S)*:** As stated in the International Building Code IBC (2009) (Section 1608), snow loads on structures shall be determined in accordance with Section 7 of American Society of Civil Engineers (ASCE 7). In general, 15 lb/ft2 shall be used as the ground snow load, pg, but in no case roofs be designed for less than 20 lb/ft2 snow load. For PC-1 SSCs, Importance Factor, Is, shall be 0.8, and that for PC-2 SSCs.

- **Soil Pressure *(H)*:** Structures and elements of structures retaining soil shall be for the lateral earth pressure and any surcharge plus any hydrostatic pressure corresponding to the maximum probable groundwater level. In the absence of a geotechnical soil analysis, the minimum design active and at-rest lateral soil loads shall be in accordance with Section 1610 of IBC (2009). Dynamic pressures from seismic effects shall be evaluated following the elastic procedures described in Seismic Analysis of Nuclear Structures (ASCE 4).
- **Ashfall Loads (*Ak*)**: All SSCs and modifications or additions to existing SSCs, where appropriate, shall be designed for ashfall loads. Design ashfall loading shall be 24-psf.
- **Flood Loads (*Fa*)**: the probable maximum flood of the Columbia River down-stream of Priest Rapids Dam has been calculated to be 1.41 million cubic feet per second and is greater than the 500-year flood. Values in WCH-56, Figure 4-3 will be considered.
- **Hydrostatic Pressure (*F*)**: Hydrostatic pressures shall be considered in design based on ASCE 7. For underground structures, retaining walls, or submersible equipment, the design shall be based on the design groundwater levels as established in WCH-56, Section 3.0.
- **Thermal Loads (*T*)**: The effect of extreme temperature shall be considered as applicable. Minimum and maximum operating temperatures are 22°F and 98°F assume base temperature of 70°F. Design temperature differentials are 48°F and 28°F.
- **Wind (W)** and **Seismic Loads (E)** will be based on requirements pertaining to the function of this facility. As stated in Section 4, the REC is part of a non-Reactor Category 2 Nuclear Facility. The building is undergoing deactivation, decommissioning, decontamination, and demolition (D4), but it is also undergoing a major modification with the proposed addition of a new structural foundation. Additional consideration will be given to wind and seismic requirements, in accordance with DOE-STD-1020 and DOE-STD-1189.

6. Assumptions

6.1 Steel Reinforcement

- REC steel reinforcement is ASTM A15, intermediate grade as specified in Ref. 12.10

7. Method of Analysis

For 30% Design Review, this calculation is limited to REC SAP2000 model development. Beyond 30% Design the remaining methodology will be used.

The following methodology is to be used for this calculation:

- Develop REC SAP2000 Model
- Apply appropriate Dead and Live Loads associated with:
  - Existing Equipment such as cranes, crane doors, and shield doors
  - Loads to REC from adjacent steel structure
  - Remote Excavator Arm (REA) Loads
  - Other Large Loads associated with the Soil Remediation Project
  - Other miscellaneous dead and live loads (IBC minimum)
- Apply applicable loads as defined in Section 5.2
- Apply Appropriate Load Combinations in accordance with design basis
- Develop baseline results for ZERO excavation
- Utilize REC SAP2000 Model to simulate removal of supporting soil beneath B-Cell foundation
- Determine demands for design of new B-Cell foundation
- Incorporate foundation design in REC SAP2000 model and verify the structural stability
- Iterate new foundation design with structural stability evaluation until solution and stability check converge
- Perform confirmatory structural stability evaluation

7.1 SAP2000 Model Development

Current development of the REC SAP2000 model is documented in Figures 4 through 16. Figure 4 provides an overlay of SAP2000 gridlines. Hanford H-3 drawings provided by Washington Closure were reviewed and used to develop the REC SAP2000 model.

Different concrete wall and slab thicknesses exist in the REC structure. The thicknesses of the floor and roof slabs vary between 12-in. and 60-in. The thickness of the REC walls varies between 30-in. and 52-in. at crane locations and between 42-in. and 75-in. for other locations. The C-cell, A-cell, and Airlock walls below grade vary in thickness between 12-in. and 16-in. Foundation (footing) thickness is 24-in. throughout. Each concrete section thickness is considered in the REC SAP2000 model. Table 1shows the various area element section property definitions used in the REC model. Figure 3 shows a three-dimensional view of the REC SAP2000 model. The concrete and high density (HD) concrete material properties are as defined in Section 5.1, with the exception of wall sections that consist of one-half or one-third high density concrete. The weight average of the unit weights is used in the material definition in the SAP2000 model.

Table 1. REC SAP2000 Area Section Properties

TABLE: Area Section Properties					
Section	Material	MatAngle	AreaType	Thickness	BendThick
Text	Text	Degrees	Text	in	in
12PTW	concrete	0	Shell	12.0	12.0
12S	concrete	0	Shell	12.0	12.0
16FW	concrete	0	Shell	16.0	16.0
18S	concrete	0	Shell	18.0	18.0
20FW	concrete	0	Shell	20.0	20.0
24FTG	concrete	0	Shell	24.0	24.0
24S	concrete	0	Shell	24.0	24.0
26S	concrete	0	Shell	26.0	26.0
30W	concrete	0	Shell	30.0	30.0
33W	concrete	0	Shell	33.0	33.0
36HDW	HDconcrete	0	Shell	36.0	36.0
36S	concrete	0	Shell	36.0	36.0
39HDW	1/3HD	0	Shell	39.0	39.0
41W	concrete	0	Shell	41.0	41.0
42HDW	HDconcrete	0	Shell	42.0	42.0
42W	concrete	0	Shell	42.0	42.0
45W	concrete	0	Shell	45.0	45.0
48HDW	HDconcrete	0	Shell	48.0	48.0
48W	concrete	0	Shell	48.0	48.0
49W	concrete	0	Shell	49.0	49.0
52W	concrete	0	Shell	52.0	52.0
54W	concrete	0	Shell	54.0	54.0
60S	concrete	0	Shell	60.0	60.0
60W	concrete	0	Shell	60.0	60.0
64W	concrete	0	Shell	64.0	64.0
66W	concrete	0	Shell	66.0	66.0
70W	concrete	0	Shell	70.0	70.0
75W	concrete	0	Shell	75.0	75.0

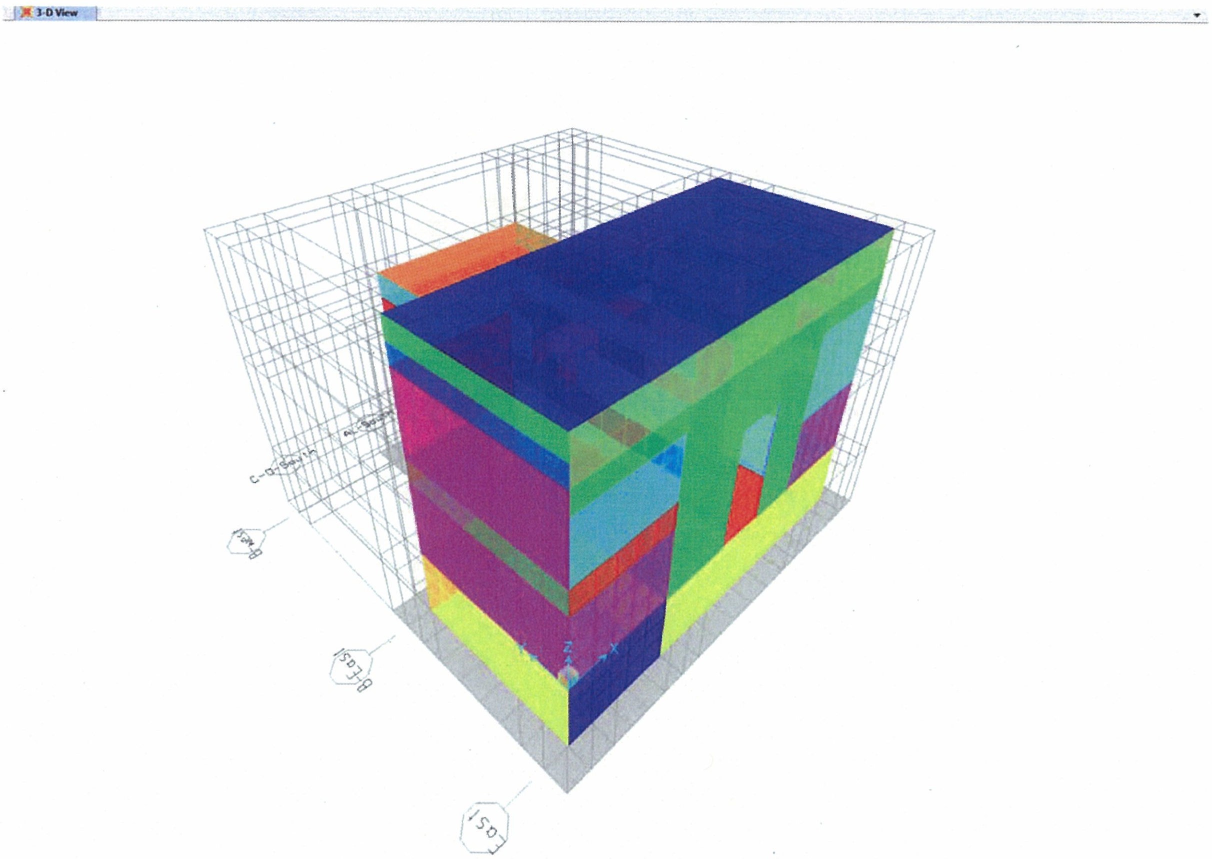

Figure 3. REC SAP2000 Model

The SAP2000 model uses approximate centerlines locations of the REC walls as the basis for grid development and location of area elements (shells). Figure 4 shows the SAP2000 gridline superimposed on a plan view of the REC structure.

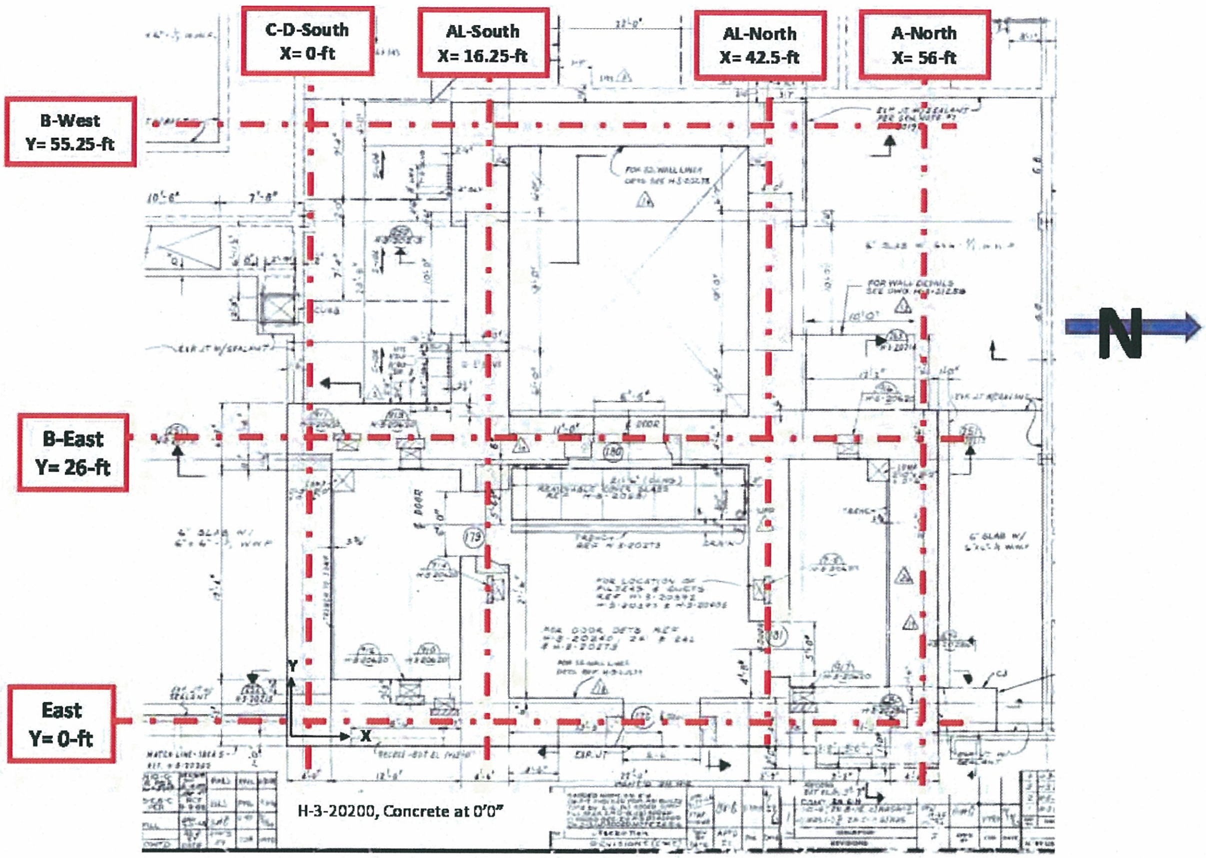

Figure 4. REC SAP2000 gridline locations

The following figures (Figures 5-11) display wall elevations for the REC SAP2000 model. Coordinates corresponding to the elevations shown in Figures 5-11 are listed in Table 2. Figures 12-16 show plan views of the REC SAP2000 model at foundation, slab, and roof elevations.

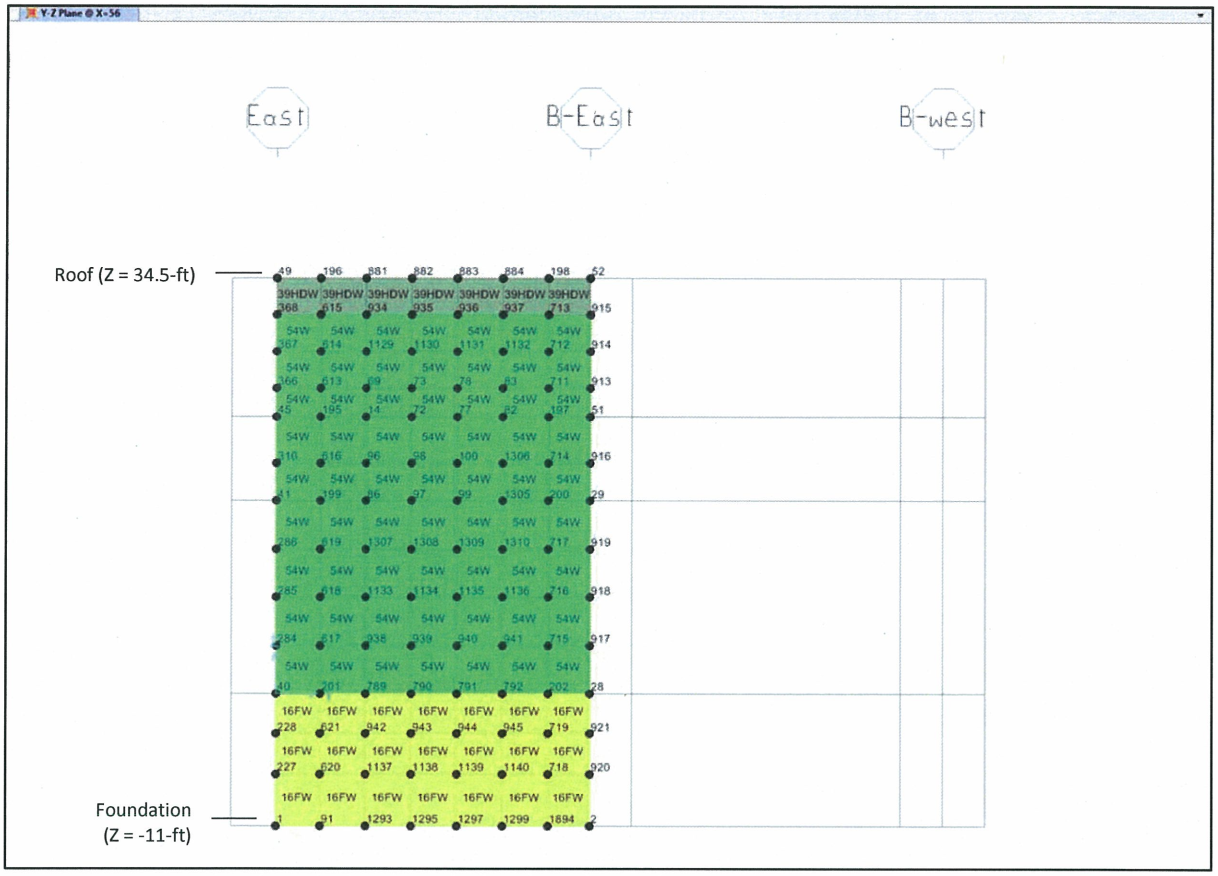

Figure 5. REC SAP2000 A-North Elevation Looking South

Calculation Title: 324 Building Structural Stability Evaluation (30% Design)

Originator: R.S. Rast **Date:** 7/24/14 **Checker:** M.L. LaCome **Date:** 7/24/14

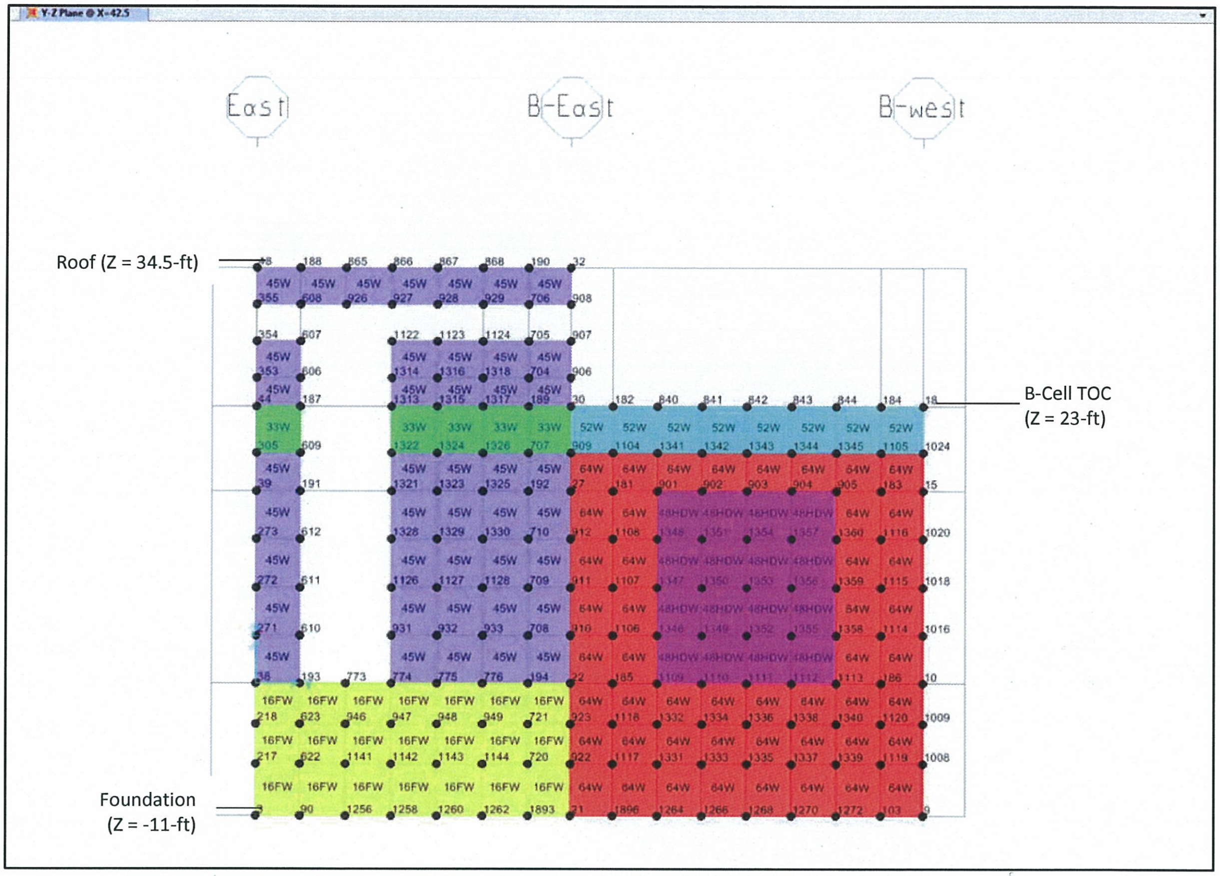

Figure 6. REC SAP2000 AL-North Elevation Looking South

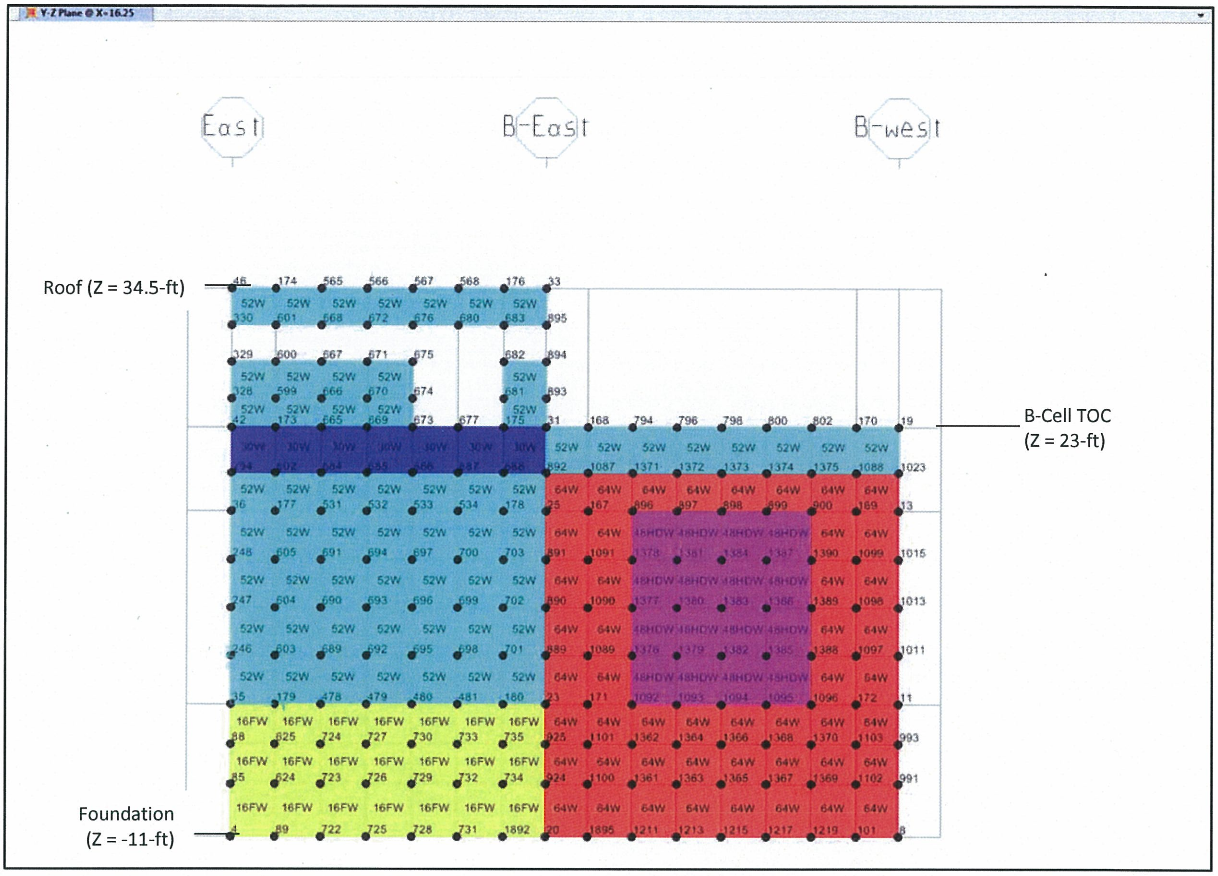

Figure 7. REC SAP2000 AL-South Elevation Looking South

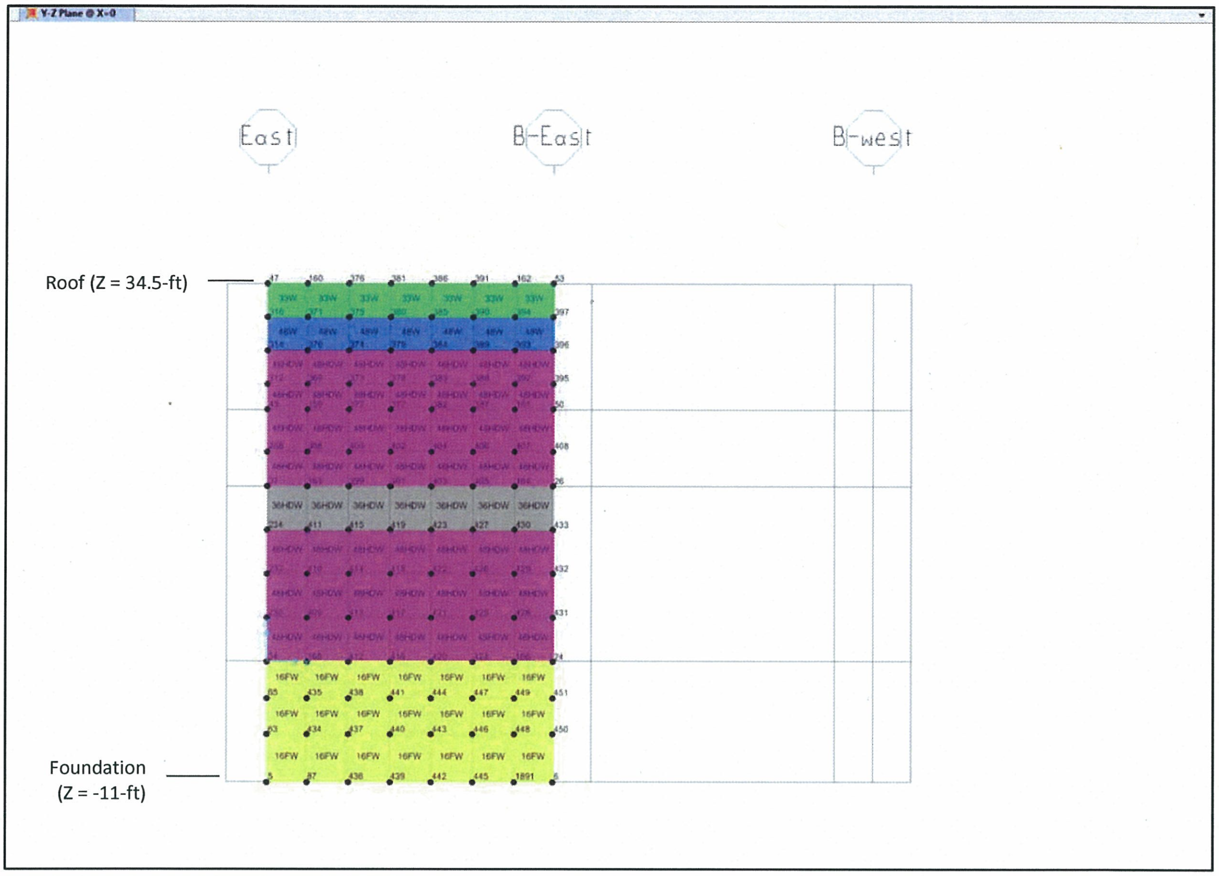

Figure 8. REC SAP2000 C-D-South Elevation Looking South

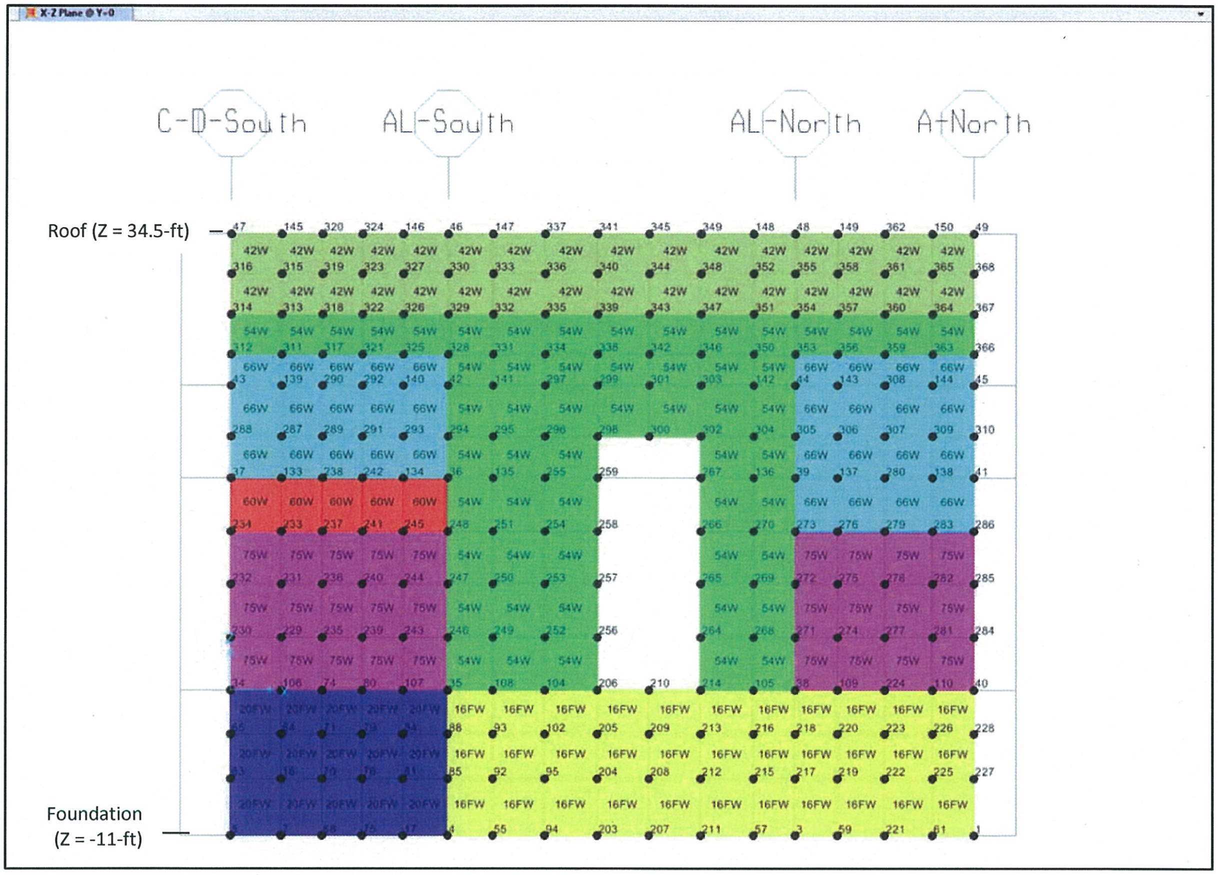

Figure 9. REC SAP2000 East Elevation Looking West

Calculation Title: 324 Building Structural Stability Evaluation (30% Design)

Originator: R.S. Rast **Date:** 7/24/14 **Checker:** M.L. LaCome **Date:** 7/24/14

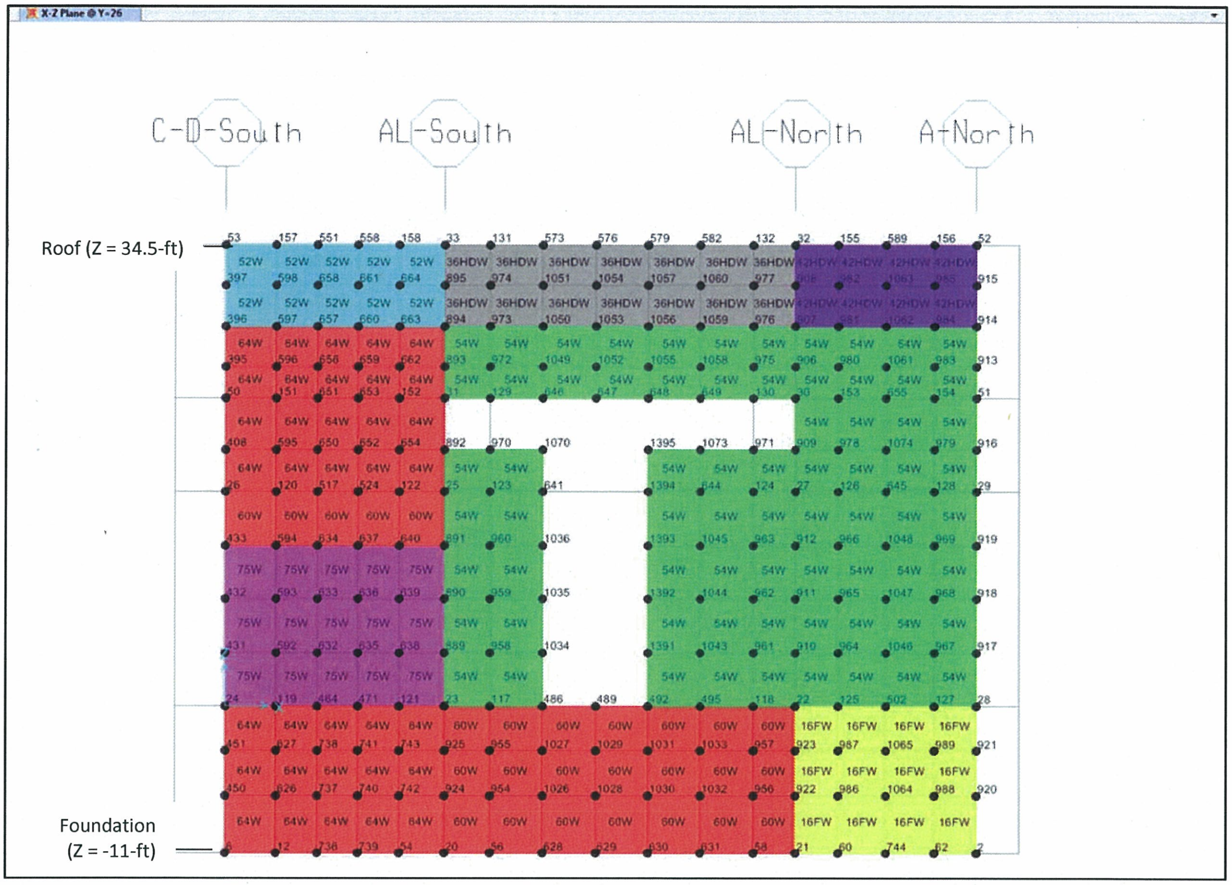

Figure 10. REC SAP2000 B-East Elevation Looking West

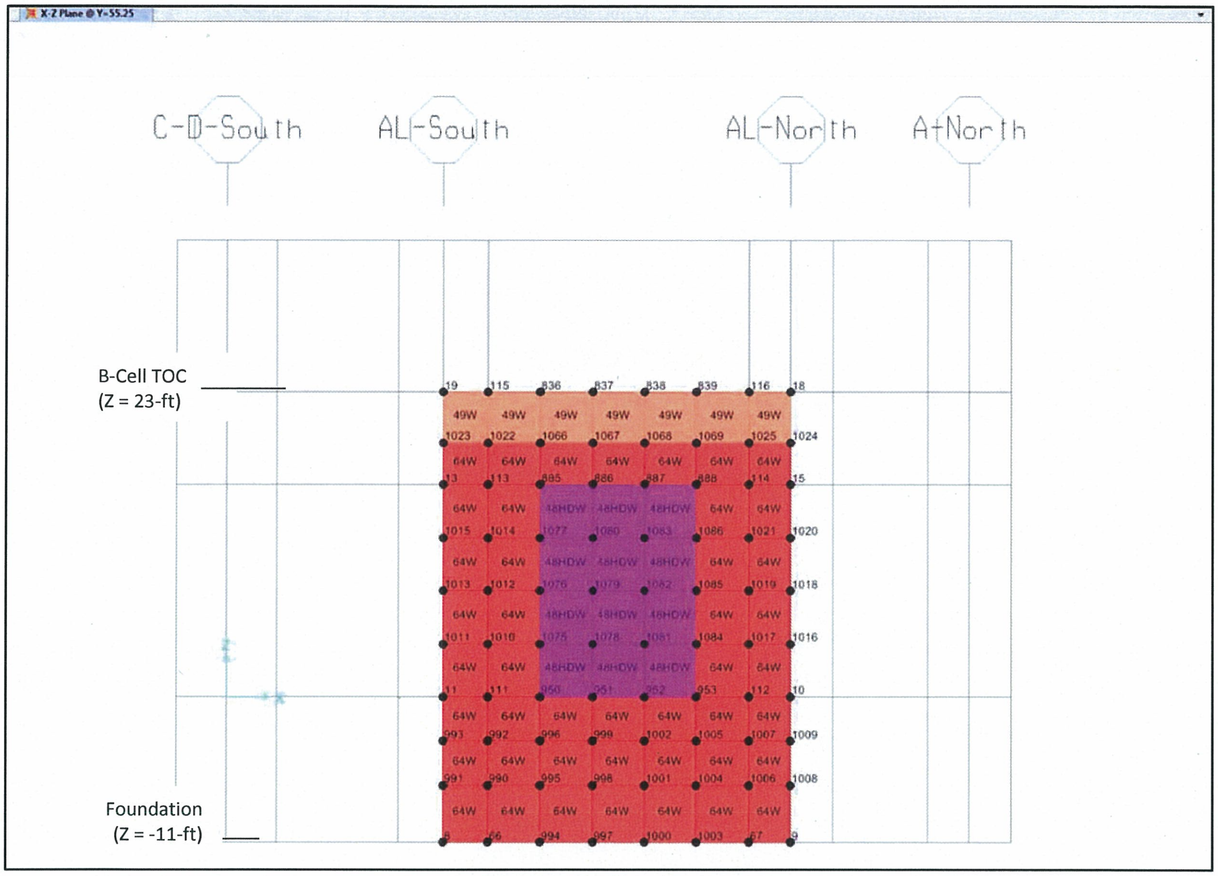

Figure 11. REC SAP2000 B-West Elevation Looking West

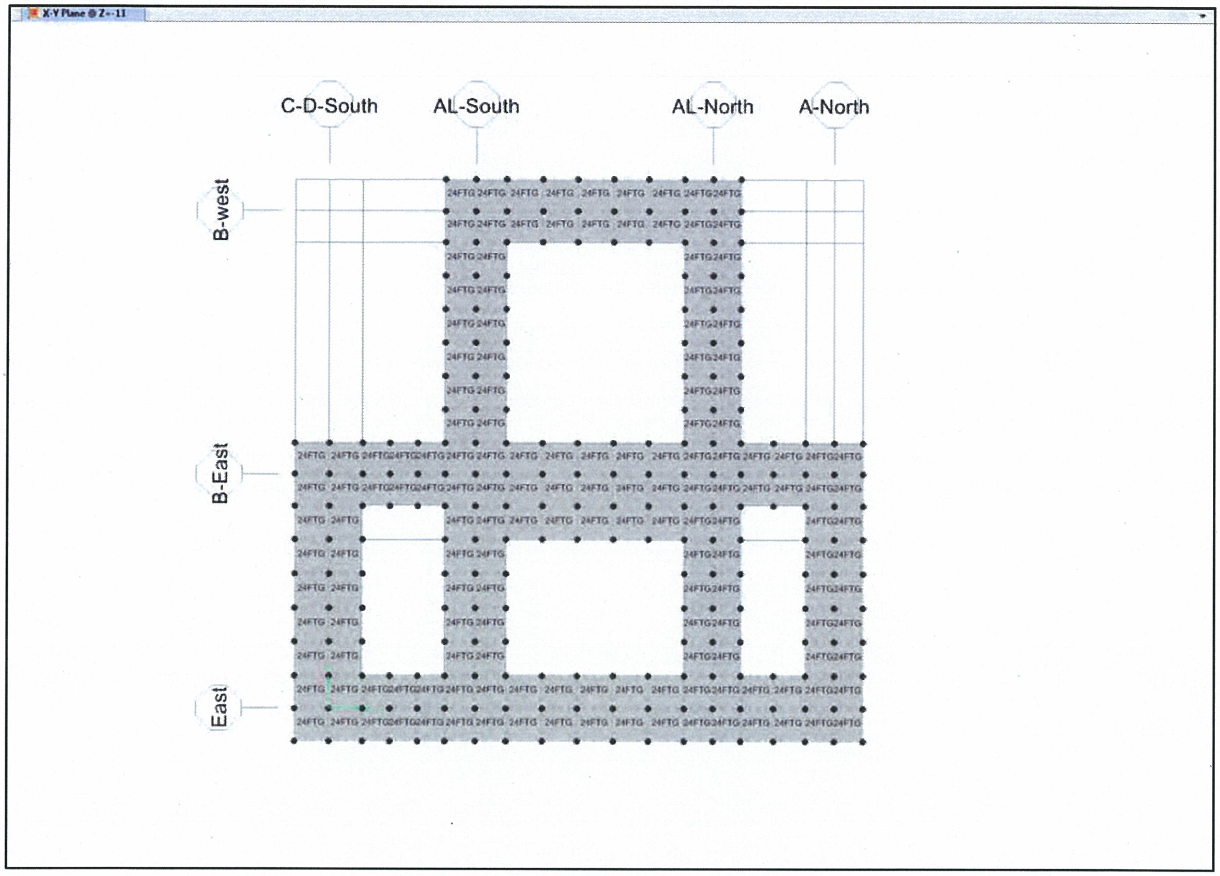

Figure 12. REC SAP2000 Foundation Plan at Z = -11-ft

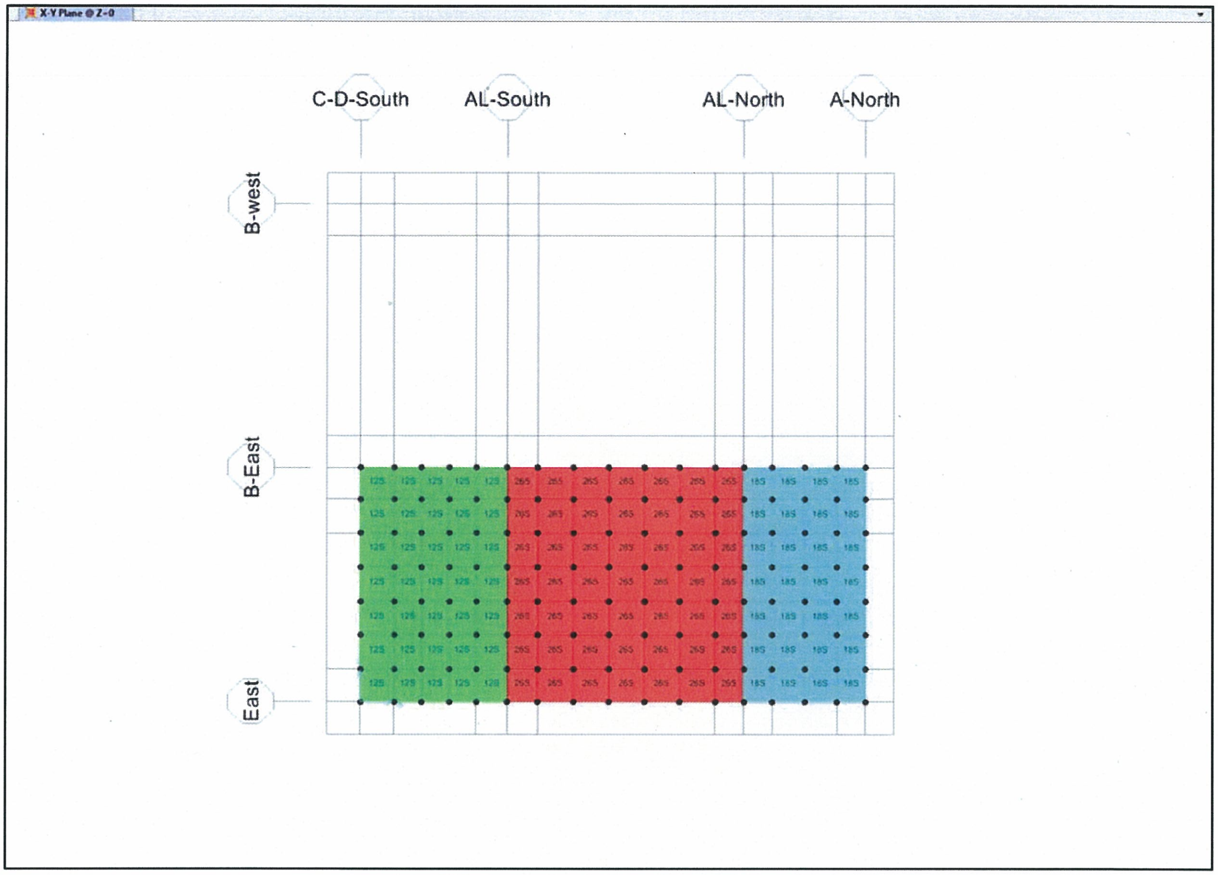

Figure 13. REC SAP2000 Floor Plan at Z = 0-ft

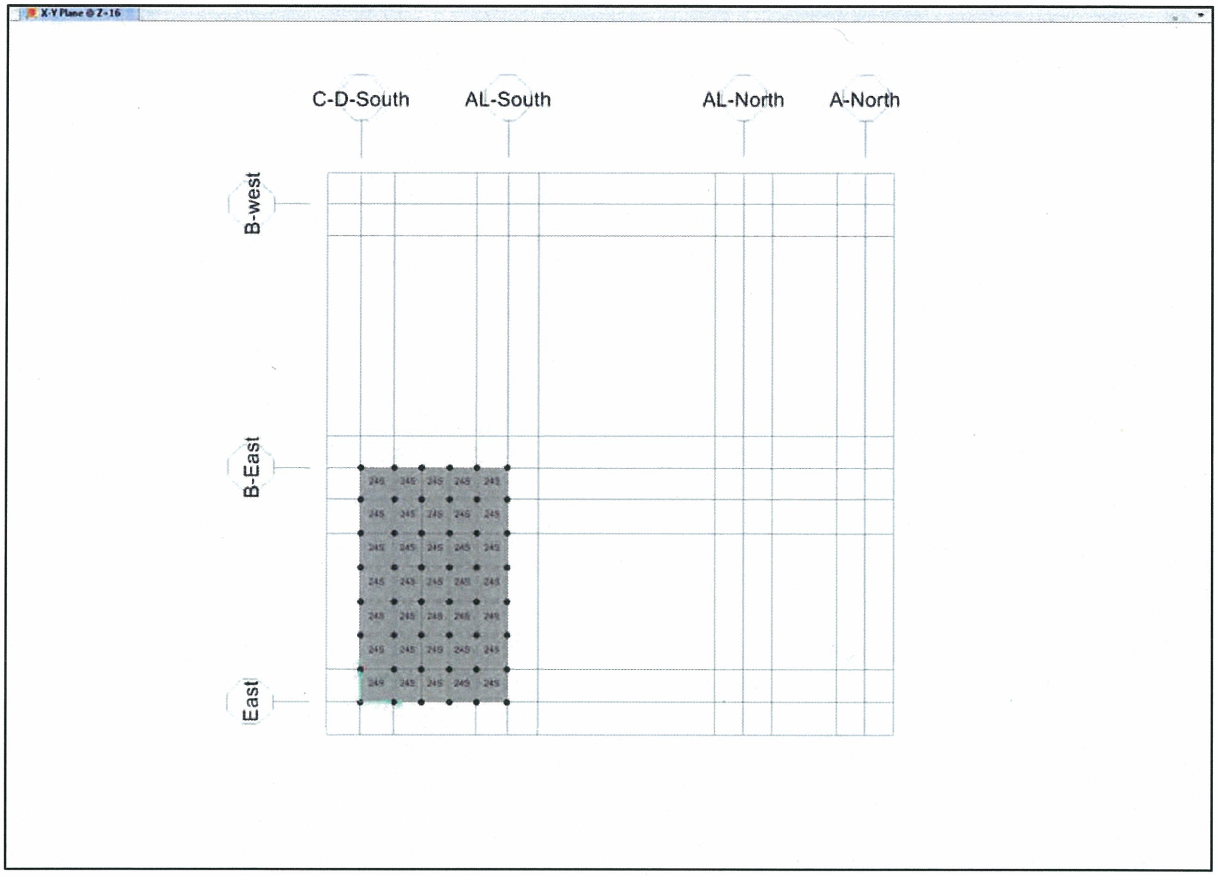

Figure 14. REC SAP2000 D-Cell Floor Plan at Z = 16-ft

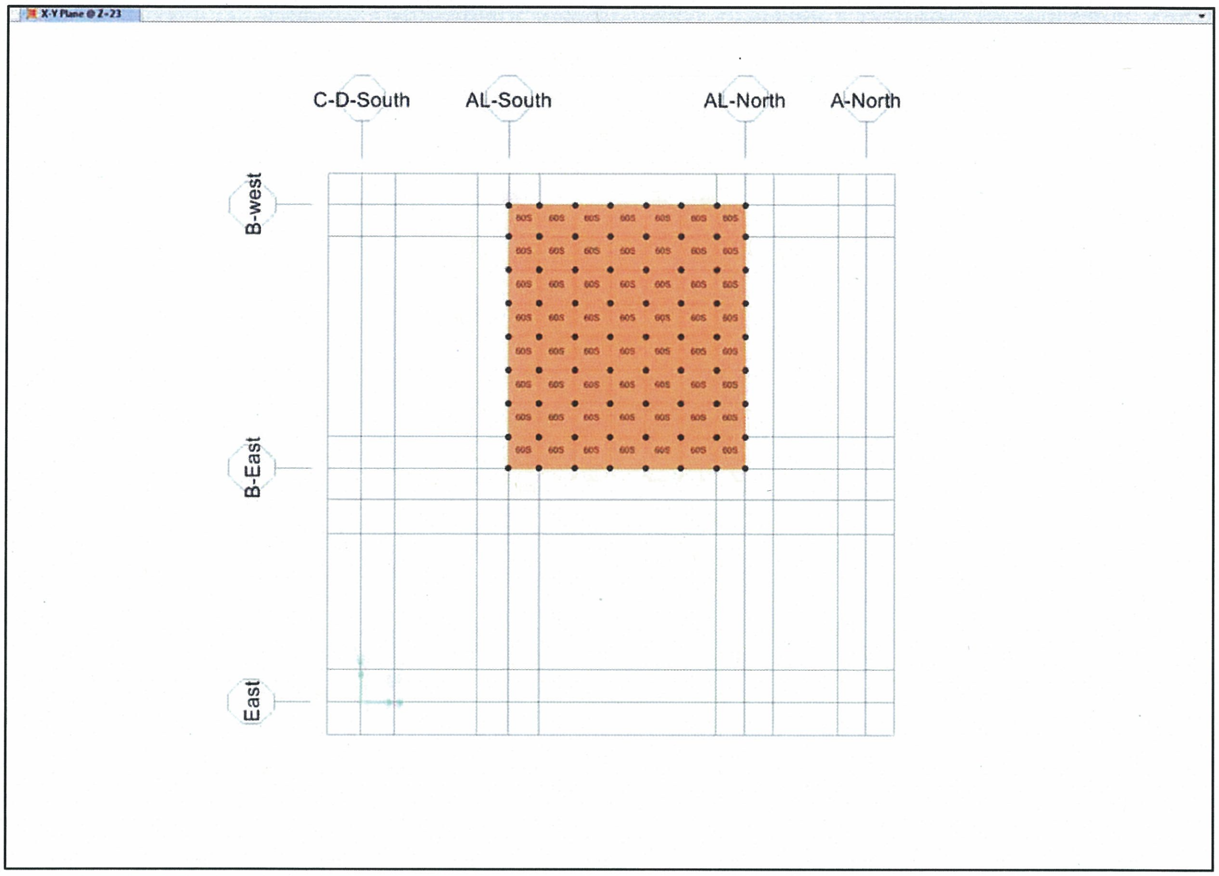

Figure 15. REC SAP2000 B-Cell Top of Concrete Plan at Z = 23-ft

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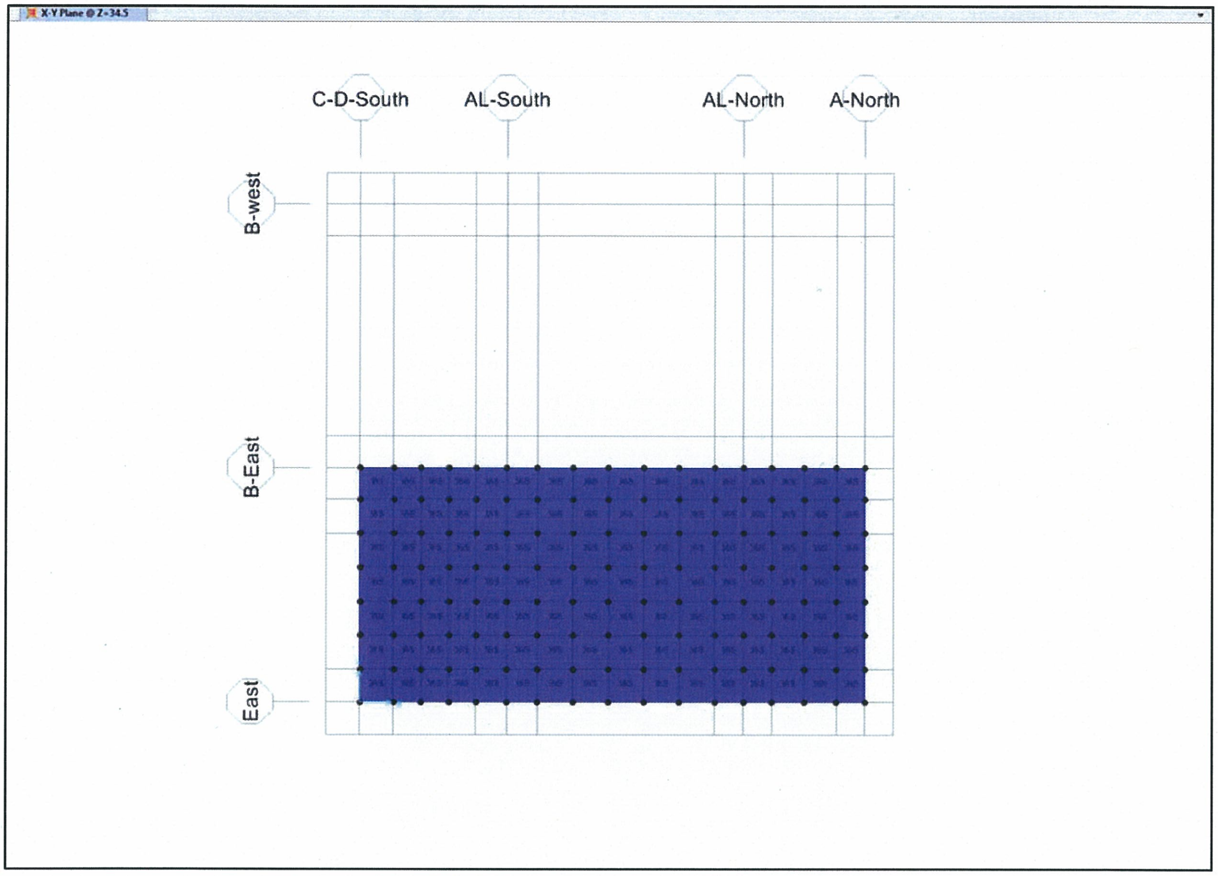

Figure 16. REC SAP2000 Roof Plan at Z = 34.5-ft

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Table 2 Reference SAP2000 Joint Coordinates

TABLE: Joint Coordinates					TABLE: Joint Coordinates			
Joint	XorR	Y	Z		Joint	XorR	Y	Z
Text	ft	ft	ft		Text	ft	ft	ft
1	56	0	-11.00		246	16.25	0	4.00
2	56	26	-11.00		247	16.25	0	8.00
3	42.5	0	-11.00		248	16.25	0	12.00
4	16.25	0	-11.00		271	42.5	0	4.00
5	0	0	-11.00		272	42.5	0	8.00
9	42.5	55.25	-11.00		273	42.5	0	12.00
10	42.5	55.25	0.00		284	56	0	4.00
15	42.5	55.25	16.00		285	56	0	8.00
18	42.5	55.25	23.00		286	56	0	12.00
28	56	26	0.00		288	0	0	19.17
29	56	26	16.00		294	16.25	0	19.17
34	0	0	0.00		305	42.5	0	19.17
35	16.25	0	0.00		310	56	0	19.17
36	16.25	0	16.00		312	0	0	25.37
37	0	0	16.00		314	0	0	28.42
38	42.5	0	0.00		316	0	0	31.46
39	42.5	0	16.00		328	16.25	0	25.37
40	56	0	0.00		329	16.25	0	28.42
41	56	0	16.00		330	16.25	0	31.46
42	16.25	0	23.00		353	42.5	0	25.37
43	0	0	23.00		354	42.5	0	28.42
44	42.5	0	23.00		355	42.5	0	31.46
45	56	0	23.00		366	56	0	25.37
46	16.25	0	34.50		367	56	0	28.42
47	0	0	34.50		368	56	0	31.46
48	42.5	0	34.50		913	56	26	25.37
49	56	0	34.50		914	56	26	28.42
51	56	26	23.00		915	56	26	31.46
52	56	26	34.50		916	56	26	19.17
63	0	0	-6.67		917	56	26	4.00
65	0	0	-3.33		918	56	26	8.00
85	16.25	0	-6.67		919	56	26	12.00
88	16.25	0	-3.33		920	56	26	-6.67
217	42.5	0	-6.67		921	56	26	-3.33
218	42.5	0	-3.33		1008	42.5	55.25	-6.67
227	56	0	-6.67		1009	42.5	55.25	-3.33
228	56	0	-3.33		1016	42.5	55.25	4.00
230	0	0	4.00		1018	42.5	55.25	8.00
232	0	0	8.00		1020	42.5	55.25	12.00
234	0	0	12.00		1024	42.5	55.25	19.17

8. Use of Computer – Type and Software

SAP2000, Version 16.1.1, as used in this calculation is qualified in accordance with KUR-ENG-PRO-03-14, *Safety Software Requirements*. This software is a commercially available computer program qualified to perform static and dynamic analysis of structural systems. The SAP2000 Software Verification and Validation report is contained in Ref. 12.6.

9. Results

Table 2 REC SAP2000 Base Reactions

TABLE: Base Reactions				
OutputCase	CaseType	GlobalFX	GlobalFY	GlobalFZ
Text	Text	Kip	Kip	Kip
DEAD	LinStatic	0	0	10113

The self-weight of the concrete REC superstructure is 10113 kips, as shown in Table 2.

10. Conclusions

The geometry of the REC SAP2000 model approximately matches the actual REC superstructure.

11. Recommendations

Not used

12. References

12.1 *Facility Design Basis Requirements 300-296 Soil Remediation Project Phase I and II.* A-300-296-00045, Rev. 0. AREVA Federal Services, LLC. Richland, WA

12.2 *General Design Criteria for River Corridor Closure Contract.* WCH-56, Rev. 5. Washington Closure Hanford. Richland, WA 99352

12.3 *300-296 Soil Remediation Project Phase I & II Assessment Report*, KUR-1782F-RPT-001, Rev. 0 KURION, Inc. Richland, WA

12.4 *300-296 Soil Remediation Project Phase I & II Conceptual Design Report*, KUR-1782F-RPT-002, Rev. 0 KURION, Inc. Richland, WA

12.5 *Safety Software Requirements*, KUR-ENG-PRO-03-14, Rev. 1, KURION, Inc. Richland, WA

12.6 *Validation and Verification Report for SAP2000 Version 16*, KUR-ENG-V&V-021, Rev. 0. KURION, Inc. Richland, WA

12.7 *Building Code Requirements for Structural Concrete and Commentary*, ACI 318-08. American Concrete Institute. Farmington Hills, MI

12.8 *BLDG. 324 Hot Cells Demolition REC Segmentation and Lifting Plan D-Cell Detail Plan/Isometric,* M4B, Rev. B (60% Submittal Set), NW Demolition and Environmental. Richland, WA

12.9 *Specification for Fuels Recycle Pilot Plant, Building 324, Project CAH-916*, HWS-5967. General Electric Co. Richland, WA

12.10 *Standard Specification for Placing Reinforced Concrete*, HWS-4798-S. General Electric Co. Richland, WA

12.11 *Evaluation of Reinforcing Bars in Old Reinforced Concrete Structures,* Engineering Data Report Number 48, Concrete Reinforcing Steel Institute

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Revision: B

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Project Title: 300-296 Soil Remediation

Status: ☒ **In-Process** ☐ **Final**

Contains assumptions and/or inputs which require verification: ☒ **Yes** ☐ **No**

Calculation History

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B	30% Design Review	Originator: R.S. Rast [signature] 24 JULY 2014 Checker: M.L. LaCome [signature] 7/24/14 PM: [signature] 7/24/14 Other:
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1. Objective/Purpose

The objective of the 300-296 Soil Remediation Project is to remove the highly contaminated soils from beneath the 324 Building B-Cell to the point where the remaining contaminated soil can be excavated by conventional methods in open-air. The highly contaminated debris in the B-Cell and underlying soils will be removed remotely, transferred to other facility hot cells, and solidified in place, or transferred to the Environmental Restoration and Disposal Facility (ERDF) in approved packaging.

The objective of this calculation is to perform a structural design of a foundation system to support 300-296 project activities The excavation of the soil below the bottom of B-cell will undermine the structural foundations of the B-Cell walls. In order to ensure structural stability of the REC, installation of a reinforced concrete footing is anticipated. The new structural foundation will need to be placed on load bearing soil. Evaluation of the soil is also required to ensure structural stability.

For 30% Design, this is a scoping calculation to determine if the proposed grout curtain wall can provide support for a new structural foundation.

2. Summary of Results and Conclusions

This calculation provides an evaluation of the load bearing capacity of the proposed grout curtain to be installed to minimize soil sloughing. Assumed strength and geometry is used to evaluate the grout curtain. The conclusion for this scoping calculation is that the grout curtain alone cannot withstand the imposed loading that results from soil excavation and the change in REC load path to a new structural foundation. Additional analysis with geotechnical engineering design input is necessary. Alternative soil stabilization, deep foundation, or a combination thereof is required.

3. Unverified Inputs or Assumptions

3.1 Grout Curtain Strength:

- Grout curtain wall compressive strength is 500-psi (Hold Number H4)

3.2 Grout Curtain Size:

- A proposed 30-inch spacing between grout curtain installation locations is used as the section thickness for structural evaluation (Hold Number H5)

4. Introduction/Background

The 324 Building is a non-reactor Category 2 Nuclear Facility located in the 300 Area of the U.S. Department of Energy (DOE) Hanford Site. The building is undergoing deactivation, decommissioning, decontamination, and demolition (D4) by Washington Closure Hanford (WCH) under the River Corridor Closure Contract. During the Cold War Era, the facility was used for chemical and radionuclide processing associated with nuclear weapons production.

The REC superstructure is a reinforced concrete structure that consists of four different rooms called cells and a fifth room connecting the cells. Four rooms called cells are referred to as A-Cell (Hi Bay Cell), B-Cell (Low Bay Cell), C-Cell (Pyro Cell), and D-Cell (Mechanical Cell). A fifth room referred to as the Air Lock connects the individual cells. The layout of the REC foundations is shown in Figure 1.

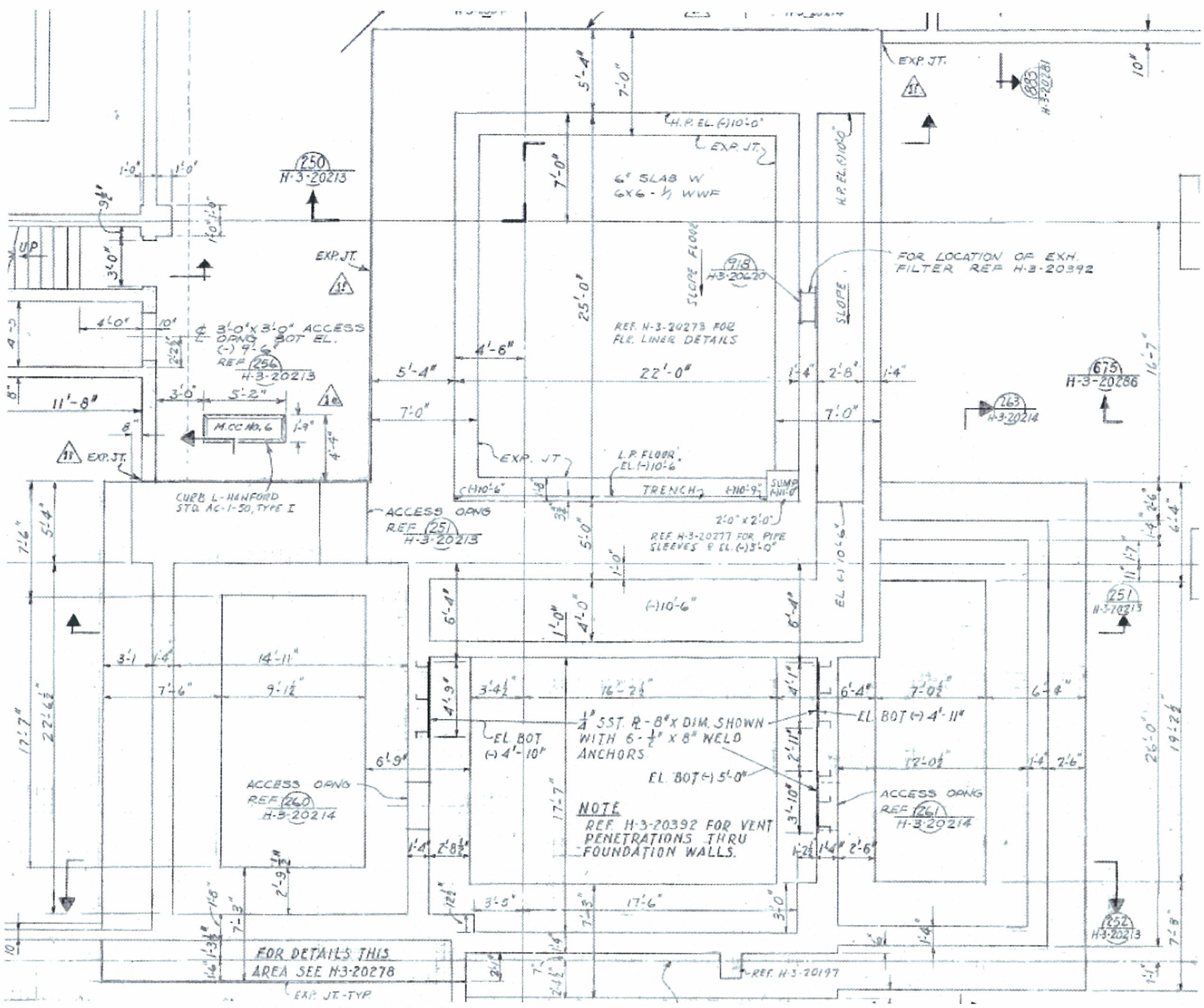


Figure 1. REC Foundation Plan at (-)10'-0" Elevation

During 300-296 project activities, soil will be excavated from beneath B-Cell. According to the *300-296 Soil Remediation Project Phase I & II Conceptual Design Report* (Ref. 12.3), it is proposed to install a grout curtain at (-)10-ft and 0-ft elevations, around B-Cell. As it is currently planned, this grout curtain will provide volume control by prohibiting additional soil from sloughing into the excavation. Also, as the configuration exists in the conceptual phase, the grout curtain must withstand the imposed loading from lateral earth pressures and surcharge loading from the new structural foundation. This calculation evaluates the grout curtain for this loading.

5. Input Data

5.1 Foundation Design Information:

Hanford Drawings used are:

- H-3-20195, *Structural Concrete Foundation & Basement Plan*

300-296 Soil Remediation Project Drawings used are:

- KUR-1782F-DWG-C001, *Structural REC @ EL, -10'-0"*
- KUR-1782F-DWG-C002, *Structural REC @ EL, 0'-0"*
- KUR-1782F-DWG-C003, *Structural Section A*
- KUR-1782F-DWG-C004, *Structural Section B*

Additionally, the following inputs are used:

- f_c = 500-psi Compressive strength of grout curtain (Assumption 3.1)
- ϕ = 36-deg. Soil friction angle [Ref. 12.6]
- σ_A = 35-psf per foot of wall. Active Soil Pressure [Ref. 12.6]
- W = 10113-kip. Self-Weight of REC concrete structure [Ref. 12.4]

5.2 Design Criteria

In accordance with the *Facility Design Basis Requirements 300-296 Soil Remediation Project Phase I&II* [Ref. 12.1], the following are used when applicable:

- IBC 2009, *International Building Code* [Ref. 12.7]
- ASCE 7-05, *Minimum Design Loads for Buildings and Other Structures* [Ref. 12.8]
- ACI 318-08, *Building Code Requirements for Structural Concrete and Commentary* [Ref. 12.5]
- WCH-56, *General Design Criteria for River Corridor Closure Contract* [Ref. 12.2]

For the purpose of the 30% scoping calculation, the applicable loading to evaluate the grout curtain is:

- **Soil Pressure *(H)*:** Structures and elements of structures retaining soil shall be for the lateral earth pressure and any surcharge plus any hydrostatic pressure corresponding to the maximum probable groundwater level. In the absence of a geotechnical soil analysis, the minimum design active and at-rest lateral soil loads shall be in accordance with Section 1610 of IBC (2009).

6. Assumptions

See Section 3.

7. Method of Analysis

For 30% Design Review, this scoping calculation is limited to evaluation of the grout curtain capacity. A simple approach is taken for evaluating the grout curtain wall. The grout curtain is analyzed for imposed loading and treated as an unreinforced concrete section. This approach is deemed acceptable for this scoping calculation.

The following methodology is used for this calculation:

- Determine the soil bearing stress, resulting from the REC self-weight, based on in-situ conditions
- Determine an increased bearing stress, resulting from the removal of soil beneath the B-Cell walls. This increased bearing stress is then applied as a surcharge loading
- Modeling the grout curtain as a simply supported beam, apply the factored lateral earth pressure and surcharge loading to determine design forces and moments
- Check the grout curtain capacity using ACI
- Determine the demand to capacity ratios for the curtain wall

8. Use of Computer – Type and Software

This calculation utilizes Mathcad Version 15. Mathcad is a registered trademark of Parametric Technology Corporation. All calculations are routine and checked using a handheld calculator.

9. Results

Calculations are performed in Appendix A. ACI code equations are used to determine the capacities of the grout curtain.

The following are pertinent results for the calculation:

Force	Demand	Capacity	Demand-to Capacity Ratio
Flexure	517-psi	75-psi	6.86
Shear	15814-lbf	9056-lbf	1.75

10. Conclusions

The new foundation system to provide structural stability for the REC during 300-296 activities cannot be placed on soil restrained by the proposed grout curtain. Alternative soil stabilization, deep foundation, or a combination thereof is required. For 30%, it is shown that a micro-pile system was selected. This may change depending on a study of alternatives and recommendations from geotechnical and grouting consultants.

11. Recommendations

Further analysis is required. It is recommended that geotechnical engineering and grouting/soil stabilization consultants be tasked with providing a feasibility study to develop stabilization options. The feasibility study should be completed as part of the 60% design effort, with results presented with the 60% design package. Final selection of the optimum method and necessary field testing should be completed as part of the 90% design.

12. References

12.1 *Facility Design Basis Requirements 300-296 Soil Remediation Project Phase I and II.* A-300-296-00045, Rev. 0. AREVA Federal Services, LLC. Richland, WA

12.2 *General Design Criteria for River Corridor Closure Contract*. WCH-56, Rev. 5. Washington Closure Hanford. Richland, WA 99352

12.3 *300-296 Soil Remediation Project Phase I & II Conceptual Design Report*, KUR-1782F-RPT-002, Rev. 0. KURION, Inc. Richland, WA

12.4 *3324 Building Structural Stability Evaluation (30% Design)*, KUR-1782F-CALC-C001, Rev. B. KURION, Inc. Richland, WA

12.5 *Building Code Requirements for Structural Concrete and Commentary*, ACI 318-08. American Concrete Institute. Farmington Hills, MI

12.6 *Geotechnical Engineering Study; 324 Building Gantry Crane Rail; Hanford Site, Washington,* 22-1-02805-001. Shannon & Wilson, Inc. Richland, WA

12.7 *International Building Code*, IBC 2009. International Code Council. Country Club Hills, IL

12.8 *Minimum Design Loads for Buildings and Other Structures*, ASCE 7-05. American Society of Civil Engineers. Reston, Virginia.

13. Attachments and Appendixes

Appendix A Grout Curtain Analysis

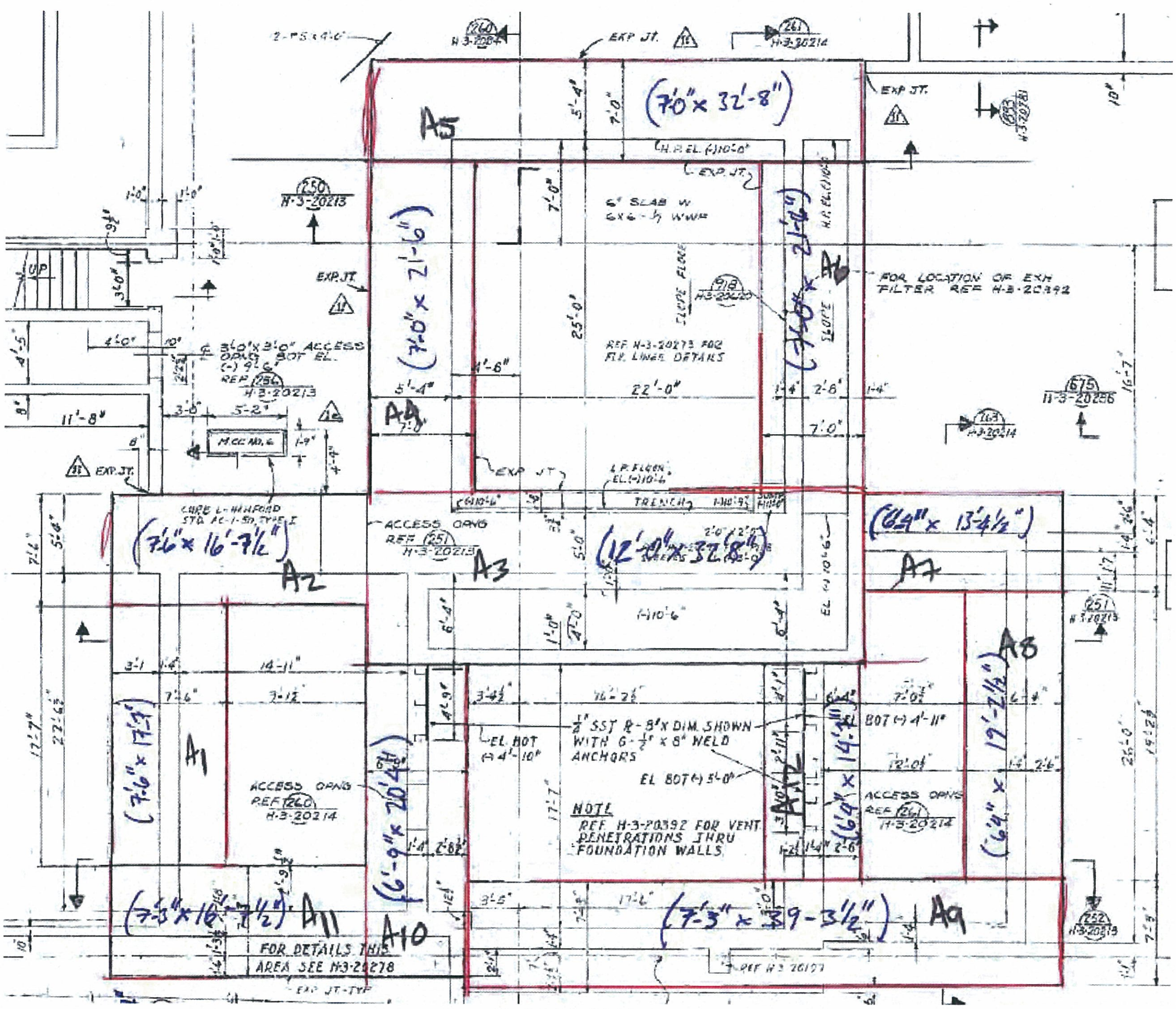
KURION
Isolating Waste from the Environment

Calc. # KUR-1782F-CALC-C002
Revision: B

Calculation Title: 324 Building B-Cell Foundation Design (30% Design)
Originator: R.S. Rast — Date: 24 July 2014
Checker: M.L. LaCome — Date: 24 July 2014

Appendix A - Grout Curtain Analysis

A.1 In-Situ Bearing Pressure



Ref: H-3-20195

Foundation Bearing Areas:

$A_1 := (7ft + 6in)(17ft + 7in) = 131.9 \cdot ft^2$

$A_2 := (7ft + 6in)(16ft + 7.5in) = 124.7 \cdot ft^2$

$A_3 := (12ft + 0in)(32ft + 8in) = 392 \cdot ft^2$

$A_4 := (7ft + 0in)(21ft + 6in) = 150.5 \cdot ft^2$

$A_5 := (7ft + 0in)(32ft + 8in) = 228.7 \cdot ft^2$

$A_6 := (7ft + 0in)(21ft + 6in) = 150.5 \cdot ft^2$

$A_7 := (6ft + 4in)(13ft + 4.5in) = 84.7 \cdot ft^2$

$A_8 := (6ft + 4in)(19ft + 2.5in) = 121.7 \cdot ft^2$

$A_9 := (7ft + 3in)(39ft + 3.5in) = 284.9 \cdot ft^2$

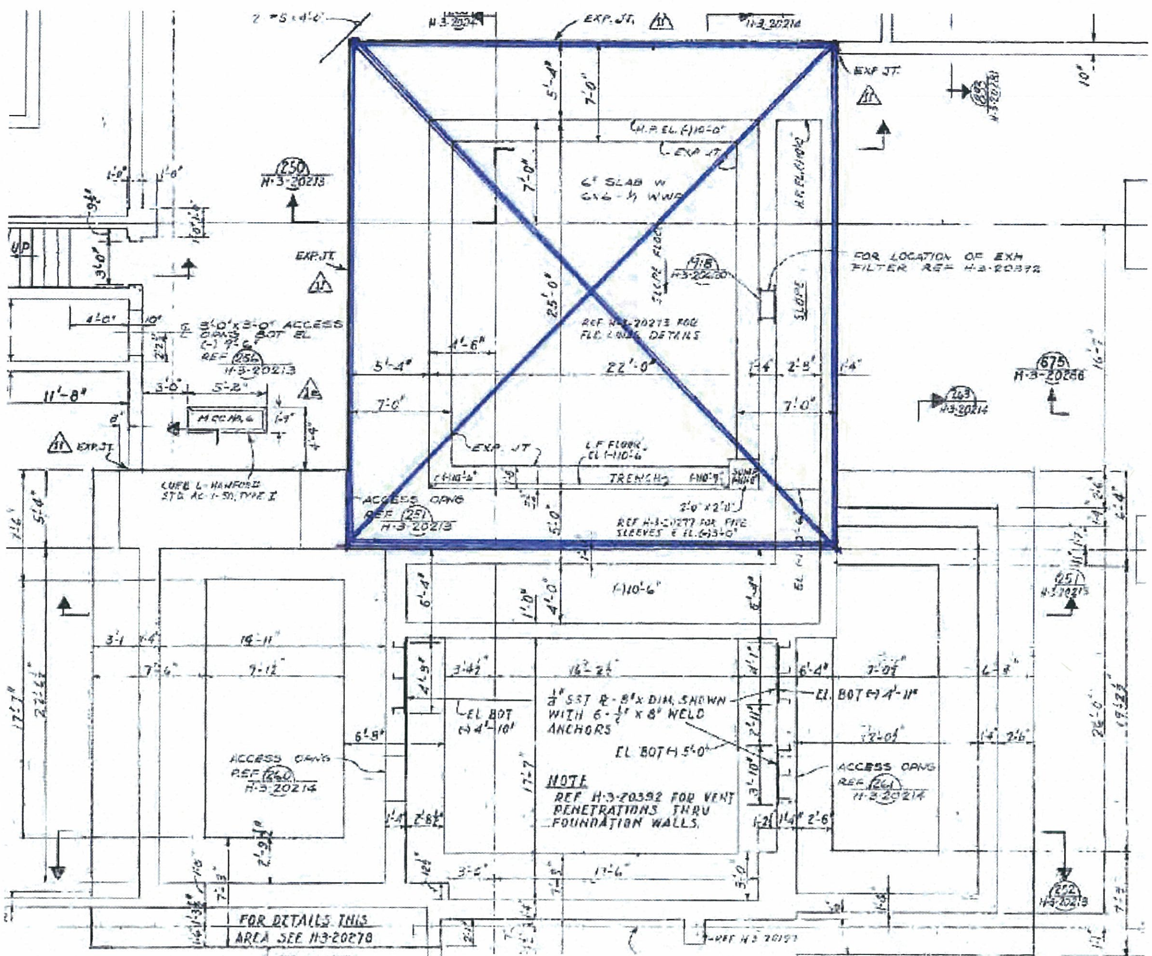
$A_{10} := (6ft + 9in)(20ft + 4in) = 137.3 \cdot ft^2$

$A_{11} := (7ft + 3in)(16ft + 7.5in) = 120.5 \cdot ft^2$

$A_{12} := (6ft + 4in)(14ft + 7in) = 92.4 \cdot ft^2$

$A_{in\_situ} := A_1 + A_2 + A_3 + A_4 + A_5 + A_6 + A_7 + A_8 + A_9 + A_{10} + A_{11} + A_{12}$

$A_{in\_situ} = 2019.6\ ft^2$ Total In-Situ Bearing Area



Ref: H-3-20195

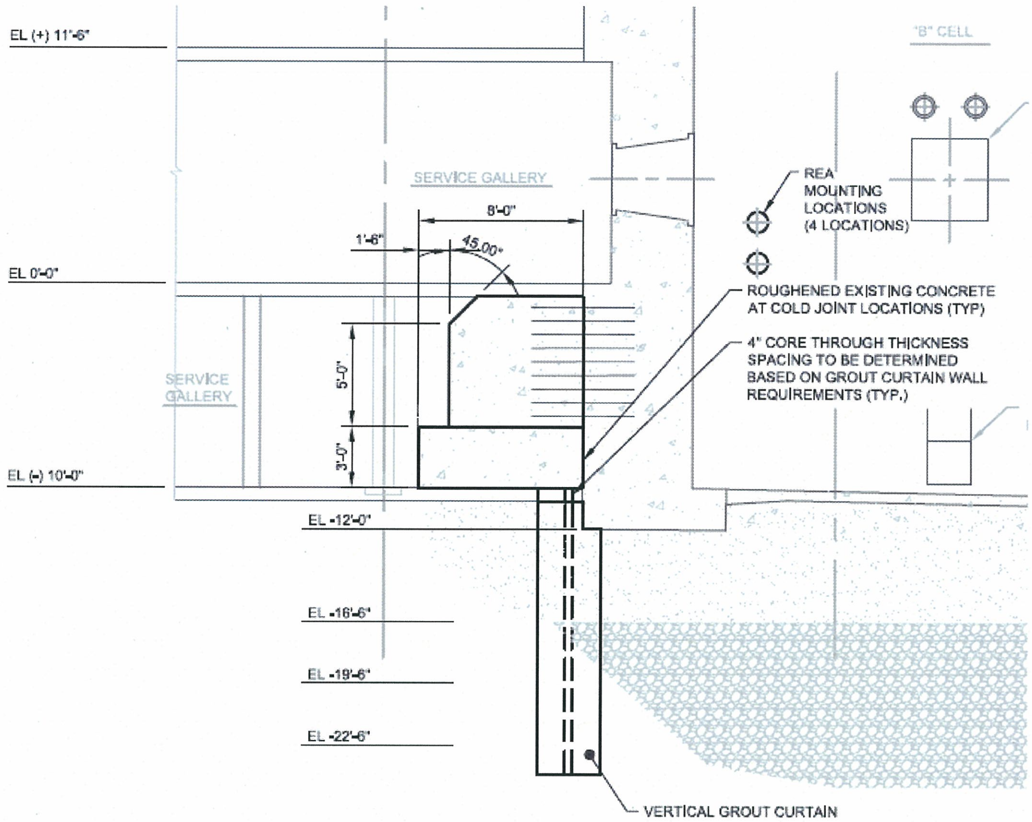
$A_{new} := 8ft \cdot (38ft + 8in) = 309.3\ ft^2$ — Bearing Area of new foundation (KUR-1782F-DWG-C001)

$A_{remain} := A_{in\_situ} - A_4 - A_5 - A_6 - \frac{A_3}{2} + A_{new} = 1603.3\ ft^2$ — Bearing area remaining after soil remediation activities

$W_{REC} := 10113kip$ — Self Weight of REC concrete as defined in SAP2000 model. (KUR-CALC-1782F-C001, Table 2)

$q_{in\_situ} := \frac{W_{REC}}{A_{in\_situ}} = 5007 \cdot psf$ — In-situ bearing pressure due to concrete self weight alone

$q_{remain} := \frac{W_{REC}}{A_{remain}} = 6308 \cdot psf$ — Bearing pressure from concrete self weight alone, resulting from removal of bearing soil from under B-Cell walls.



Ref: H-3-20214

In order to provide stability to the REC, at a minimum, a new foundation is required to transfer load from the undermined REC wall(s) to load bearing soil. The configuration shown above requires that the grout curtain behave as an earth retaing wall.

Lateral Earth Pressure on Grout Curtain

$H := 22.5ft - 12ft = 10.5\,ft$ — Height of wall

$\sigma_{H\_soil} := 35psf$ — Active lateral soil pressure for restrained retaining wall per foot of wall depth (Shannon and Wilson 22-1-02805-001)

$$P_H := 1.6 \cdot \frac{\sigma_{H\_soil} \cdot H^2}{2} = 3087 \cdot lbf$$

Ultimate lateral soil pressure load (ACI-318-08 (9-2)) acting 1/3 height from the base of the wall

$\phi := 36deg$

Soil fiction angle for soil depth 10-49 ft. (Shannon and Wilson 22-1-02805-001)

$K_a := \frac{1 - \sin(\phi)}{1 + \sin(\phi)} = 0.26$

Active earth pressure coefficient

$q_u := 1.6q_{remain} = 10092 \cdot psf$

Ultimate surcharge load for REC concrete self weight (ACI-318-08 (9-2))

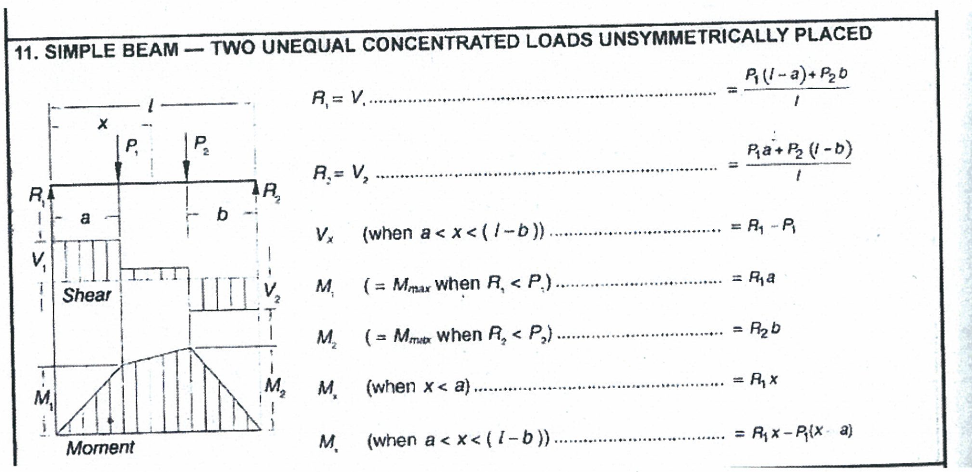
$b_{wall} := 12in$

spacing of grout curtain

$P_s := K_a \cdot q_u \cdot H \cdot b_{wall} = 27512 \cdot lbf$

Force resulting from surcharge loading acting at mid-height of wall

The grout curtain is analyzed as a simply supported beam with Point Loads acting at two locations.



11. SIMPLE BEAM — TWO UNEQUAL CONCENTRATED LOADS UNSYMMETRICALLY PLACED

$R_1 = V_1$	$= \frac{P_1(l-a)+P_2 b}{l}$
$R_2 = V_2$	$= \frac{P_1 a + P_2(l-b)}{l}$
V_x (when $a < x < (l-b)$)	$= R_1 - P_1$
M_1 ($= M_{max}$ when $R_1 < P_1$)	$= R_1 a$
M_2 ($= M_{max}$ when $R_2 < P_2$)	$= R_2 b$
M_x (when $x < a$)	$= R_1 x$
M_x (when $a < x < (l-b)$)	$= R_1 x - P_1(x-a)$

$l := H = 10.5\,ft$ $\quad P_1 := P_H = 3087 \cdot lbf$ $\quad a := \frac{l}{3} = 3.5\,ft$

$P_2 := P_s = 27512\,lbf$ $\quad b := \frac{l}{2} = 5.25\,ft$

$R_1 := \frac{P_1 \cdot (l - a) + P_2 \cdot b}{l} = 15814\,lbf$ $\quad R_2 := \frac{P_2 \cdot (l - b) + P_1 \cdot a}{l} = 14785\,lbf$

$M_u := \begin{cases} R_1 \cdot a & \text{if } R_1 < P_1 \\ R_2 \cdot b & \text{otherwise} \end{cases} = 77620 \cdot lbf \cdot ft$

Ultimate bending moment on 1 foot wide section of grout curtain, resulting from factored earth pressure and surcharge loading

$V_u := \max(R_1, R_2) = 15814\,lbf$

Ultimate Shear across section

Check Grout Curtain Capacity

$t_{wall} := 30in$ — Thickness of wall = spacing of grout curtain (KUR-DWG-1782F-C002)

Flexure: $\phi_b := 0.9$ — (ACI 318-08, Section 9.3.2.1)

$$S_{wall} := \frac{b_{wall} \cdot t_{wall}^2}{6} = 1800 \cdot in^3$$ Section Modulus of the Grout Curtain

$$f_b := \frac{M_u}{S_{wall}} = 517\,psi$$ Bending stress in Grout Curtain section

$f_c := 500psi$ — Assumed Grout Curtain Compressive Strength

$\lambda := 0.75$ — Weight factor for lightweight concrete (ACI 318-08, Section 8.6.1)

$$f_r := \phi_b \cdot 5 \cdot \lambda \cdot psi \sqrt{\frac{f_c}{psi}} = 75\,psi$$ Flexural capacity of unreinforced concrete (ACI 318-08 (22.2))

$$DC_{flexure} := \frac{f_b}{f_r} = 6.86$$ Demand to Capacity ratio for flexure

Shear: $\phi_v := 0.75$ — (ACI 318-08, Section 9.3.2.3)

$$V_c := \phi_v \cdot 2 \cdot \lambda \cdot psi \cdot \sqrt{\frac{f_c}{psi}} \cdot b_{wall} \cdot t_{wall} = 9056\,lbf$$ Shear strength of grout wall (ACI-318-08 (11-3))

$$DC_{shear} := \frac{V_u}{V_c} = 1.75$$ Demand to Capacity ratio for flexure

KURION
Isolating Waste from the Environment

Calc. #: KUR-1782F-CALC-C003
Revision: C

Calculation Title: A, C, and D-Cell Floor Structural Analysis (30% Design)
Project Title: 300-296 Soil Remediation
Status: ☒ **In-Process** ☐ **Final**

Contains assumptions and/or inputs which require verification: ☒ **Yes** ☐ **No**

Calculation History

Revision #	Reason for Revision	Approvals/Date
B	30% Design Review	Originator: R.S. Rast Checker: J. Small PM: K. Quigley Other:
C	Incorporate editorial comments	Originator: R.S. Rast [signature] 24 JULY 2014 Checker: J. Small [signature] 07/24/2014 PM: K. Quigley [signature] 7/24/14 Other:
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:

Calculation Title:	A, C, and D-Cell Floor Structural Analysis (30% Design)						
Originator:	R.S. Rast	**Date:**	7/24/14	**Checker:**	J. Small	**Date:**	7/24/14

1. Objective/Purpose

The objective of the 300-296 Soil Remediation Project is to remove the highly contaminated soils from beneath the 324 Building B-Cell to the point where the remaining contaminated soil can be excavated by conventional methods in open-air. The highly contaminated debris in the B-Cell and underlying soils will be removed remotely, transferred to other facility hot cells, and solidified in place, or transferred to the Environmental Restoration and Disposal Facility (ERDF) in approved packaging.

The objective of this calculation is to perform a structural evaluation of the 324 Building Radiochemical Engineering Cells (REC) floors. Plans to excavate soil under the B-Cell floor will result in placing large quantities of debris in A-Cell followed by soil in C and D-Cells. Prior to soil remediation, the cell floor structural capacities must be understood.

The results of the REC cell floor structural evaluation will provide a basis for decision making regarding control of loading and/or retrofitting of the REC structure. In addition, results from this calculation may be used in an REC end-state evaluation.

2. Summary of Results and Conclusions

The current analysis is based on 115-pcf soil unit weight, provided in conceptual design.

Based on the current analysis, the following loads can be placed on the Hot Cell Floors:

- A-Cell - 125,218-lbf (total weight to be relocated), uniformly distributed
- D-Cell – 115pcf (soil unit weight) from floor to ceiling
- C-Cell – 115pcf (soil unit weight) 9-ft high on floor

This calculation reflects a 30% design. Additional consideration of existing REC loads and change to load path based on soil removal is required prior to final issue.

3. Unverified Inputs or Assumptions

3.1 Concrete:

- REC concrete is structurally sound
- REC concrete strength is a minimum of 3000-psi as specified in Ref.12.9

3.2 Rebar Spacing:

- REC rebar spacing is structurally in accordance with Hanford drawings

4. Introduction/Background

The 324 Building is a non-reactor Category 2 Nuclear Facility located in the 300 Area of the U.S. Department of Energy (DOE) Hanford Site. The building is undergoing deactivation, decommissioning, decontamination, and demolition (D4) by Washington Closure Hanford (WCH) under the River Corridor Closure Contract. During the Cold War Era, the facility was used for chemical and radionuclide processing associated with nuclear weapons production.

The REC superstructure is a reinforced concrete structure that consists of four different rooms called cells and a fifth room connecting the cells. Four rooms called cells are referred to as A-Cell (Hi Bay Cell), B-Cell (Low Bay Cell), C-Cell (Pyro Cell), and D-Cell (Mechanical Cell). A fifth room referred to as the Air Lock connects the individual cells.

The general layout of the REC is shown in Figures 1 and 2. C-Cell is located beneath D-Cell, with floor elevation of 17’-0”.

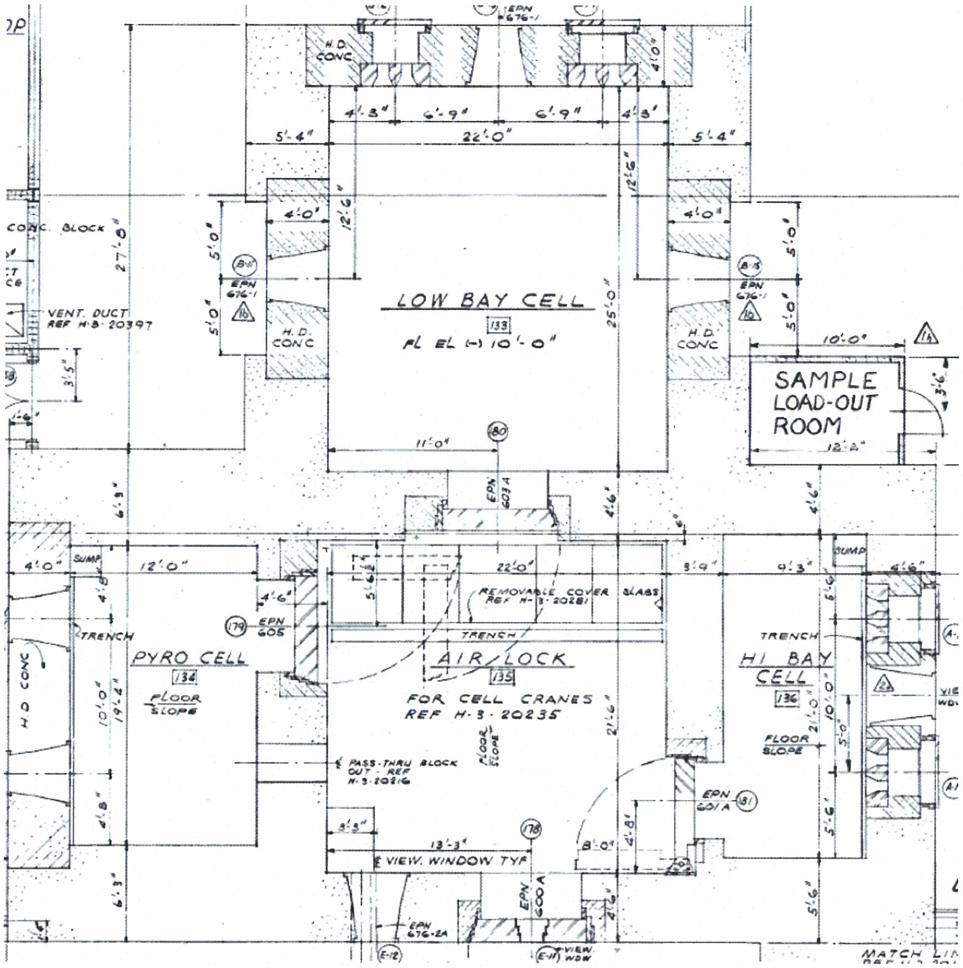


Figure 1. REC Floor Plan at 0'-0" Elevation

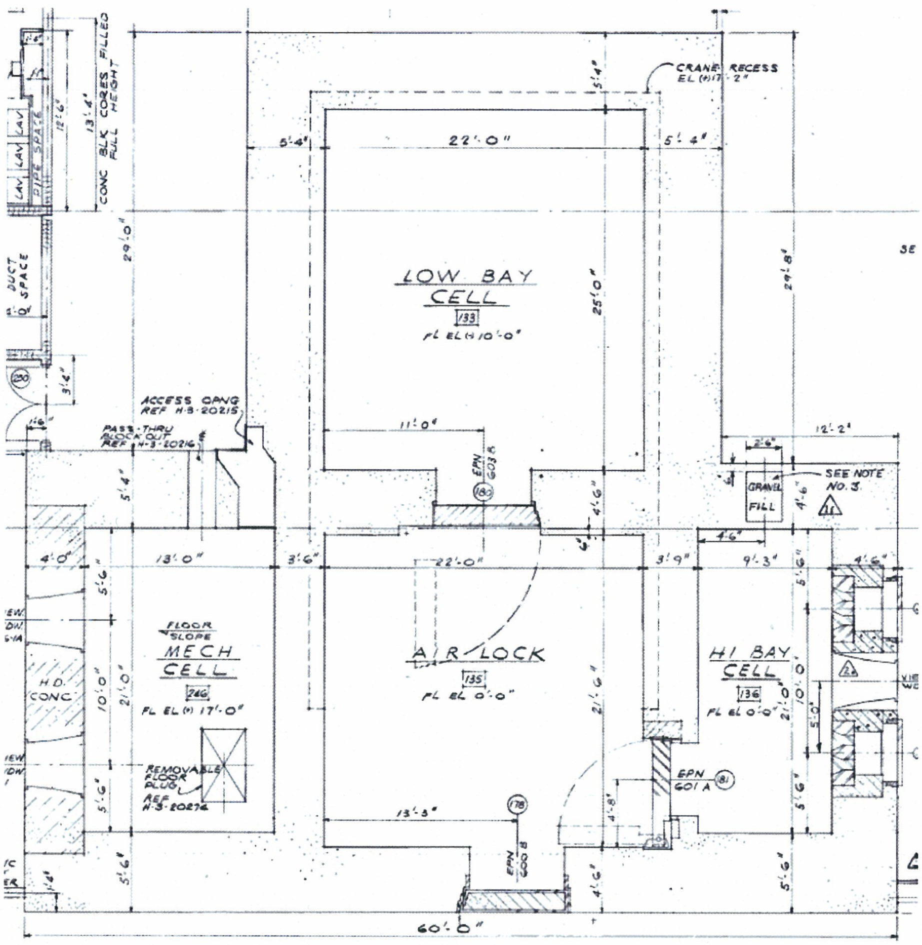


Figure 2. REC Floor Plan at 11'-6" Elevation

5. Input Data

5.1 324 Building information:

Use of existing Hanford drawings and specifications provides the input for the development of the Cell Floor SAP2000 models.

Additionally, the following inputs are used:

- f'c = 3000-psi (28-day concrete compressive strength specified at the time of construction) [Ref. 12.8, Section 4.d.]
- Ec = 3321-ksi (Modulus of Elasticity, Ec = $\gamma_c^{1.5}$*33*(√f'c) [Ref. 12.7, Section 8.5.1]
- fy = 40,000-psi (Reinforcing Bar Minimum Yield Strength) [Refs. 12.9 and 12.10]
- γ_c: = 150-pcf (normal weight reinforced concrete)
- γ_{soil}: = 115-pcf (unit weight of excavated soil, (Ref.2))

5.2 Design Criteria

In accordance with the *Facility Design Basis Requirements 300-296 Soil Remediation Project Phase I&II*, the following are used when applicable:

<u>Codes and Standards:</u>

- IBC 2009, *International Building Code*
- ASCE 7-05, *Minimum Design Loads for Buildings and Other Structures*
- ACI 318-08, *Building Code Requirements for Structural Concrete and Commentary*

ACI capacity checks are determined through the use of ACI load combination 1.2D+1.6L.

6. Assumptions

not used

7. Method of Analysis

The reinforced concrete floor of each of the 324 A, C, and D REC cells are two way elevated slabs. The section thickness and placement of reinforcement for each cell is different. The thickness of each slab varies according to the slope in the floor. Additionally, there is a trench and sump placed in the floor, thereby removing section thickness.

The analysis of the three cell floors considers proposed loading in the *300-296 Soil Remediation Project Phase I & II Conceptual Design Report* (Ref. 2). Prior to initiation of soil removal activities, debris from other REC cells will be placed in A-Cell (Hi Bay Cell). During soil removal activities, the soil will be placed in bags and transferred first to C-Cell, until it is at structural capacity, then proceed to fill D-Cell above. This will be performed using a removable plug in the D-Cell floor.

For 30% Design Review, this calculation is limited to structural evaluation based on conceptual design.

Additional analysis beyond 30% design may address the following:

- Current stress state for Hot Cell floors
- Change in Hot Cells floor load paths/stress resulting from excavation
- Review of concrete details for accurate determination of capacities
- More accurate soil densities and/or bag weights
- Additional load configurations
- Additional weight from grouting/end state activities

The following sub-sections provide information related to the REC floor sections and analysis performed.

7.1 A-Cell Floor Assessment

Prior to excavation, debris currently present in the other cells and adjoining Air-Lock will be placed in A-Cell. According to Section 2 of Ref. 12.11, the total estimated weight of debris to be placed in A-Cell is 125,218-lbf.

The A-Cell (Hi Bay Cell) floor is a structural two-way slab approximately 18 in. thick with a length of 21 ft. and width of 9 ft. 3 in. A sump measuring 2 ft. by 2 ft. by 6 in. deep is located in the Northwest corner and a 3-3/4 in. wide trench (Figure 3) is located along the North wall draining to the sump. The sump and trench do not appear to be compromised. In A-Cell, the minimum floor thickness along the trench is 17-1/4 in. Below the sump, the floor is only 13-1/4 in. thick. Reinforcing consists of #5 (5/8 in. dia.) bar spaced at 12 in., top and bottom, running in the longitudinal (East/West) direction, and #9 (1-1/8 in. dia.) spaced at 7 in., top and bottom, running in the lateral (North/South) direction. Figure 4 shows the SAP2000 model used to represent A-Cell floor. Detailed analyses of the A-Cell Floor are contained in Appendix A.

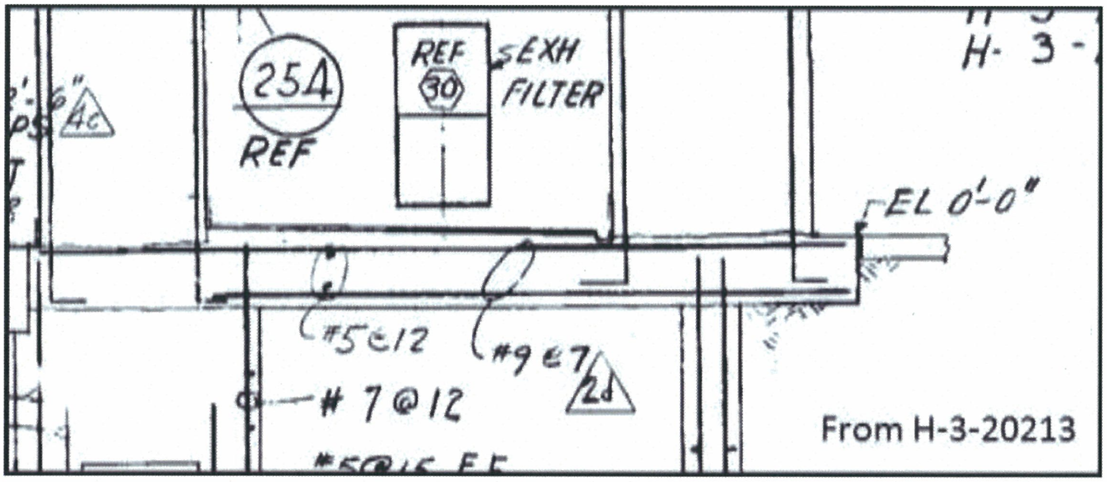


Figure 3 A-Cell Floor Section (North-South Span)

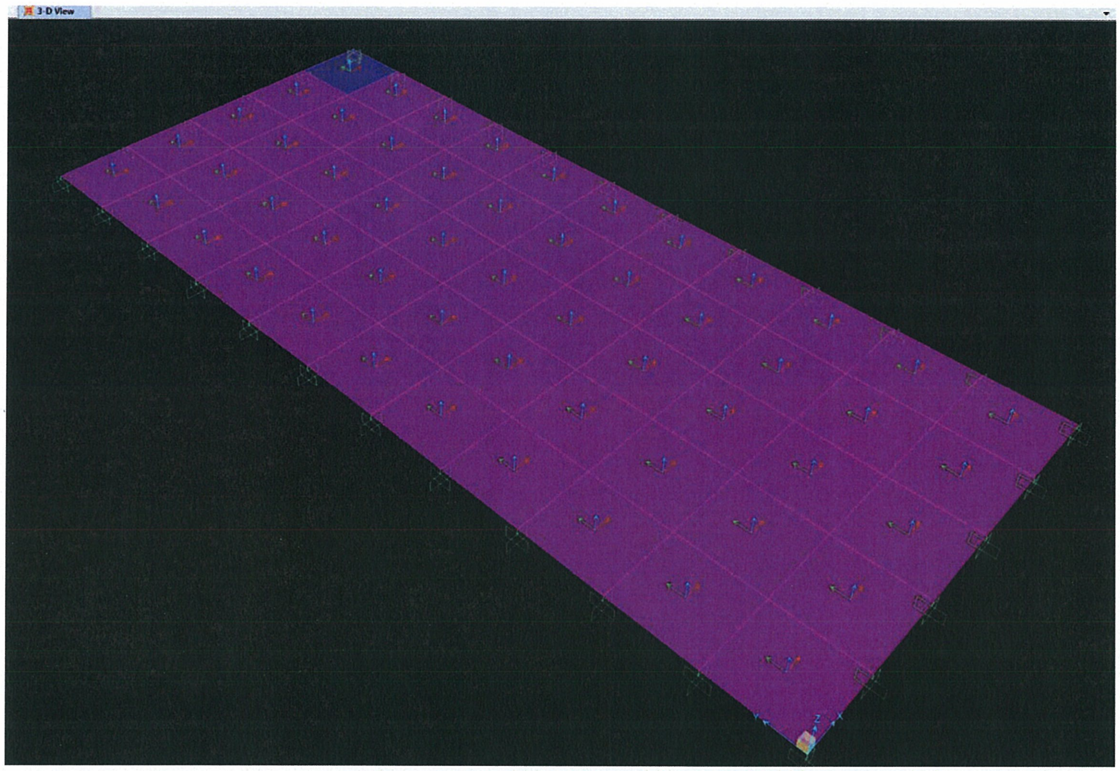


Figure 4 A-Cell Floor SAP2000 Model

7.2 D-Cell Floor Assessment

The D-Cell (Mechanical Cell) floor is a structural two-way slab approximately 24 in. thick with a length of 21 ft. and width of 13 ft. A sump measuring 2 ft. by 2 ft. by 6 in. deep is located in the Southwest corner and a 3-3/4 in. wide trench located along the South wall draining to the sump. In D-Cell, the minimum floor thickness along the trench is 20 in. Under the sump, the floor is only 18 in. thick. Reinforcing consists of #9 (1-1/8 in. dia.) bar spaced at 9 in., top and bottom, running in both directions (see Figure 5). Figure 6 shows the SAP2000 model used to represent D-Cell floor. Detailed analyses of the D-Cell Floor are contained in Appendix B. Unlike the other floors, D-Cell is analyzed using three models. The models correspond to a basic case without modification, consideration of the floor opening and filling the cell from floor to ceiling. All analysis and design code checks are contained in Appendix B

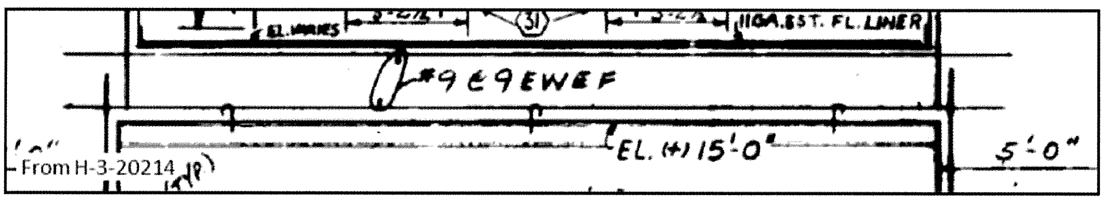


Figure 5 D-Cell Floor Section (East-West Span)

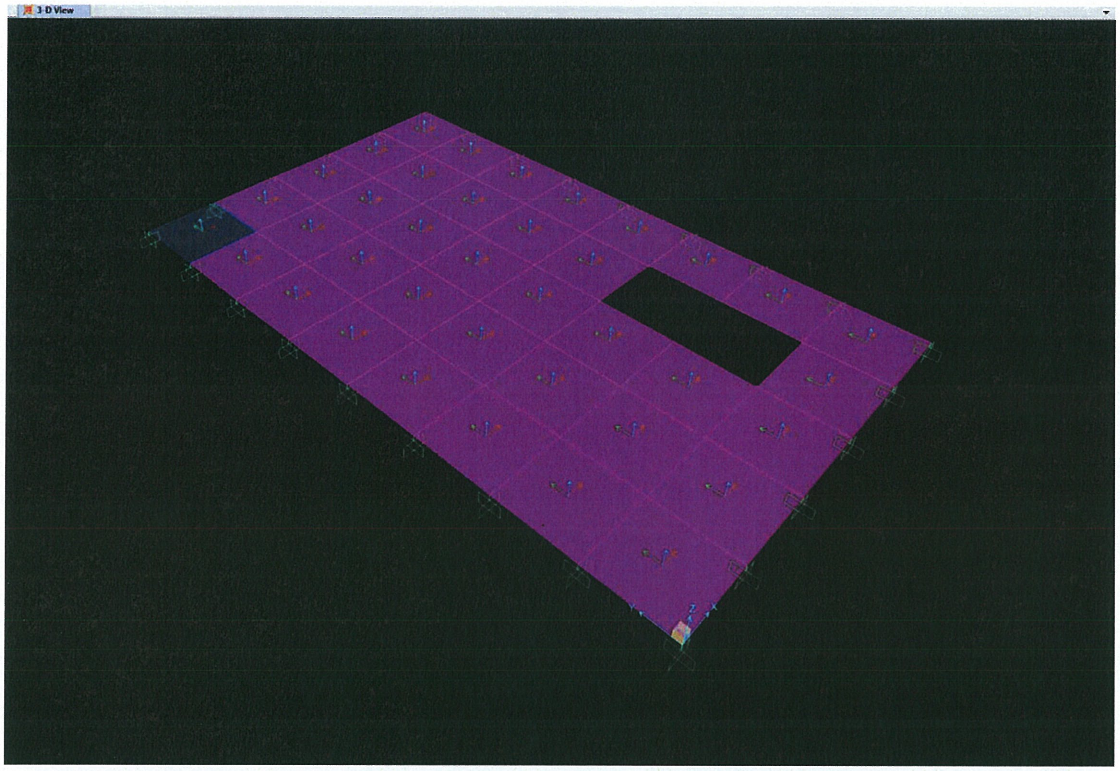


Figure 6 D-Cell Floor SAP2000 Model

7.3 C-Cell Floor Assessment

The C-Cell (Pyro Cell) floor is a structural two-way slab approximately 12 in. thick with a length of 19 ft. 3 in. and width of 12 ft. A sump measuring 2 ft. by 2 ft. by 6 in. deep is located in the Southwest corner and a 3-3/4 in. wide trench is located along the South wall, draining to the sump. In C-Cell, the minimum floor thickness along the trench is 9-1/4 in. Under the sump, the floor is only 5-1/4 in. thick. Reinforcing consists of #5 (5/8 in. dia.) bar spaced at 9 in. along the bottom, running in both the longitudinal (East/West) and lateral (North/South) directions (See Figures 7 and 8).

Top reinforcing is placed as:

- #8 (1 in. dia.) bar spaced at 9 in., extending out 4 ft. from the South wall
- #7 (7/8 in. dia.) bar spaced at 12 in., extending out 4 ft. from the North wall
- #5 bar spaced at 9 in., extending out 4 ft. from the East and West walls

In both directions at mid-span, there is no top layer reinforcement.

Figure 9 shows the SAP2000 model used to represent C-Cell floor. Detailed analyses of the C-Cell Floor are contained in Appendix C.

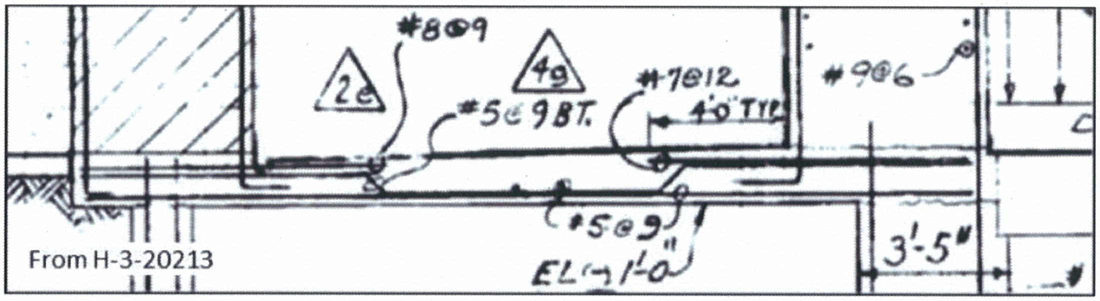


Figure 7 C-Cell Floor Section (North – South Span)

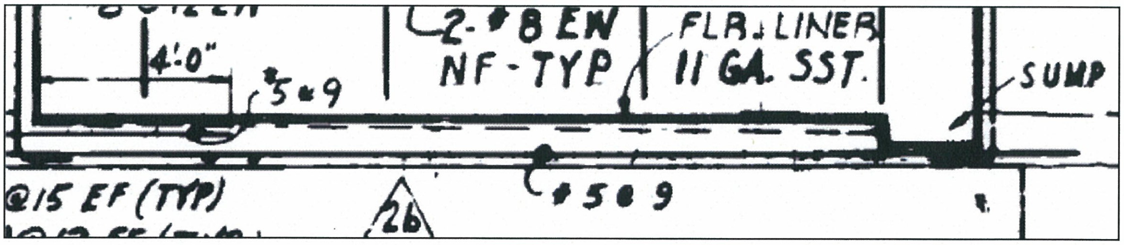


Figure 8 C-Cell Floor Section (East – West Span)

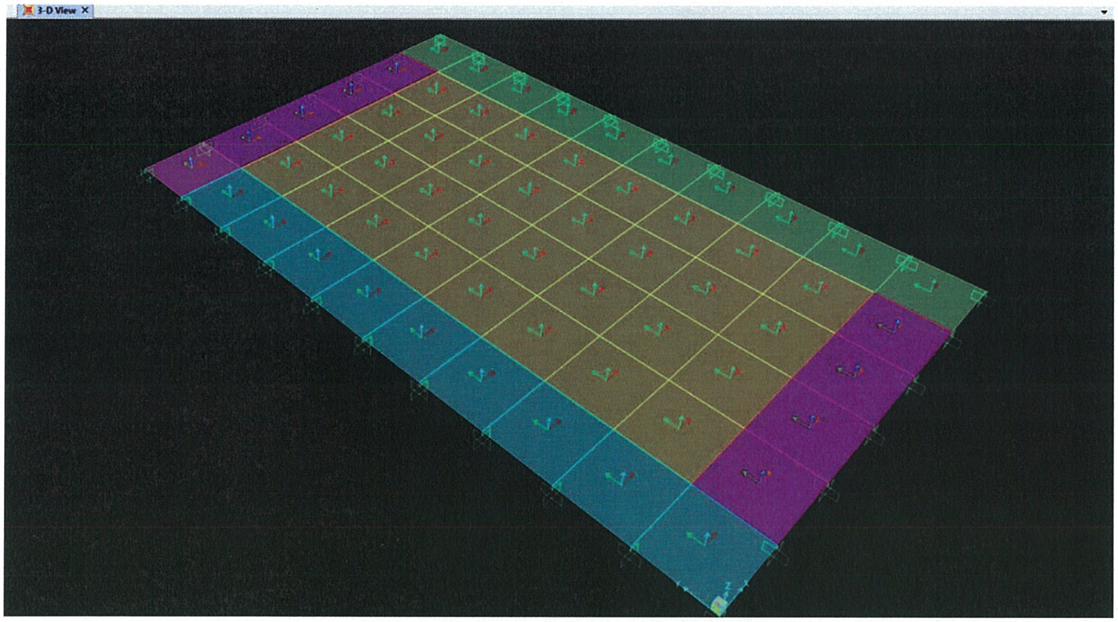


Figure 9 C-Cell Floor SAP2000 Model

8. Use of Computer – Type and Software

SAP2000, Version 16.1.1, as used in this calculation is qualified in accordance with KUR-ENG-PRO-03-14, *Safety Software Requirements*. This software is a commercially available computer program qualified to perform static and dynamic analysis of structural systems. The SAP2000 Software Verification and Validation report is contained in Ref. 12.6.

9. Results

Analytical results are presented in the appendices corresponding to the floor under consideration. All cell floors are analyzed for two-way slab bending and shear.

Based on the current analysis, the following loads can be placed on the Hot Cell Floors:

- A-Cell - 125,218-lbf (total weight to be relocated), uniformly distributed
- D-Cell – 115pcf (soil unit weight) from floor to ceiling
- C-Cell – 115pcf (soil unit weight) 7-ft high on floor

10. Conclusions

The structural evaluations of the A, D, and C-Cell floors satisfy requirements of 30% design. Future consideration will be given to the considerations listed in Section 7.

11. Recommendations

Not used

12. References

12.1 *Facility Design Basis Requirements 300-296 Soil Remediation Project Phase I and II.* A-300-296-00045, Rev. 0. AREVA Federal Services, LLC. Richland, WA

12.2 *General Design Criteria for River Corridor Closure Contract*. WCH-56, Rev. 5. Washington Closure Hanford. Richland, WA 99352

12.3 *300-296 Soil Remediation Project Phase I & II Assessment Report*, KUR-1782F-RPT-001, Rev. 0 KURION, Inc. Richland, WA

12.4 *300-296 Soil Remediation Project Phase I & II Conceptual Design Report*, KUR-1782F-RPT-002, Rev. 0 KURION, Inc. Richland, WA

12.5 *Safety Software Requirements*, KUR-ENG-PRO-03-14, Rev. 1, KURION, Inc. Richland, WA

12.6 *Validation and Verification Report for SAP2000 Version 16*, KUR-ENG-V&V-021, Rev. 0. KURION, Inc. Richland, WA

12.7 *Building Code Requirements for Structural Concrete and Commentary*, ACI 318-08. American Concrete Institute. Farmington Hills, MI

12.8 *Specification for Fuels Recycle Pilot Plant, Building 324, Project CAH-916*, HWS-5967. General Electric Co. Richland, WA

12.9 *Standard Specification for Placing Reinforced Concrete*, HWS-4798-S. General Electric Co. Richland, WA

12.10 *Evaluation of Reinforcing Bars in Old Reinforced Concrete Structures,* Engineering Data Report Number 48, Concrete Reinforcing Steel Institute

12.11 *300-296 Soil Remediation Project Phase I & II 30% Design Report*, KUR-1782F-RPT-005, Rev. B KURION, Inc. Richland, WA

13. Attachments and Appendixes

Appendix A – Structural Evaluation of A-Cell Floor
Appendix B – Structural Evaluation of D-Cell Floor
Appendix C – Structural Evaluation of C-Cell Floor

Appendix A - A-Cell Floor Structural Evaluation

A.1 MATERIAL Properties

$\gamma_{steel} := 490pcf$ — Unit weight - steel

$\gamma_{concrete} := 150pcf$ — Unit weight - reinforced concrete

$E_s := 29000ksi$ — Modulus of Elasticity for steel

$f_y := 40ksi$ — Yield stress of ASTM A15 Intermediate grade rebar

$f_c := 3000psi$ — Specified 28 day concrete compressive strength

$$E_c := \left(\frac{\gamma_{concrete}}{pcf}\right)^{\frac{3}{2}} \cdot \left(33\,psi \cdot \sqrt{\frac{f_c}{psi}}\right) = 3321 \cdot ksi \qquad E_c = 3320561\,psi$$

Modulus of Elasticity for 3000-psi normal weight concrete. (ACI 8.5.1)

$$n := \frac{E_s}{E_c} = 8.7335$$

modular ratio

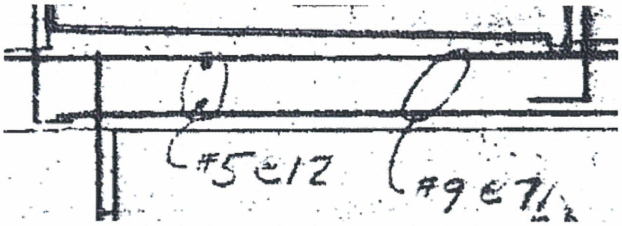
$b := 1ft$ — width of concrete section

$\upsilon := 0.2$ — Concrete Poisson Ratio

Steel Reinforcement Information: ACI 318 Appendix E

$d_4 := 0.5in$	$A_4 := 0.2in^2$	$d_9 := 1.128in$	$A_9 := 1in^2$
$d_5 := 0.625in$	$A_5 := 0.31in^2$	$d_{10} := 1.270in$	$A_{10} := 1.27in^2$
$d_6 := 0.75in$	$A_6 := 0.44in^2$	$d_{11} := 1.410in$	$A_{11} := 1.56in^2$
$d_7 := 0.875in$	$A_7 := 0.6in^2$	$d_{14} := 1.693in$	$A_{14} := 2.25in^2$
$d_8 := 1in$	$A_8 := 0.79in^2$	$d_{18} := 2.257in$	$A_{18} := 4.00in^2$

A.2 A-Cell Floor UNCRACKED Concrete Section Properties:



Ref: H-3-20213, Section 251

Plan dimensions shown on H-3-20200:

E-W Dimension $L_{22} := 21\text{ft}$

N-S Dimension $L_{11} := 9\text{ft} + 3\text{in} = 9.25\text{ ft}$

The floor is nominally 1.5-ft thick reinforced concrete with #9@7EF(each face) in the North-South Direction and #5@12EF(each face) in the East-West Direction.

$t := 18\text{in}$ — H-3-20213

$cover := 0.75\text{in}$ — Concrete cover for interior members (Ref. H-3-20198 Note 6)

North-South (11) Direction

$spacing := 7\text{in}$ — rebar spacing

$y_c := \frac{t}{2} = 0.75\text{ ft}$ — location of centroid of concrete

$A_c := b \cdot t = 1.5\text{ ft}^2$ — Gross area of concrete

Top Steel:

$db_{t11} := d_9$ $Ab_{t11} := A_9$ — top bar diameter and Area

$d'_{11} := cover + \frac{db_{t11}}{2} = 1.314 \cdot \text{in}$ — Depth to centroid of compression steel

$A_{s'11} := \frac{b}{spacing} \cdot Ab_{t11} = 1.7143 \cdot \text{in}^2$ — Area of top steel

$A_{stran'11} := A_{s'11} \cdot (n - 1) = 13.2574 \cdot \text{in}^2$ — Transformed area of steel

Bottom:

$db_{b11} := d_9$ $Ab_{b11} := A_9$ — bottom bar diameter and Area

$d_{11} := t - cover - \frac{db_{b11}}{2} = 16.686 \cdot \text{in}$ — Depth to centroid of tension steel

$A_{s11} := \frac{b}{spacing} \cdot Ab_{b11} = 1.7143 \cdot \text{in}^2$ — Area of bottom steel

$A_{stran11} := A_{s11} \cdot (n - 1) = 13.2574 \cdot \text{in}^2$ — Transformed area of steel

Transformed Section:

$$y_{bar} := \frac{A_c \cdot y_c + A_{stran'11} \cdot d'_{11} + A_{stran11} \cdot d_{11}}{A_c + A_{stran'11} + A_{stran11}} = 0.75\,ft$$

Location of tansformed section centroid (measured from top)

$$\Delta y_c := y_{bar} - y_c = 0\,ft \qquad I_c := \frac{b \cdot t^3}{12} = 5832 \cdot in^4 \qquad \Delta y_c{}^2 \cdot A_c = 0 \cdot in^4$$

$$\Delta y_{s'} := y_{bar} - d'_{11} = 7.686 \cdot in \qquad I_{s'} := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t11}{}^4}{64} = 0.1362 \cdot in^4 \qquad \Delta y_{s'}{}^2 \cdot A_{stran'11} = 783.2 \cdot in^4$$

$$\Delta y_s := y_{bar} - d_{11} = -7.686 \cdot in \qquad I_s := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{b11}{}^4}{64} = 0.1362 \cdot in^4 \qquad \Delta y_s{}^2 \cdot A_{stran11} = 783.2 \cdot in^4$$

$$I_{11} := I_c + I_{s'} + I_s + \Delta y_c{}^2 \cdot A_c + \Delta y_{s'}{}^2 \cdot A_{stran'11} + \Delta y_s{}^2 \cdot A_{stran11} = 7399 \cdot in^4$$

Transformed Moment of Inertia

Stiffness modifiers for SAP2000 model:

$$mod_{11} := \frac{I_{11}}{I_c} = 1.2686 \qquad E_{mod11} := mod_{11} \cdot E_c = 4212546 \cdot psi$$

East-West (22) Direction

$spacing := 12in$

$y_c := \frac{t}{2} = 0.75\,ft$ — location of centroid of concrete

$A_c := b \cdot t = 1.5\,ft^2$ — Gross area of concrete

Top Steel:

$db_{t22} := d_5$ $Ab_{t22} := A_5$ — top bar diameter and Area

$d'_{22} := cover + db_{t11} + \frac{db_{t22}}{2} = 2.1905 \cdot in$ — Depth to centroid of compression steel

$A_{s'22} := \frac{b}{spacing} \cdot Ab_{t22} = 0.31 \cdot in^2$ — Area of top steel

$A_{stran'22} := A_{s'22} \cdot (n - 1) = 2.3974 \cdot in^2$ — Transformed area of steel

Bottom:

$db_{b22} := d_5$ $Ab_{b22} := A_5$ — bottom bar diameter and Area

$d_{22} := t - cover - db_{b11} - \frac{db_{b22}}{2} = 15.8095 \cdot in$ — Depth to centroid of tension steel

$A_{s22} := \frac{b}{spacing} \cdot Ab_{b22} = 0.31 \cdot in^2$ — Area of bottom steel

$A_{stran22} := A_{s22} \cdot (n - 1) = 2.3974 \cdot in^2$ — Transformed area of steel

Transformed Section:

$$y_{bar} := \frac{A_c \cdot y_c + A_{stran'22} \cdot d'_{22} + A_{stran22} \cdot d_{22}}{A_c + A_{stran'22} + A_{stran22}} = 0.75\,ft$$

Location of tansformed section centroid (measured from top)

$\Delta y_c := y_{bar} - y_c = 0\,ft$ $I_c := \frac{b \cdot t^3}{12} = 5832 \cdot in^4$ $\Delta y_c^{\,2} \cdot A_c = 0 \cdot in^4$

$\Delta y_{s'} := y_{bar} - d'_{22} = 6.8095 \cdot in$ $I_{s'} := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t22}^{\,4}}{64} = 0.0075 \cdot in^4$ $\Delta y_{s'}^{\,2} \cdot A_{stran'22} = 111.2 \cdot in^4$

$\Delta y_s := y_{bar} - d_{22} = -6.8095 \cdot in$ $I_s := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t22}^{\,4}}{64} = 0.0075 \cdot in^4$ $\Delta y_s^{\,2} \cdot A_{stran22} = 111.2 \cdot in^4$

$$I_{22} := I_c + I_{s'} + I_s + \Delta y_c^{\,2} \cdot A_c + \Delta y_{s'}^{\,2} \cdot A_{stran'22} + \Delta y_s^{\,2} \cdot A_{stran22} = 6054 \cdot in^4$$

Transformed Moment of Inertia

Stiffness modifiers for SAP2000 model:

$mod_{22} := \frac{I_{22}}{I_c} = 1.0381$ $E_{mod22} := mod_{22} \cdot E_c = 3447157 \cdot psi$

SAP2000 Material Properties:

$E_1 := E_{mod11} = 4212546\ psi$

$G_{13} := \frac{E_1}{(1 + \upsilon)2} = 1755227\ psi$

$E_2 := E_{mod22} = 3447157\ psi$

$G_{23} := \frac{E_2}{(1 + \upsilon)2} = 1436315\ psi$

$E_3 := E_c = 3320561\ psi$

$G_{12} := \frac{E_3}{(1 + \upsilon)2} = 1383567\ psi$

Loads for SAP2000 model:

$W_{debris} := 125218\text{lbf}$

Weight of and volume of debris to be relocated to A-Cell (KUR-1782F-RPT-005, Section 2)

$V_{debris} := 2372\text{ft}^3$

$Area_{cell} := L_{11} \cdot L_{22} = 194.25\ \text{ft}^2$

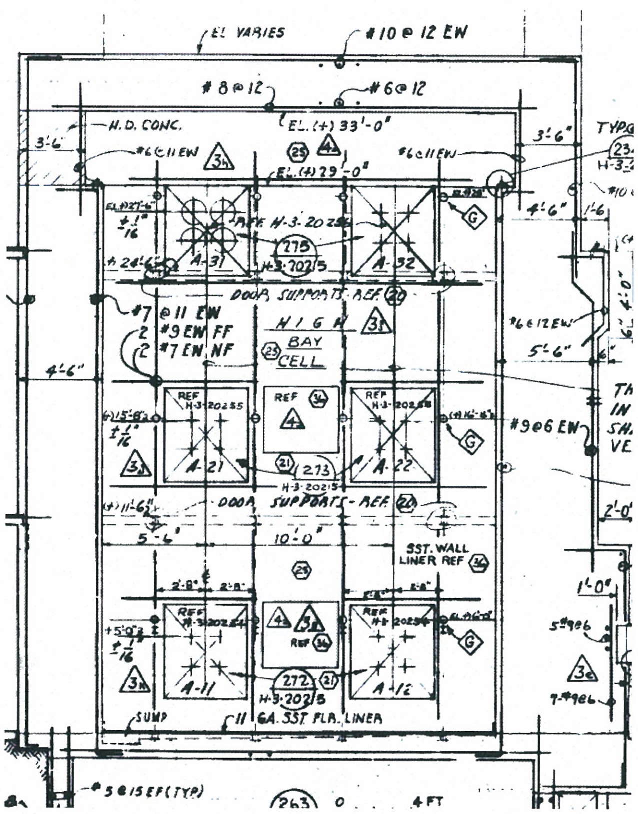
Cell Floor Area

$$h_{debris\_min} := \frac{V_{debris}}{Area_{cell}} = 12.2111\ \text{ft}$$

Minimum height of debris to be paced in A-cell

$EL_{TOR} := 29\text{ft}$

$EL_{TOC} := 0\text{ft}$



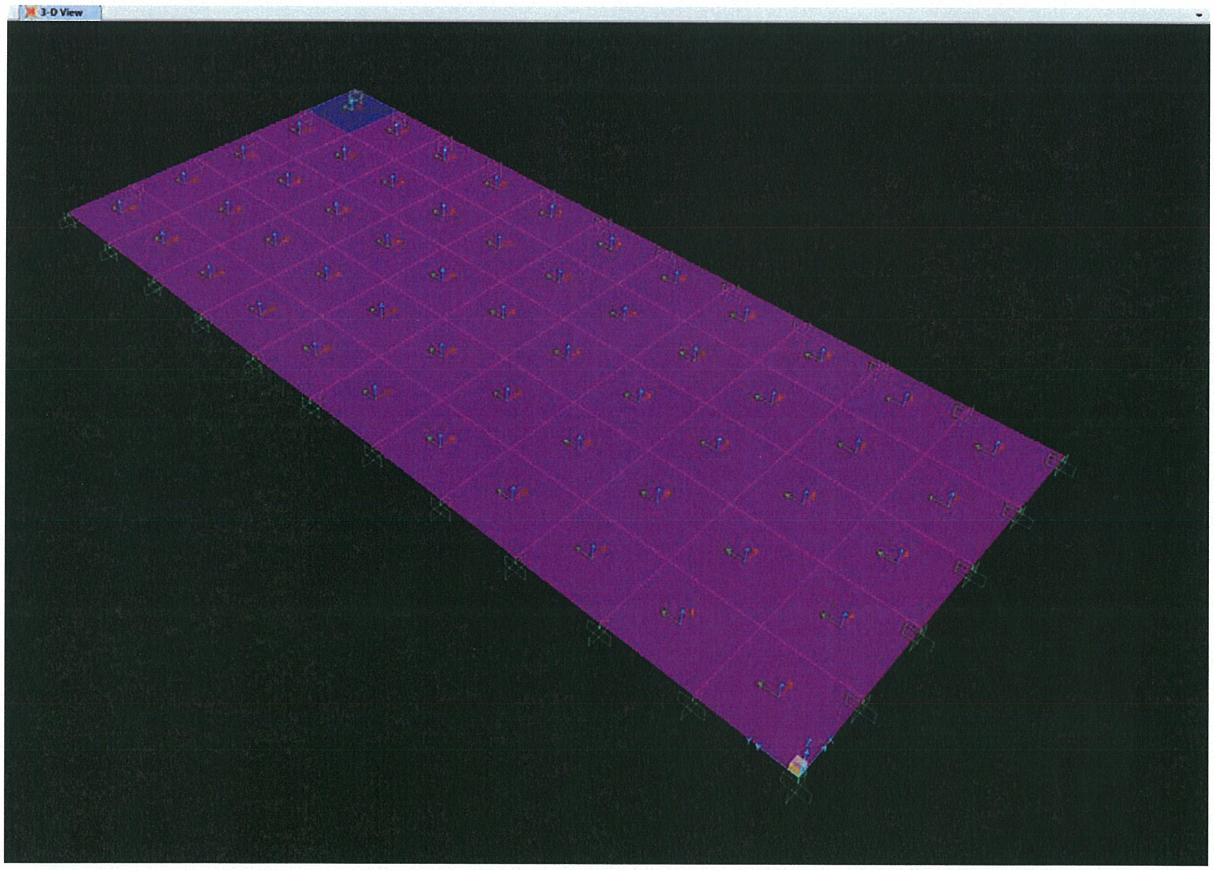
Ref. H-3-20214, Section 263

$$w_{debris} := \frac{W_{debris}}{Area_{cell}} = 645 \cdot \text{psf}$$

uniformly distributed load resulting from placement of debris

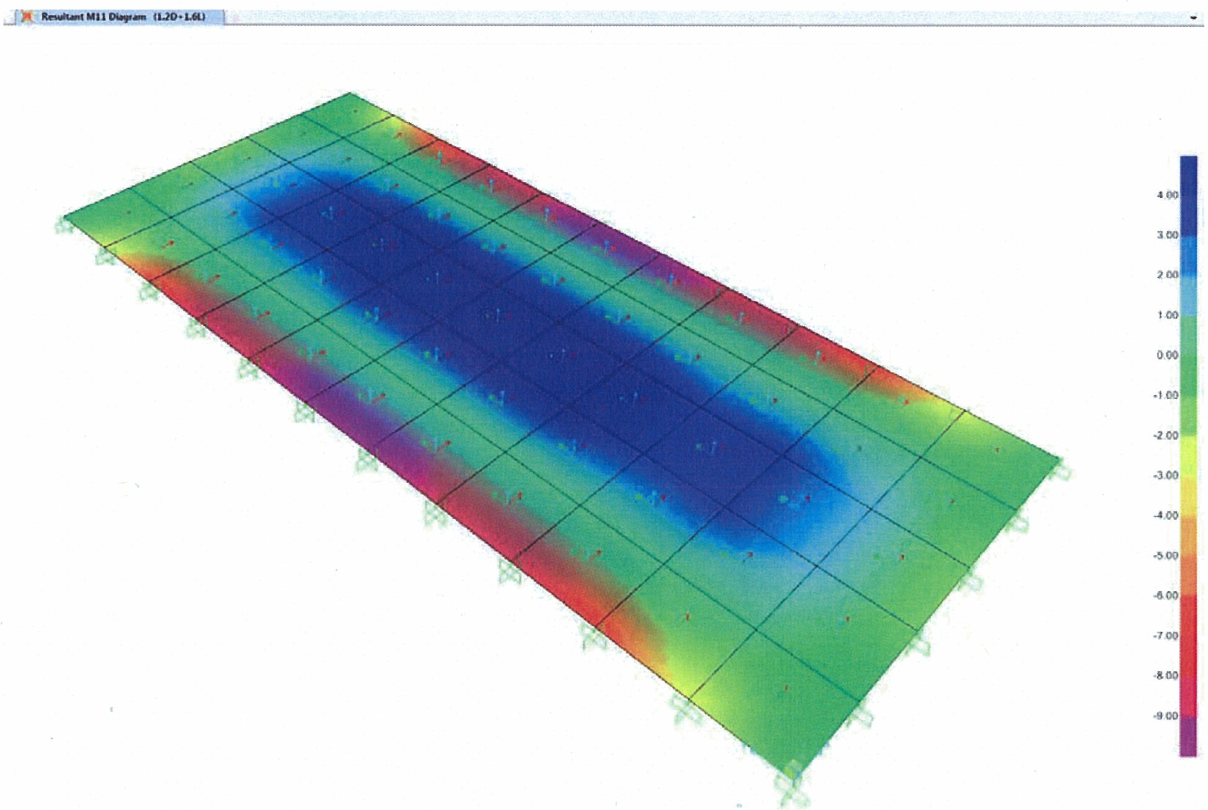
A.3 SAP20000 Structural Analysis Results

Using the material properties determined for the the reinforced concrete slab, a SAP2000 finite element model is generated. The self weight of the concrete and additional weight of the soil are considered. The self weight is considered as a dead load and the added weight of the debris is considered as a live load. Therefore, according to ACI, the reinforced concrete section is checked for strength using the load combination of 1.2D+1.6L.

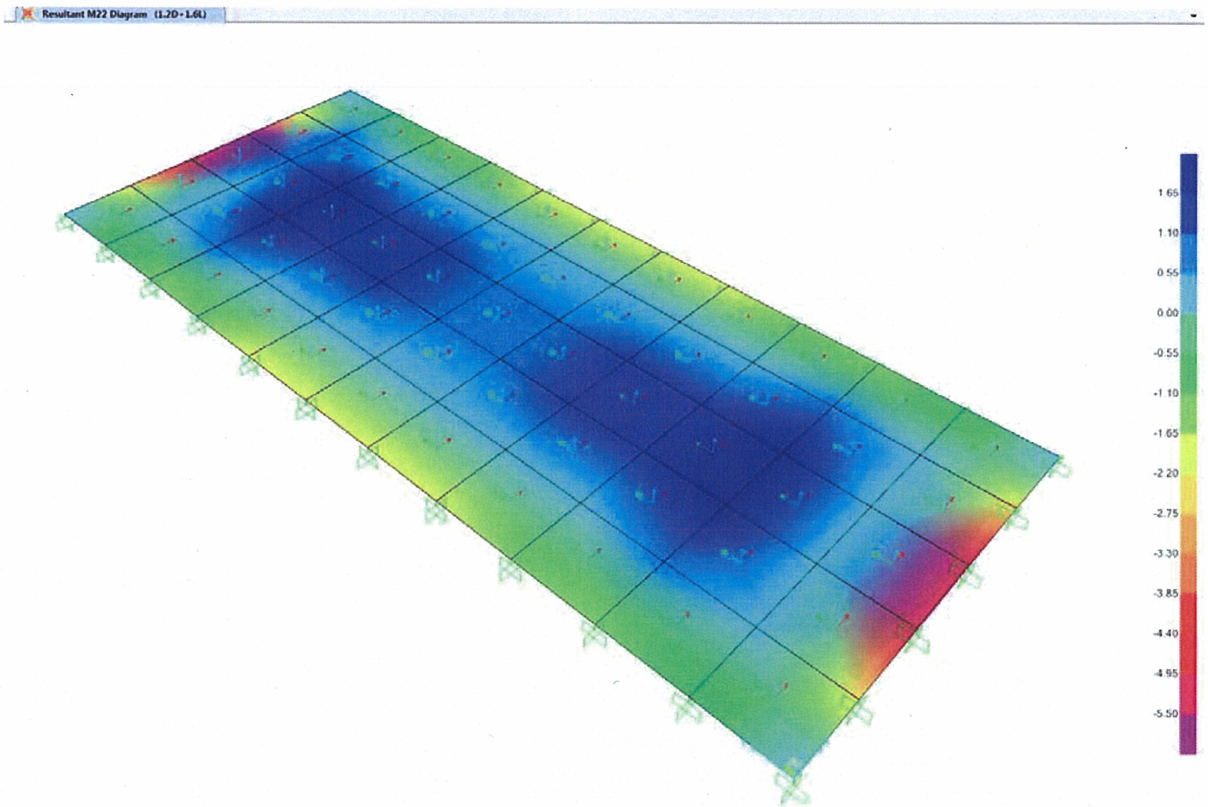


A-Cell Floor SAP2000 Model

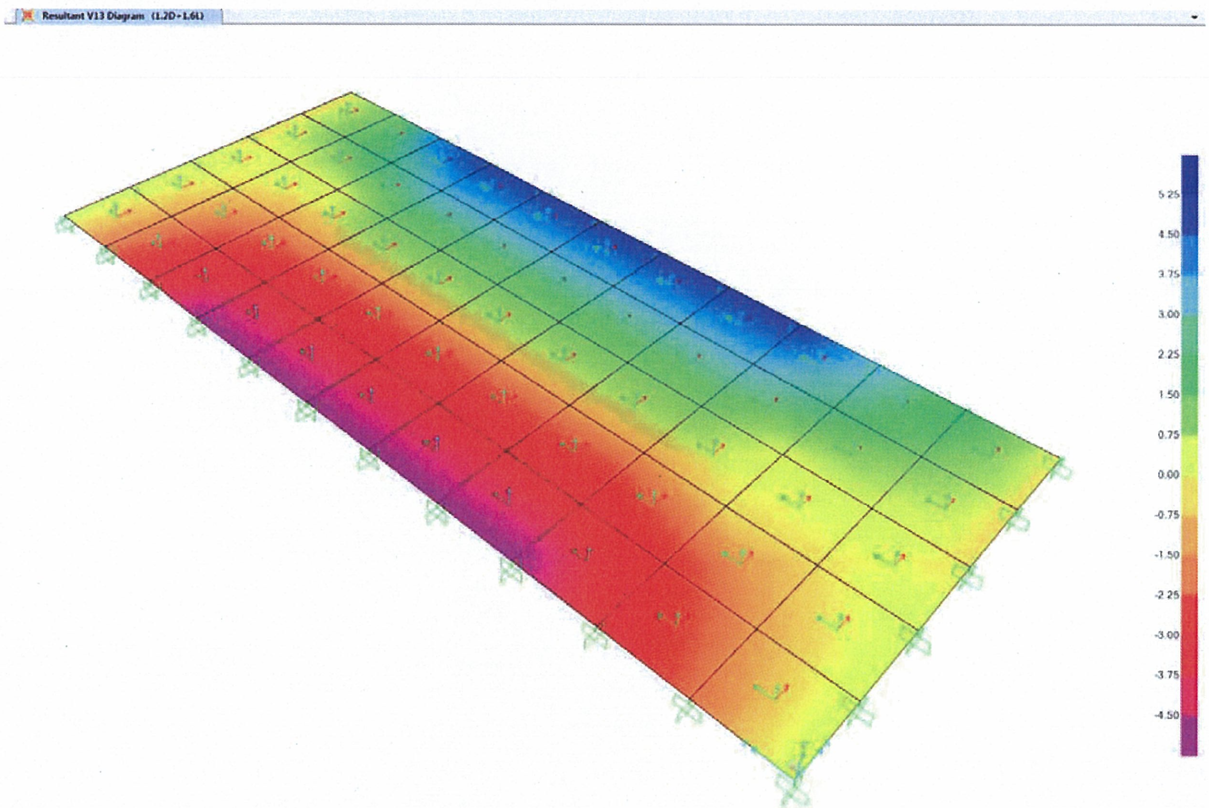
Model Orientation uses the following: Global X = Local 1
Global Y = Local 2
Global Z = Local 3



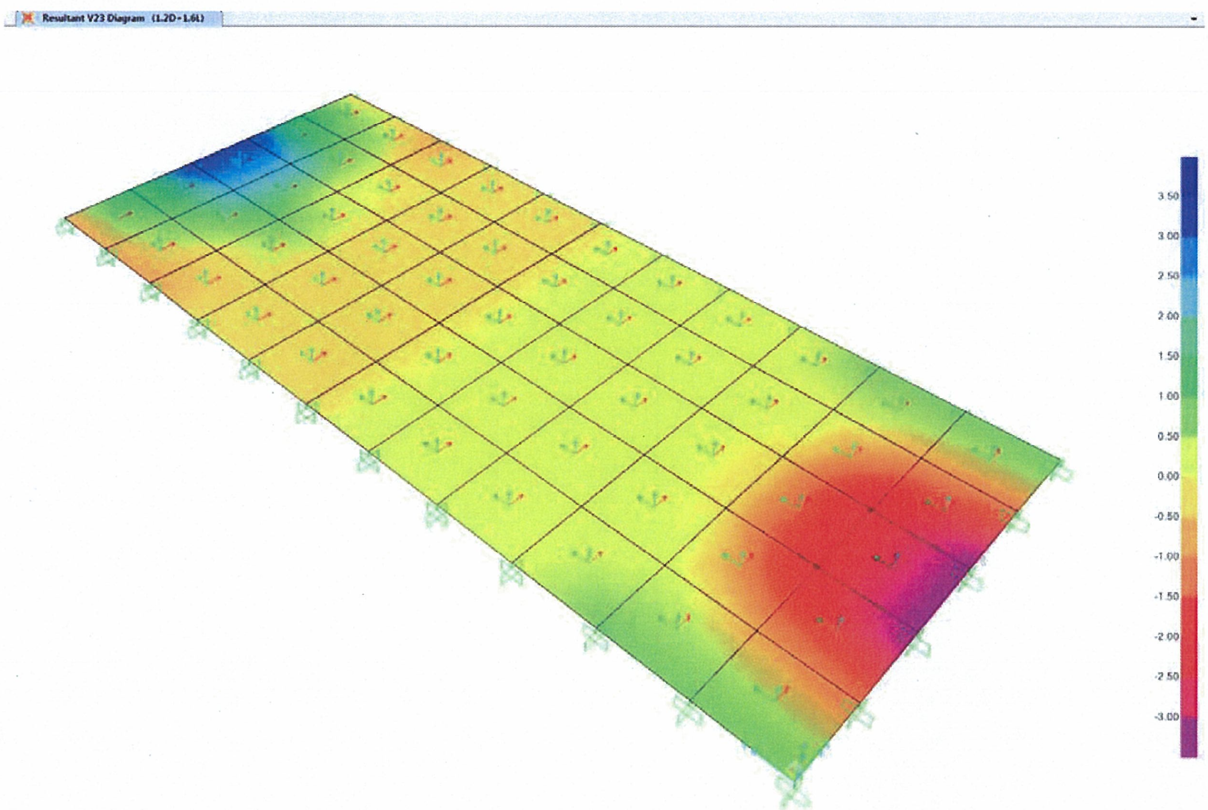
Resulting Moment M11 (kip-ft) (North-South Direction)



Resulting Moment M22 (kip-ft) (East-West Direction)



Resulting Shear V13 (kip)



Resulting Shear V23 (kip)

KURION
Isolating Waste from the Environment

Calc. # KUR-1782F-CALC-C003
Revision: C

Calculation Title: A, C, and D-Cell Floor Structural Analysis
Originator: R.S. Rast Date: 24 July 2014
Checker: J. Small Date: 24 July 2014

SAP2000 Element Output

TABLE: Element Forces - Area Shells								
Area	ShellType	Joint	OutputCase	CaseType	M11	M22	V13	V23
Text	Text	Text	Text	Text	Kip-ft/f	Kip-ft/f	Kip/ft	Kip/ft
7062	Shell-Thin	7249	1.2D+1.6L	Combination	0.05	0.07	-4.93	0.08
7062	Shell-Thin	7250	1.2D+1.6L	Combination	-9.03	-1.79	-4.93	0.05
7063	Shell-Thin	7250	1.2D+1.6L	Combination	-9.03	-1.79	-4.92	0.00
7063	Shell-Thin	7252	1.2D+1.6L	Combination	-9.03	-1.79	-4.92	0.00
7064	Shell-Thin	7252	1.2D+1.6L	Combination	-9.03	-1.79	-4.93	-0.05
7064	Shell-Thin	7251	1.2D+1.6L	Combination	0.05	0.06	-4.93	-0.08
7073	Shell-Thin	7267	1.2D+1.6L	Combination	4.51	1.04	-2.45	0.09
7074	Shell-Thin	7267	1.2D+1.6L	Combination	4.51	1.04	-2.43	0.00
7074	Shell-Thin	7268	1.2D+1.6L	Combination	4.51	1.04	-2.44	0.00
7075	Shell-Thin	7268	1.2D+1.6L	Combination	4.51	1.04	-2.45	-0.09
7080	Shell-Thin	7262	1.2D+1.6L	Combination	-1.09	-5.42	0.00	-3.35
7080	Shell-Thin	7274	1.2D+1.6L	Combination	-1.09	-5.42	0.00	-3.35
7080	Shell-Thin	7275	1.2D+1.6L	Combination	1.23	0.51	0.00	-3.35
7080	Shell-Thin	7263	1.2D+1.6L	Combination	1.23	0.51	0.00	-3.35
7084	Shell-Thin	7279	1.2D+1.6L	Combination	4.51	1.04	0.00	0.07
7084	Shell-Thin	7267	1.2D+1.6L	Combination	4.51	1.04	0.00	0.07
7085	Shell-Thin	7267	1.2D+1.6L	Combination	4.51	1.04	0.00	0.00
7085	Shell-Thin	7279	1.2D+1.6L	Combination	4.51	1.04	0.00	0.00
7085	Shell-Thin	7280	1.2D+1.6L	Combination	4.51	1.04	0.00	0.00
7085	Shell-Thin	7268	1.2D+1.6L	Combination	4.51	1.04	0.00	0.00
7086	Shell-Thin	7268	1.2D+1.6L	Combination	4.51	1.04	0.00	-0.07
7086	Shell-Thin	7280	1.2D+1.6L	Combination	4.51	1.04	0.00	-0.06
7089	Shell-Thin	7283	1.2D+1.6L	Combination	3.07	1.76	-0.06	0.98
7090	Shell-Thin	7284	1.2D+1.6L	Combination	1.16	0.60	0.04	3.50
7090	Shell-Thin	7285	1.2D+1.6L	Combination	-1.14	-5.64	0.03	3.50
7095	Shell-Thin	7279	1.2D+1.6L	Combination	4.51	1.04	2.45	0.09
7096	Shell-Thin	7279	1.2D+1.6L	Combination	4.51	1.04	2.43	0.00
7096	Shell-Thin	7280	1.2D+1.6L	Combination	4.51	1.04	2.44	0.00
7097	Shell-Thin	7280	1.2D+1.6L	Combination	4.51	1.04	2.45	-0.09
7100	Shell-Thin	7283	1.2D+1.6L	Combination	3.08	1.76	1.44	0.81
7101	Shell-Thin	7285	1.2D+1.6L	Combination	-1.14	-5.64	-0.58	3.43
7106	Shell-Thin	7302	1.2D+1.6L	Combination	-9.03	-1.79	4.93	0.05
7106	Shell-Thin	7291	1.2D+1.6L	Combination	0.05	0.07	4.93	0.08
7107	Shell-Thin	7302	1.2D+1.6L	Combination	-9.03	-1.79	4.92	0.00
7107	Shell-Thin	7303	1.2D+1.6L	Combination	-9.03	-1.79	4.92	0.00
7108	Shell-Thin	7292	1.2D+1.6L	Combination	0.05	0.06	4.93	-0.08
7108	Shell-Thin	7303	1.2D+1.6L	Combination	-9.03	-1.79	4.93	-0.05
				Min	-9.03	-5.64	-4.93	-3.35
				Max	4.51	1.76	4.93	3.50

*The following are maximum element forces from ACI load combination 1.2D+1.6L:

$M_{11} := 9.03 kip \cdot ft$ $M_{22} := 5.64 kip \cdot ft$ $V_{13} := 4.93 kip$ $V_{23} := 3.50 kip$

* Note: All units are presented as per foot. This agrees with use of b=1 ft. for ACI strength determination.

A.4 ACI Code Evaluation:

ACI Design Factors: $\phi_{shear} := 0.75$ — Strength Reduction Factor for Shear (ACI 318, 9.3.2.3)

$\phi_{flexure} := 0.9$ — Strength Reduction Factor (ACI 318, 9.3.2.1)

Flexure in the 11 Direction:

$d := d_{11} = 16.686 \cdot in \quad A_s := A_{s11} = 1.7143 \cdot in^2$

$a := A_s \cdot \dfrac{f_y}{0.85 \cdot f_c \cdot b} = 2.2409 \cdot in$ — depth of rectangular compressive stress block (ignoring compression steel)

$M_n := A_s \cdot f_y \cdot \left(d - \dfrac{a}{2}\right) = 89 \cdot kip \cdot ft$ per foot — Nominal Moment Capacity

$M_A := \phi_{flexure} \cdot M_n = 80 \cdot kip \cdot ft$ — Allowable Moment Capacity

$DC_{bending} := \dfrac{M_{11}}{M_A} = 0.11$ — Demand to Capacity Ratio for Floor Bending

Flexure in the 22 Direction:

$d := d_{22} = 15.8095 \cdot in \quad A_s := A_{s22} = 0.31 \cdot in^2$

$a := A_s \cdot \dfrac{f_y}{0.85 \cdot f_c \cdot b} = 0.4052 \cdot in$ — depth of rectangular compressive stress block (ignoring compression steel)

$M_n := A_s \cdot f_y \cdot \left(d - \dfrac{a}{2}\right) = 16 \cdot kip \cdot ft$ per foot — Nominal Moment Capacity

$M_A := \phi_{flexure} \cdot M_n = 15 \cdot kip \cdot ft$ — Allowable Moment Capacity

$DC_{bending} := \dfrac{M_{22}}{M_A} = 0.39$ — Demand to Capacity Ratio for Floor Bending

Check Shear:

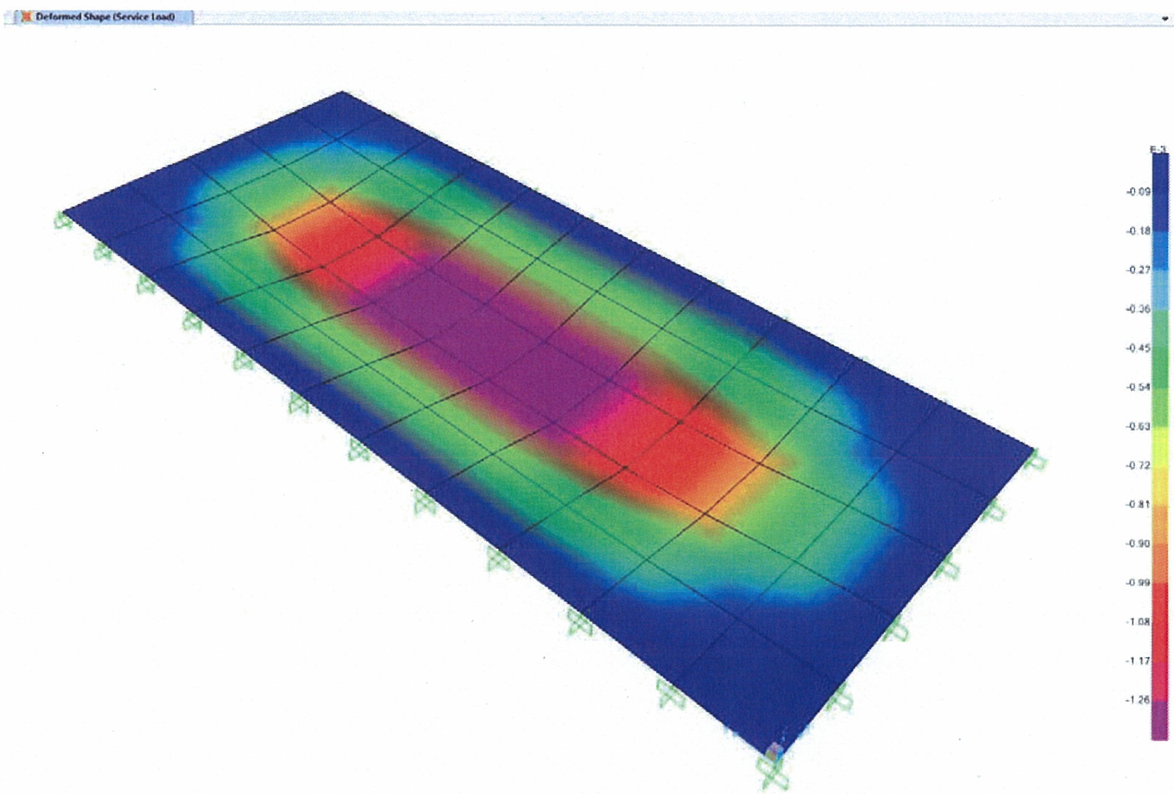
$V_u := \max(V_{13}, V_{23}) = 5 \cdot kip$

$V_c := 2 \cdot psi \cdot \sqrt{\dfrac{f_c}{psi}} \cdot b \cdot d = 21 \cdot kip$ per foot — ACI (11-3)

$\phi_{shear} \cdot V_c = 16 \cdot kip$

$DC_{shear} := \dfrac{V_u}{\phi_{shear} \cdot V_c} = 0.32$

A.5 Slab Deflection:



Deformed Shape under Service Load Combination (in)

SAP2000 Joint Displacement

TABLE: Joint Displacements					
Joint	OutputCase	CaseType	U1	U2	U3
Text	Text	Text	in	in	in
1	Service Load	Combination	0	0	0.000E+00
2	Service Load	Combination	0	0	0.000E+00
61	Service Load	Combination	0	0	0.000E+00
105	Service Load	Combination	0	0	0.000E+00
7240	Service Load	Combination	0	0	0.000E+00
7242	Service Load	Combination	0	0	0.000E+00
7244	Service Load	Combination	0	0	0.000E+00
7246	Service Load	Combination	0	0	0.000E+00
7248	Service Load	Combination	0	0	0.000E+00
7250	Service Load	Combination	0	0	0.000E+00
7252	Service Load	Combination	0	0	0.000E+00
7254	Service Load	Combination	0	0	0.000E+00
7256	Service Load	Combination	0	0	0.000E+00
7258	Service Load	Combination	0	0	0.000E+00
7260	Service Load	Combination	0	0	0.000E+00
7261	Service Load	Combination	0	0	0.000E+00
7262	Service Load	Combination	0	0	0.000E+00
7268	Service Load	Combination	0	0	-1.301E-03
7273	Service Load	Combination	0	0	0.000E+00
7274	Service Load	Combination	0	0	0.000E+00
7280	Service Load	Combination	0	0	-1.301E-03
7285	Service Load	Combination	0	0	0.000E+00
7286	Service Load	Combination	0	0	0.000E+00
7297	Service Load	Combination	0	0	0.000E+00
7298	Service Load	Combination	0	0	0.000E+00
7299	Service Load	Combination	0	0	0.000E+00
7300	Service Load	Combination	0	0	0.000E+00
7301	Service Load	Combination	0	0	0.000E+00
7302	Service Load	Combination	0	0	0.000E+00
7303	Service Load	Combination	0	0	0.000E+00
7304	Service Load	Combination	0	0	0.000E+00
7305	Service Load	Combination	0	0	0.000E+00
7306	Service Load	Combination	0	0	0.000E+00
7307	Service Load	Combination	0	0	0.000E+00
				max up	**0.000E+00**
				max down	**-1.301E-03**

$\Delta := 1.301 \times 10^{-3}\ \text{in}$ $\quad \frac{L_{11}}{360} = 3.083 \times 10^{-1} \cdot \text{in} \quad \frac{L_{22}}{360} = 7.000 \times 10^{-1} \cdot \text{in}$

$$ACI_{\Delta} := \min\left(\frac{L_{22}}{360}, \frac{L_{11}}{360}\right)$$

Deflection Criteria
(ACI 318 Table 9.5(b))

$$\text{Serviceability} := \begin{cases} \text{"OK"} & \text{if } \Delta < ACI_{\Delta} \\ \text{"Too Much Deflection"} & \text{otherwise} \end{cases} = \text{"OK"}$$

Appendix B - D-Cell Floor Structural Evaluation

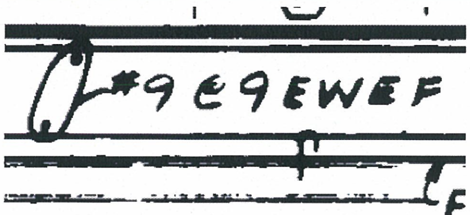
B.1 MATERIAL Properties

$\gamma_{steel} := 490pcf$	Unit weight - steel
$\gamma_{concrete} := 150pcf$	Unit weight - reinforced concrete
$E_s := 29000ksi$	Modulus of Elasticity for steel
$f_y := 40ksi$	Yield stress of ASTM A15 Intermediate grade rebar
$f_c := 3000psi$	Specified 28 day concrete compressive strength
$E_c := \left(\frac{\gamma_{concrete}}{pcf}\right)^{\frac{3}{2}} \cdot \left(33\,psi \cdot \sqrt{\frac{f_c}{psi}}\right) = 3321 \cdot ksi \qquad E_c = 3320561\,psi$	Modulus of Elasticity for 3000-psi normal weight concrete. (ACI 8.5.1)
$n := \frac{E_s}{E_c} = 8.7335$	modular ratio
$b := 1ft$	width of concrete section
$\upsilon := 0.2$	Concrete Poisson Ratio

Steel Reinforcement Information: ACI 318 Appendix E

$d_4 := 0.5in$	$A_4 := 0.2in^2$	$d_9 := 1.128in$	$A_9 := 1in^2$
$d_5 := 0.625in$	$A_5 := 0.31in^2$	$d_{10} := 1.270in$	$A_{10} := 1.27in^2$
$d_6 := 0.75in$	$A_6 := 0.44in^2$	$d_{11} := 1.410in$	$A_{11} := 1.56in^2$
$d_7 := 0.875in$	$A_7 := 0.6in^2$	$d_{14} := 1.693in$	$A_{14} := 2.25in^2$
$d_8 := 1in$	$A_8 := 0.79in^2$	$d_{18} := 2.257in$	$A_{18} := 4.00in^2$

B.2 D-Cell Floor UNCRACKED Concrete Section Properties:



Ref: H-3-20214, Section 262

Plan dimensions shown on H-3-20205:

E-W Dimension $L_{22} := 21\text{ft}$

N-S Dimension $L_{11} := 13\text{ft}$

The floor is nominally 2-ft thick reinforced concrete with #9@9EWEF (each way, each face).

$t := 24\text{in}$ — H-3-20213

$\text{cover} := 0.75\text{in}$ — Concrete cover for interior members (Ref. H-3-20198 Note 6)

North-South (11) Direction

$\text{spacing} := 9\text{in}$ — rebar spacing

$y_c := \dfrac{t}{2} = 1\ \text{ft}$ — location of centroid of concrete

$A_c := b \cdot t = 2\ \text{ft}^2$ — Gross area of concrete

Top Steel:

$db_{t11} := d_9 \quad Ab_{t11} := A_9$ — top bar diameter and Area

$d'_{11} := \text{cover} + \dfrac{db_{t11}}{2} = 1.314 \cdot \text{in}$ — Depth to centroid of compression steel

$A_{s'11} := \dfrac{b}{\text{spacing}} \cdot Ab_{t11} = 1.3333 \cdot \text{in}^2$ — Area of top steel

$A_{stran'11} := A_{s'11} \cdot (n-1) = 10.3113 \cdot \text{in}^2$ — Transformed area of steel

Bottom:

$db_{b11} := d_9 \quad Ab_{b11} := A_9$ — bottom bar diameter and Area

$d_{11} := t - \text{cover} - \dfrac{db_{b11}}{2} = 22.686 \cdot \text{in}$ — Depth to centroid of tension steel

$A_{s11} := \dfrac{b}{\text{spacing}} \cdot Ab_{b11} = 1.3333 \cdot \text{in}^2$ — Area of bottom steel

$A_{stran11} := A_{s11} \cdot (n-1) = 10.3113 \cdot \text{in}^2$ — Transformed area of steel

Transformed Section:

$$y_{bar} := \frac{A_c \cdot y_c + A_{stran'11} \cdot d'_{11} + A_{stran11} \cdot d_{11}}{A_c + A_{stran'11} + A_{stran11}} = 1\ \text{ft}$$

Location of tansformed section centroid (measured from top)

$$\Delta y_c := y_{bar} - y_c = 0\ \text{ft} \qquad I_c := \frac{b \cdot t^3}{12} = 13824 \cdot \text{in}^4 \qquad \Delta y_c{}^2 \cdot A_c = 0 \cdot \text{in}^4$$

$$\Delta y_{s'} := y_{bar} - d'_{11} = 10.686 \cdot \text{in} \qquad I_{s'} := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t11}{}^4}{64} = 0.106 \cdot \text{in}^4 \qquad \Delta y_{s'}{}^2 \cdot A_{stran'11} = 1177.5 \cdot \text{in}^4$$

$$\Delta y_s := y_{bar} - d_{11} = -10.686 \cdot \text{in} \qquad I_s := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{b11}{}^4}{64} = 0.106 \cdot \text{in}^4 \qquad \Delta y_s{}^2 \cdot A_{stran11} = 1177.5 \cdot \text{in}^4$$

$$I_{11} := I_c + I_{s'} + I_s + \Delta y_c{}^2 \cdot A_c + \Delta y_{s'}{}^2 \cdot A_{stran'11} + \Delta y_s{}^2 \cdot A_{stran11} = 16179 \cdot \text{in}^4$$

Transformed Moment of Inertia

Stiffness modifiers for SAP2000 model:

$$mod_{11} := \frac{I_{11}}{I_c} = 1.1704 \qquad E_{mod11} := mod_{11} \cdot E_c = 3886266 \cdot \text{psi}$$

East-West (22) Direction

$spacing := 9in$

$y_c := \frac{t}{2} = 1\,ft$ — location of centroid of concrete

$A_c := b \cdot t = 2\,ft^2$ — Gross area of concrete

Top Steel:

$db_{t22} := d_9$ $Ab_{t22} := A_9$ — top bar diameter and Area

$d'_{22} := cover + db_{t11} + \frac{db_{t22}}{2} = 2.442 \cdot in$ — Depth to centroid of compression steel

$A_{s'22} := \frac{b}{spacing} \cdot Ab_{t22} = 1.3333 \cdot in^2$ — Area of top steel

$A_{stran'22} := A_{s'22} \cdot (n-1) = 10.3113 \cdot in^2$ — Transformed area of steel

Bottom:

$db_{b22} := d_9$ $Ab_{b22} := A_9$ — bottom bar diameter and Area

$d_{22} := t - cover - db_{b11} - \frac{db_{b22}}{2} = 21.558 \cdot in$ — Depth to centroid of tension steel

$A_{s22} := \frac{b}{spacing} \cdot Ab_{b22} = 1.3333 \cdot in^2$ — Area of bottom steel

$A_{stran22} := A_{s22} \cdot (n-1) = 10.3113 \cdot in^2$ — Transformed area of steel

Transformed Section:

$$y_{bar} := \frac{A_c \cdot y_c + A_{stran'22} \cdot d'_{22} + A_{stran22} \cdot d_{22}}{A_c + A_{stran'22} + A_{stran22}} = 1\,ft$$

Location of tansformed section centroid (measured from top)

$\Delta y_c := y_{bar} - y_c = 0\,ft$ $I_c := \frac{b \cdot t^3}{12} = 13824 \cdot in^4$ $\Delta y_c^{\,2} \cdot A_c = 0 \cdot in^4$

$\Delta y_{s'} := y_{bar} - d'_{22} = 9.558 \cdot in$ $I_{s'} := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t22}^{\,4}}{64} = 0.106 \cdot in^4$ $\Delta y_{s'}^{\,2} \cdot A_{stran'22} = 942 \cdot in^4$

$\Delta y_s := y_{bar} - d_{22} = -9.558 \cdot in$ $I_s := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t22}^{\,4}}{64} = 0.106 \cdot in^4$ $\Delta y_s^{\,2} \cdot A_{stran22} = 942 \cdot in^4$

$$I_{22} := I_c + I_{s'} + I_s + \Delta y_c^{\,2} \cdot A_c + \Delta y_{s'}^{\,2} \cdot A_{stran'22} + \Delta y_s^{\,2} \cdot A_{stran22} = 15708 \cdot in^4$$

Transformed Moment of Inertia

Stiffness modifiers for SAP2000 model:

$mod_{22} := \frac{I_{22}}{I_c} = 1.1363$ $E_{mod22} := mod_{22} \cdot E_c = 3773149 \cdot psi$

SAP2000 Material Properties:

$E_1 := E_{mod11} = 3886266\ psi$ $\qquad G_{13} := \dfrac{E_1}{(1+\upsilon)2} = 1619277\ psi$

$E_2 := E_{mod22} = 3773149\ psi$ $\qquad G_{23} := \dfrac{E_2}{(1+\upsilon)2} = 1572146\ psi$

$E_3 := E_c = 3320561\ psi$ $\qquad G_{12} := \dfrac{E_3}{(1+\upsilon)2} = 1383567\ psi$

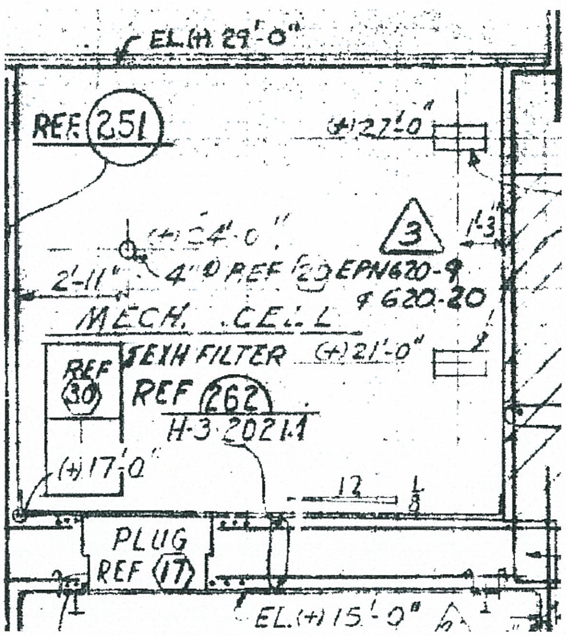
Loads for SAP2000 model:

$weight := \gamma_{concrete} \cdot t \cdot L_{11} \cdot L_{22} = 81.9 \cdot kip$

Use for comparison to SAP base reactions

$\gamma_{soil} := 115pcf$

unit weight of excavated soil and bags. (KUR-1782F-RPT-002, Section 4.2)



$EL_{TOR} := 29ft$

$EL_{TOC} := 17ft$

Ref. H-3-20213, Section 252

$Clearance := EL_{TOR} - EL_{TOC} = 12\ ft$

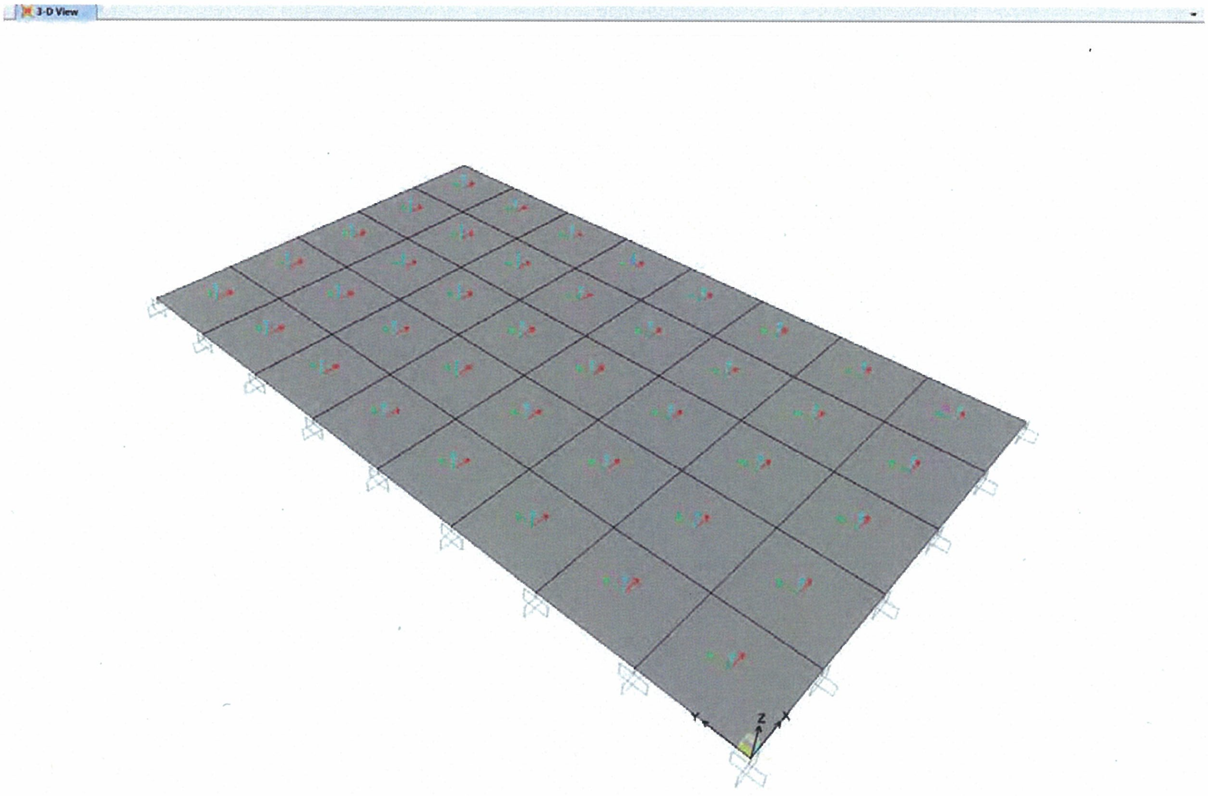
Clearance between top of concrete and bottom of crane rail

$w_{soil} := Clearance \cdot \gamma_{soil} = 1380 \cdot psf$

uniformly distributed soil load on cell floor

B.3 SAP20000 Structural Analysis Results

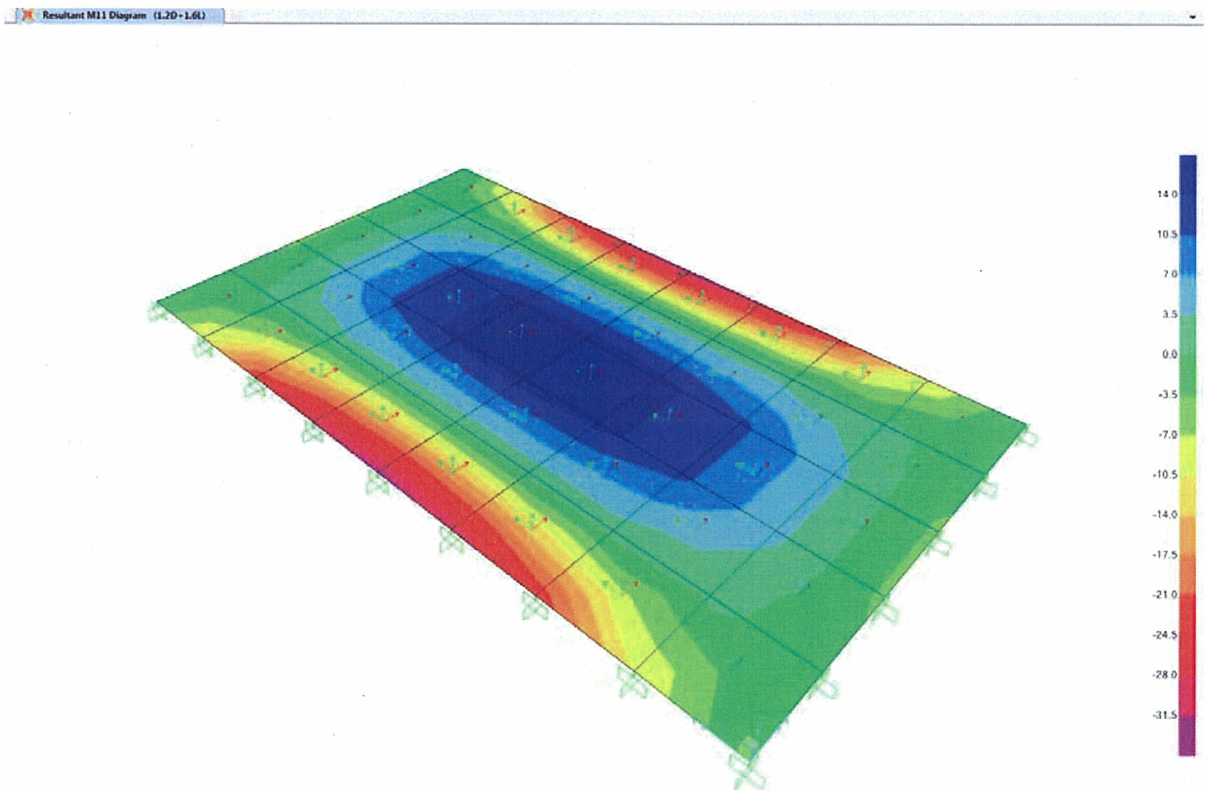
Using the material properties determined for the the reinforced concrete slab, a SAP2000 finite element model is generated. The self weight of the concrete and additional weight of the soil are considered. The self weight is considered as a dead load and the added weight of the soil is considered as a live load. Therefore, according to ACI, the reinforced concrete section is checked for strength using the load combination of 1.2D+1.6L.



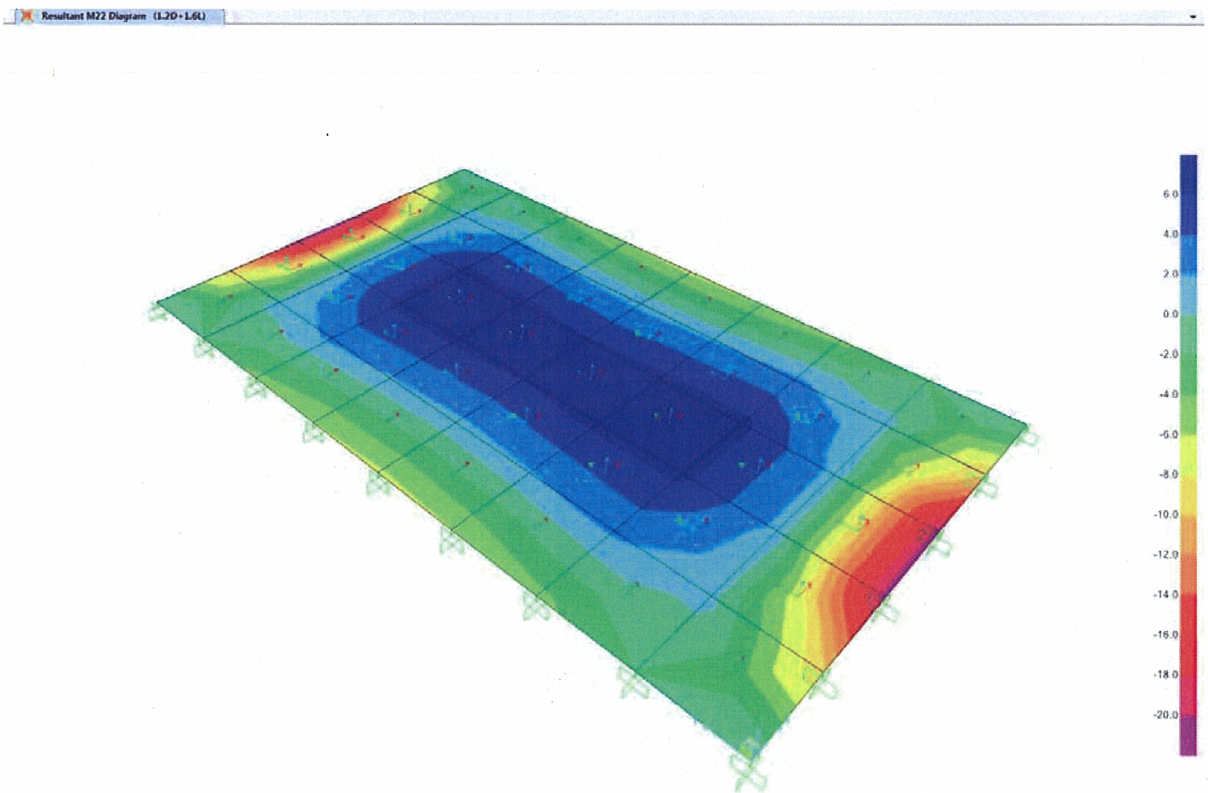
D-Cell Floor SAP2000 Model

Model Orientation uses the following:

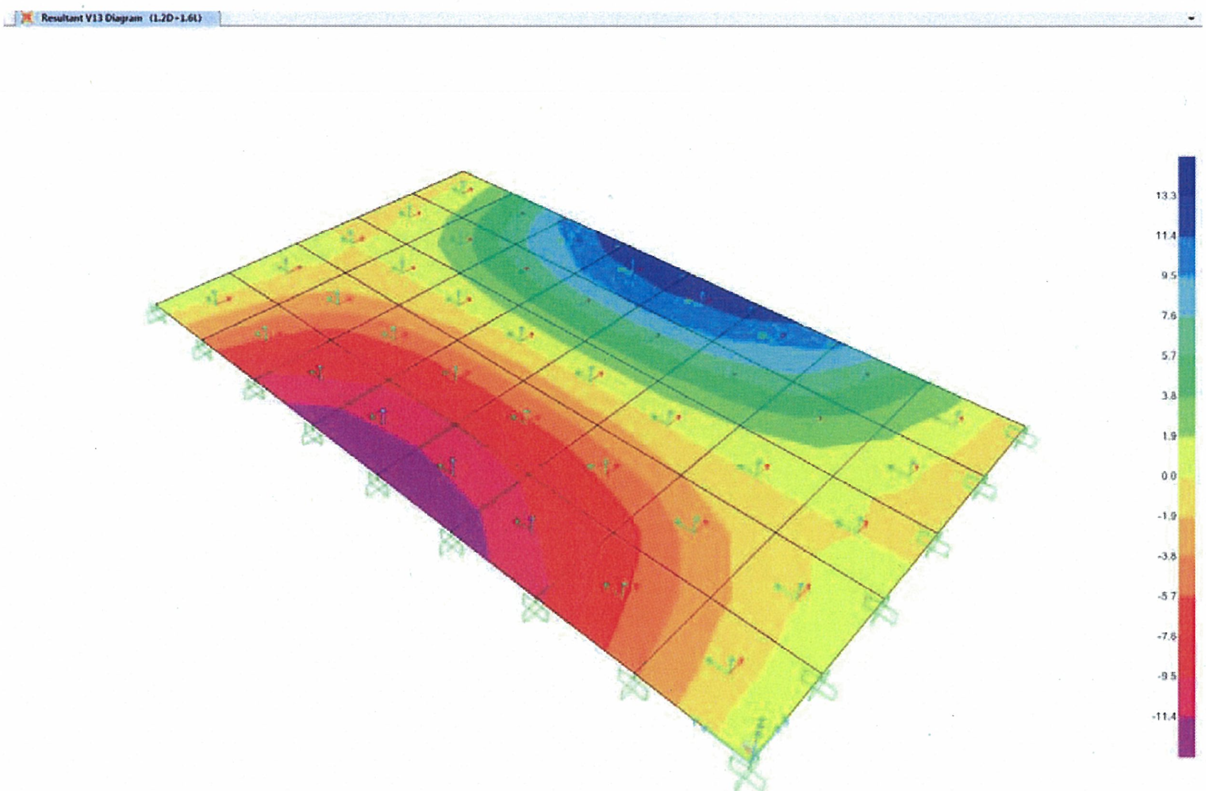
Global X = Local 1
Global Y = Local 2
Global Z = Local 3



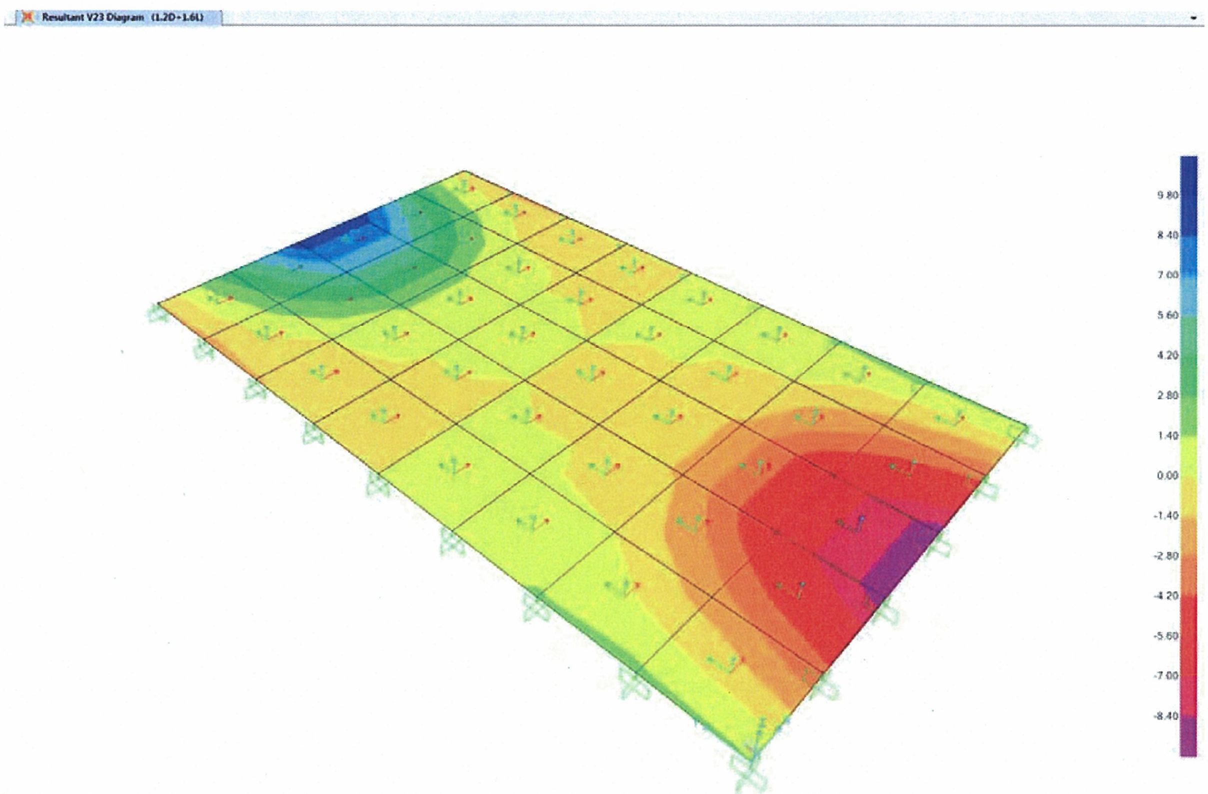
Resulting Moment M11 (kip-ft) (North-South Direction)



Resulting Moment M22 (kip-ft) (East-West Direction)



Resulting Shear V13 (kip)



Resulting Shear V23 (kip)

SAP2000 Element Output

TABLE: Element Forces - Area Shells								
Area	ShellType	Joint	OutputCase	CaseType	M11	M22	V13	V23
Text	Text	Text	Text	Text	Kip-ft/ft	Kip-ft/ft	Kip/ft	Kip/ft
4	Shell-Thin	10	1.2D+1.6L	Combination	1.14	1.46	-13.29	0.32
4	Shell-Thin	11	1.2D+1.6L	Combination	-32.83	-6.52	-13.29	0.33
5	Shell-Thin	11	1.2D+1.6L	Combination	-32.83	-6.52	-13.29	-0.33
5	Shell-Thin	10	1.2D+1.6L	Combination	1.14	1.46	-13.29	-0.32
9	Shell-Thin	19	1.2D+1.6L	Combination	-4.22	-20.96	1.69	-9.01
16	Shell-Thin	27	1.2D+1.6L	Combination	-4.22	-20.96	1.69	9.01
16	Shell-Thin	18	1.2D+1.6L	Combination	-1.98	-9.84	1.69	4.37
17	Shell-Thin	19	1.2D+1.6L	Combination	-4.22	-20.96	0.00	-9.28
17	Shell-Thin	28	1.2D+1.6L	Combination	-4.22	-20.96	0.00	-9.28
17	Shell-Thin	29	1.2D+1.6L	Combination	4.53	1.67	0.00	-9.28
17	Shell-Thin	20	1.2D+1.6L	Combination	4.53	1.67	0.00	-9.28
24	Shell-Thin	26	1.2D+1.6L	Combination	4.53	1.67	0.00	9.28
24	Shell-Thin	35	1.2D+1.6L	Combination	4.53	1.67	0.00	9.28
24	Shell-Thin	36	1.2D+1.6L	Combination	-4.22	-20.96	0.00	9.28
24	Shell-Thin	27	1.2D+1.6L	Combination	-4.22	-20.96	0.00	9.28
25	Shell-Thin	28	1.2D+1.6L	Combination	-4.22	-20.96	-1.69	-9.01
37	Shell-Thin	49	1.2D+1.6L	Combination	-32.83	-6.52	13.29	0.33
37	Shell-Thin	41	1.2D+1.6L	Combination	1.14	1.46	13.29	0.32
38	Shell-Thin	41	1.2D+1.6L	Combination	1.14	1.46	13.29	-0.32
38	Shell-Thin	49	1.2D+1.6L	Combination	-32.83	-6.52	13.29	-0.33
				Min	-32.83	-20.96	-13.29	-9.28
				Max	16.23	6.62	13.29	9.28

*The following are maximum element forces from ACI load combination 1.2D+1.6L:

$M_{11} := 32.83 \text{kip} \cdot \text{ft}$ $M_{22} := 20.96 \text{kip} \cdot \text{ft}$ $V_{13} := 13.29 \text{kip}$ $V_{23} := 9.28 \text{kip}$

* Note: All units are presented as per foot. This agrees with use of b=1 ft. for ACI strength determination.

B.4 ACI Code Evaluation:

ACI Design Factors: $\phi_{shear} := 0.75$ — Strength Reduction Factor for Shear (ACI 318, 9.3.2.3)

$\phi_{flexure} := 0.9$ — Strength Reduction Factor (ACI 318, 9.3.2.1)

Flexure in the 11 Direction:

$d := d_{11} = 22.686 \cdot in \quad A_s := A_{s11} = 1.3333 \cdot in^2$

$a := A_s \cdot \dfrac{f_y}{0.85 \cdot f_c \cdot b} = 1.7429 \cdot in$ — depth of rectangular compressive stress block (ignoring compression steel)

$M_n := A_s \cdot f_y \cdot \left(d - \dfrac{a}{2}\right) = 97 \cdot kip \cdot ft$ per foot — Nominal Moment Capacity

$M_A := \phi_{flexure} \cdot M_n = 87 \cdot kip \cdot ft$ — Allowable Moment Capacity

$DC_{bending} := \dfrac{M_{11}}{M_A} = 0.38$ — Demand to Capacity Ratio for Floor Bending

Flexure in the 22 Direction:

$d := d_{22} = 21.558 \cdot in \quad A_s := A_{s22} = 1.3333 \cdot in^2$

$a := A_s \cdot \dfrac{f_y}{0.85 \cdot f_c \cdot b} = 1.7429 \cdot in$ — depth of rectangular compressive stress block (ignoring compression steel)

$M_n := A_s \cdot f_y \cdot \left(d - \dfrac{a}{2}\right) = 92 \cdot kip \cdot ft$ per foot — Nominal Moment Capacity

$M_A := \phi_{flexure} \cdot M_n = 83 \cdot kip \cdot ft$ — Allowable Moment Capacity

$DC_{bending} := \dfrac{M_{22}}{M_A} = 0.25$ — Demand to Capacity Ratio for Floor Bending

Check Shear:

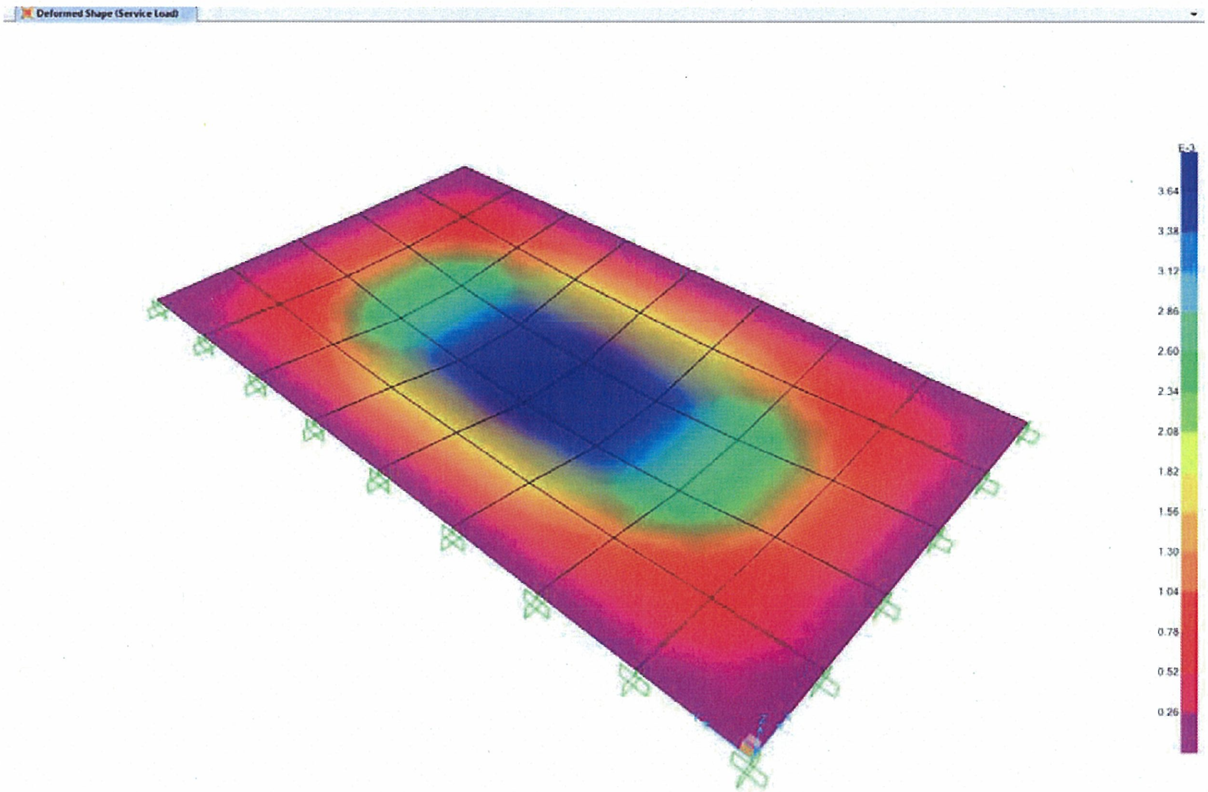
$V_u := \max(V_{13}, V_{23}) = 13 \cdot kip$

$V_c := 2 \cdot psi \cdot \sqrt{\dfrac{f_c}{psi}} \cdot b \cdot d = 28 \cdot kip$ per foot — ACI (11-3)

$\phi_{shear} \cdot V_c = 21 \cdot kip$

$DC_{shear} := \dfrac{V_u}{\phi_{shear} \cdot V_c} = 0.63$

B.5 Slab Deflection:



Deformed Shape under Service Load Combination (in)

TABLE: Joint Displacements					
Joint	OutputCase	CaseType	U1	U2	U3
Text	Text	Text	in	in	in
23	Service Load	Combination	0	0	-3.77E-03
32	Service Load	Combination	0	0	-3.77E-03
				max up	8.06E-05
				max down	-3.77E-03

$\Delta := 8.06 \times 10^{-5}\ \text{in}$ $\quad \dfrac{L_{11}}{360} = 4.333 \times 10^{-1} \cdot \text{in}$ $\quad \dfrac{L_{22}}{360} = 7.000 \times 10^{-1} \cdot \text{in}$

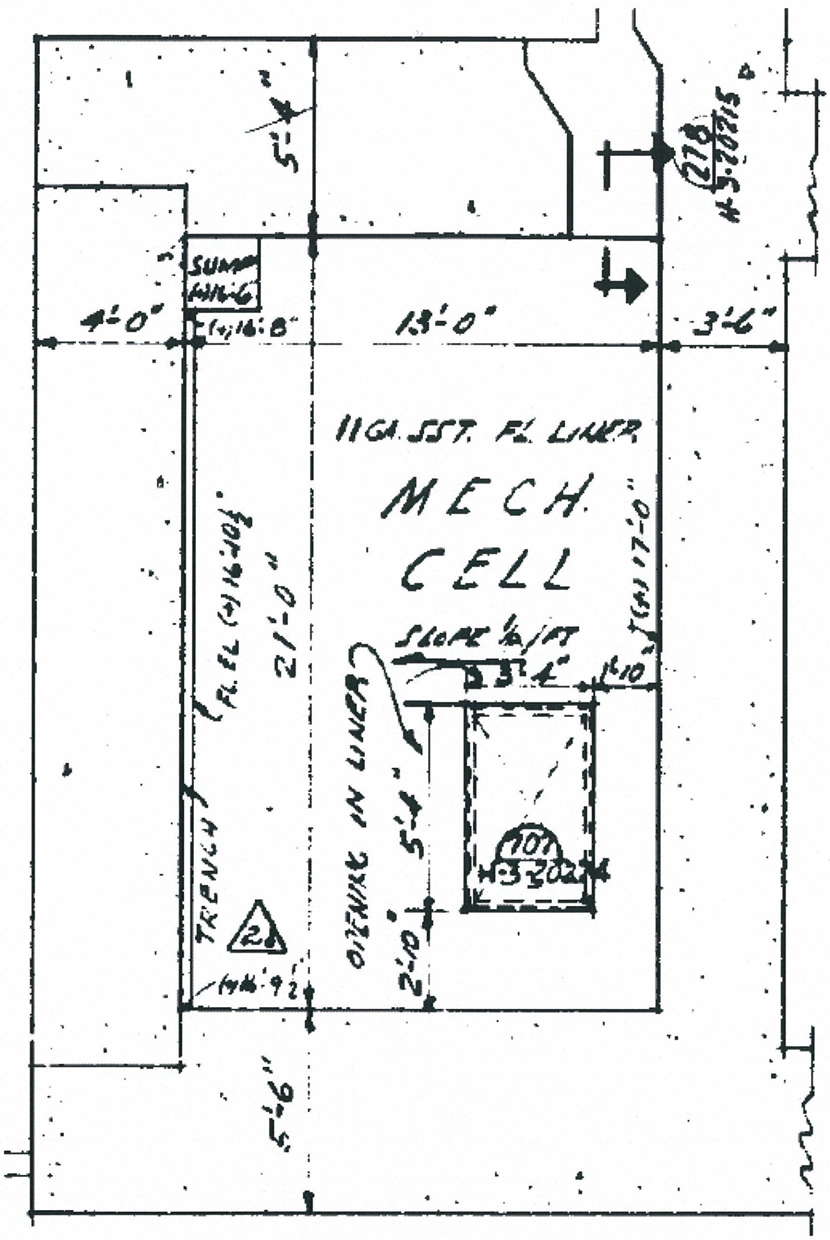
$$ACI_{\Delta} := \min\left(\frac{L_{22}}{360}, \frac{L_{11}}{360}\right)$$

Deflection Criteria
(ACI 318 Table 9.5(b))

$$\text{Serviceability} := \begin{cases} \text{"OK"} & \text{if } \Delta < ACI_{\Delta} \\ \text{"Too Much Deflection"} & \text{otherwise} \end{cases} = \text{"OK"}$$

B.6 Sump and Opening Evaluation:

A penetration and reduced section exist in the D-Cell Floor. The reduced section is modeled as 18-inches thick with normal modulus of elasticity for 3000-psi concrete. The floor opening is modeled by removing two shell elements approximately matching its geometry and location.

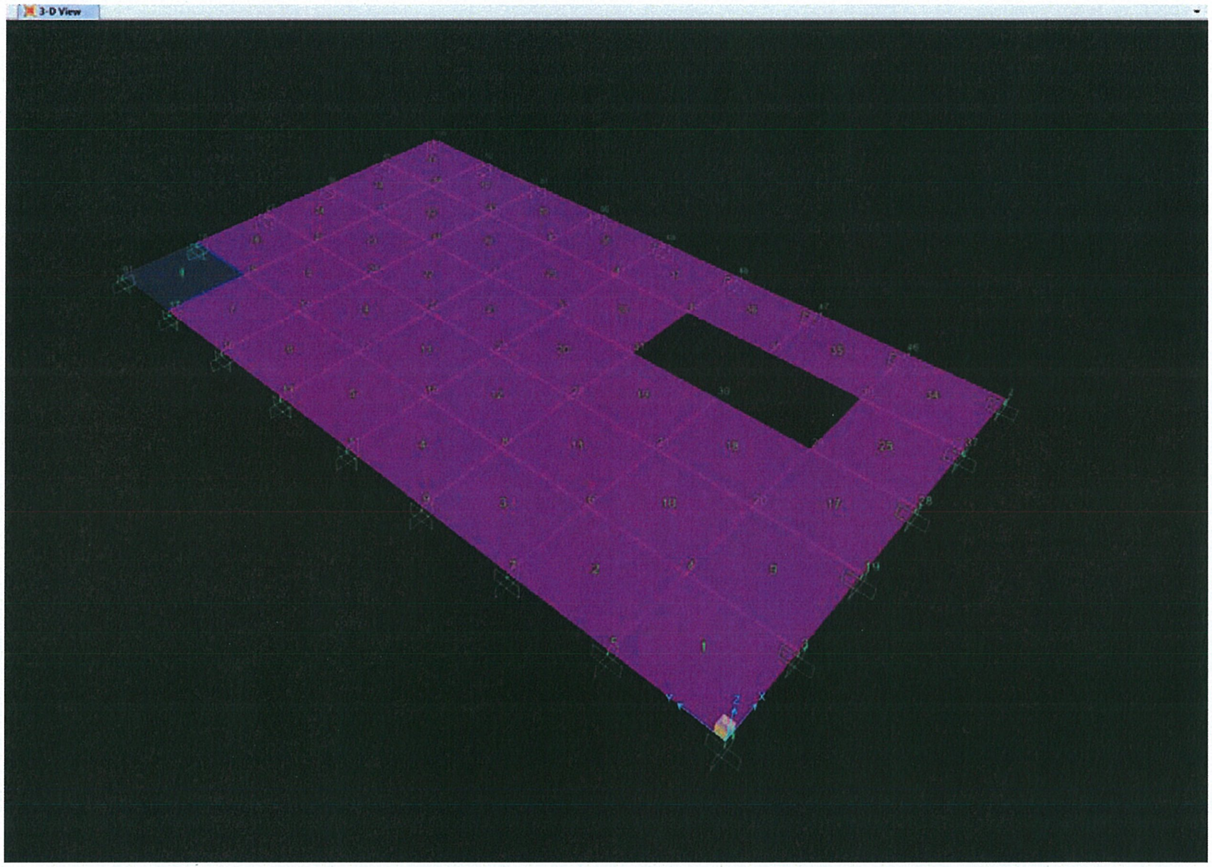


PLAN EL 17'-0"

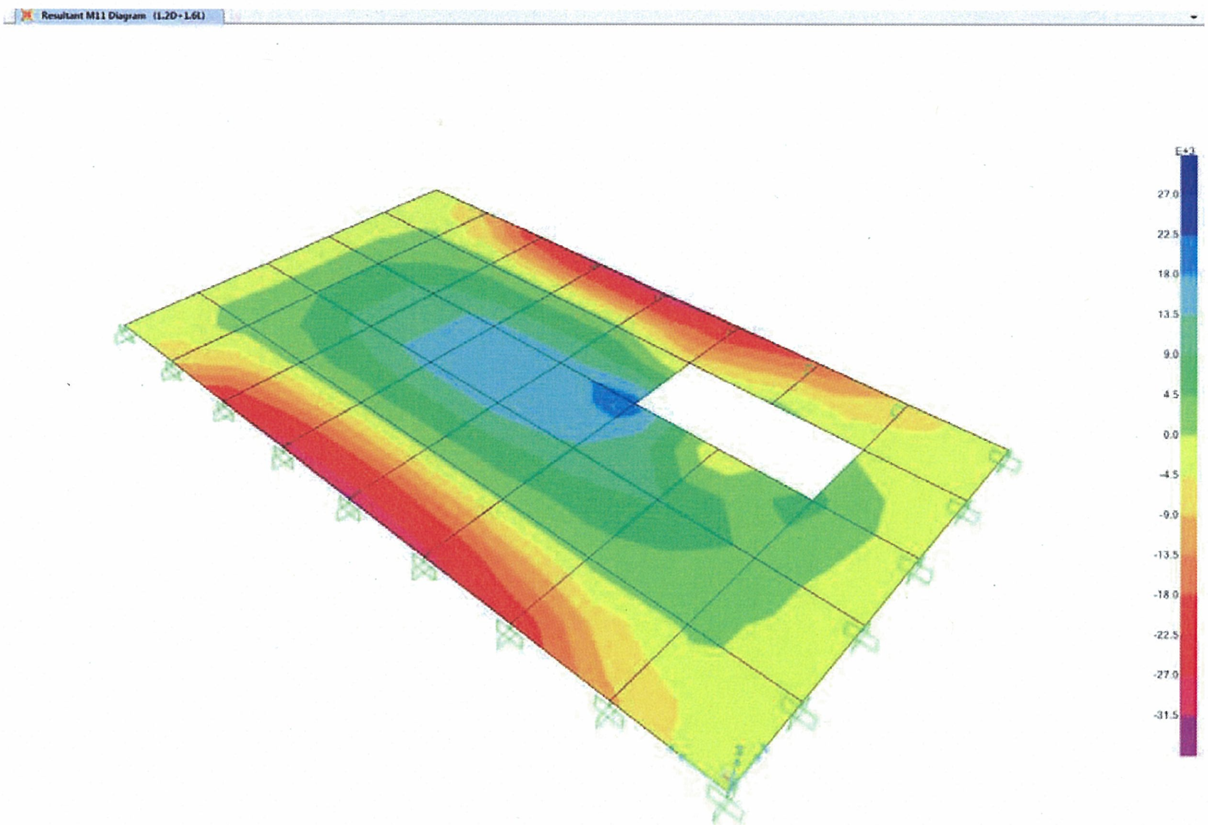
0 4 FT

Ref. H-3-20273

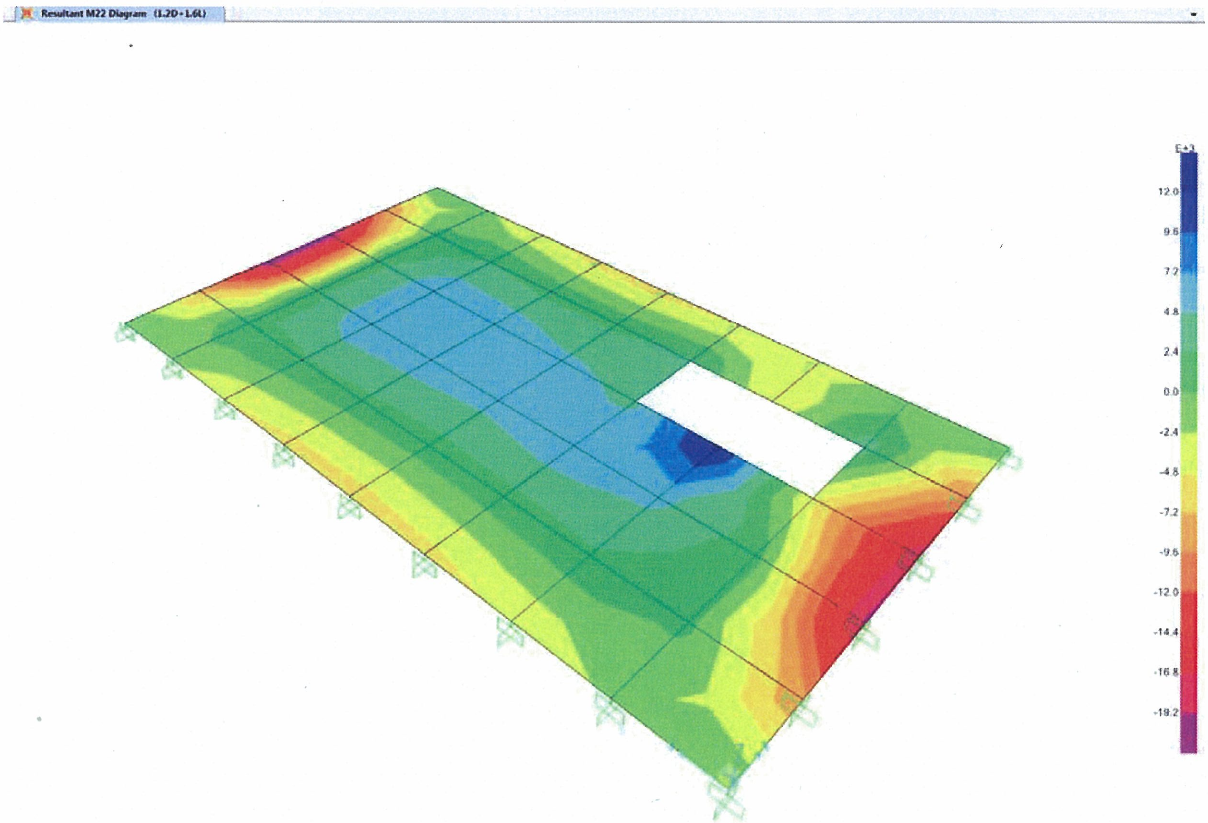
Calculation Title: A, C, and D-Cell Floor Structural Analysis
Originator: R.S. Rast Date: 24 July 2014
Checker: J. Small Date: 24 July 2014



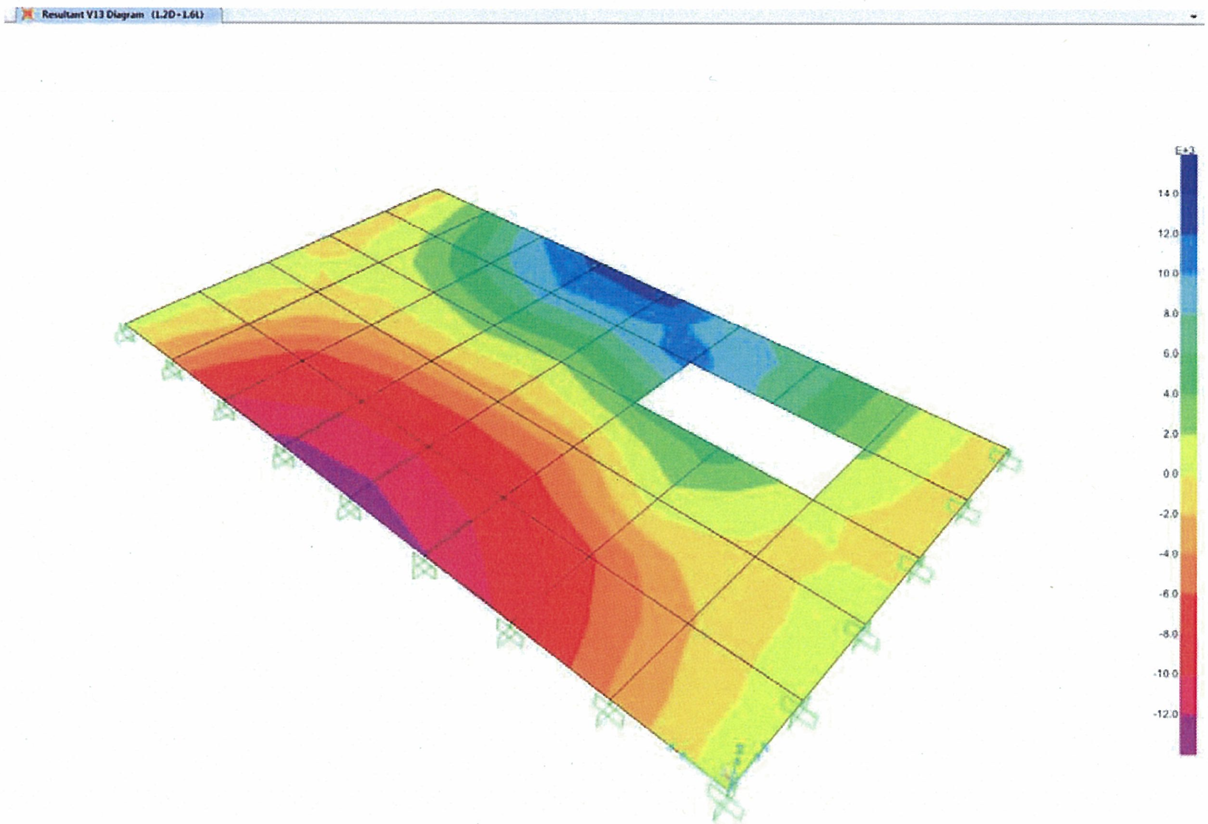
D-Cell Floor SAP2000 Model with Reduced Section and Opening



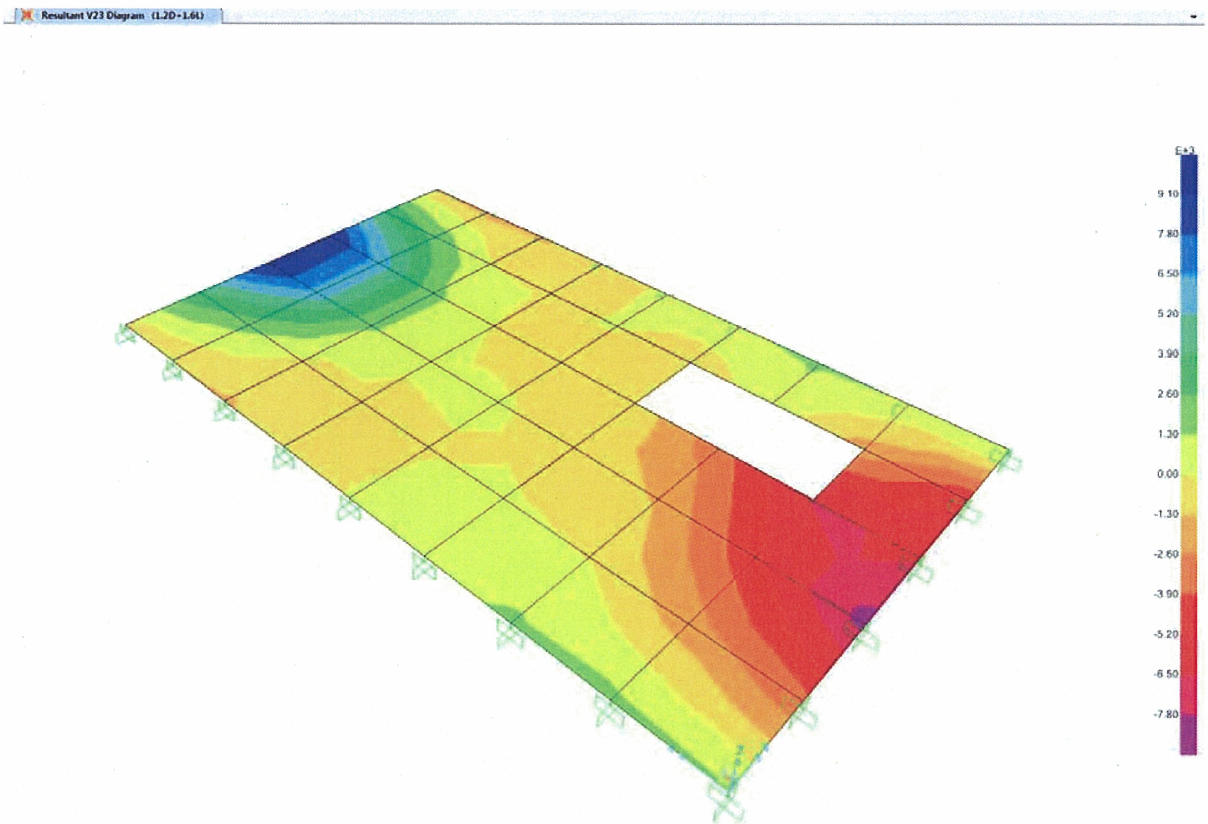
Resulting Moment M11 (kip*ft) for D-Cell Floor with Opening and Reduced Section Thickness



Resulting Moment M22 (kip*ft) for D-Cell Floor with Opening and Reduced Section Thickness



Resulting Shear V13 (kip) for D-Cell Floor with Opening and Reduced Section Thickness



Resulting Shear V23 (kip) for D-Cell Floor with Opening and Reduced Section Thickness

KURION
Isolating Waste from the Environment

Calc. # KUR-1782F-CALC-C003
Revision: C

Calculation Title: A, C, and D-Cell Floor Structural Analysis
Originator: R.S. Rast Date: 24 July 2014
Checker: J. Small Date: 24 July 2014

SAP2000 Element Output

TABLE: Element Forces - Area Shells

Area	ShellType	Joint	OutputCase	CaseType	M11	M22	V13	V23
Text	Text	Text	Text	Text	Kip-ft/ft	Kip-ft/ft	Kip/ft	Kip/ft
4	Shell-Thin	10	1.2D+1.6L	Combination	0.99	1.58	-13.07	0.22
4	Shell-Thin	11	1.2D+1.6L	Combination	-32.41	-6.43	-13.07	0.39
16	Shell-Thin	27	1.2D+1.6L	Combination	-4.35	-21.60	1.61	9.41
17	Shell-Thin	19	1.2D+1.6L	Combination	-3.98	-19.75	0.23	-8.42
17	Shell-Thin	20	1.2D+1.6L	Combination	2.68	0.64	-0.59	-8.42
18	Shell-Thin	30	1.2D+1.6L	Combination	-4.27	12.81	5.44	-7.03
24	Shell-Thin	26	1.2D+1.6L	Combination	4.31	1.96	-0.07	9.60
24	Shell-Thin	27	1.2D+1.6L	Combination	-4.35	-21.60	-0.06	9.60
28	Shell-Thin	31	1.2D+1.6L	Combination	31.23	4.88	15.73	0.27
28	Shell-Thin	40	1.2D+1.6L	Combination	-10.37	0.87	15.73	-0.04
37	Shell-Thin	49	1.2D+1.6L	Combination	-32.57	-6.46	13.19	0.56
38	Shell-Thin	49	1.2D+1.6L	Combination	-32.57	-6.46	13.11	-0.32
				Min	-32.57	-21.60	-13.07	-8.42
				Max	31.23	12.81	15.73	9.60

*The following are maximum element forces from ACI load combination 1.2D+1.6L:

$M_{11} := 32.57 kip \cdot ft$ $M_{22} := 21.60 kip \cdot ft$ $V_{13} := 15.73 kip$ $V_{23} := 9.6 kip$

* Note: All units are presented as per foot. This agrees with use of b=1 ft. for ACI strength determination.

B.6.1 ACI Code Evaluation:

ACI Design Factors: $\phi_{shear} := 0.75$ — Strength Reduction Factor for Shear (ACI 318, 9.3.2.3)

$\phi_{flexure} := 0.9$ — Strength Reduction Factor (ACI 318, 9.3.2.1)

Flexure in the 11 Direction:

$d := d_{11} = 22.686 \cdot in \quad A_s := A_{s11} = 1.3333 \cdot in^2$

$a := A_s \cdot \frac{f_y}{0.85 \cdot f_c \cdot b} = 1.7429 \cdot in$ — depth of rectangular compressive stress block (ignoring compression steel)

$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 97 \cdot kip \cdot ft$ per foot — Nominal Moment Capacity

$M_A := \phi_{flexure} \cdot M_n = 87 \cdot kip \cdot ft$ — Allowable Moment Capacity

$DC_{bending} := \frac{M_{11}}{M_A} = 0.37$ — Demand to Capacity Ratio for Floor Bending

Flexure in the 22 Direction:

$d := d_{22} = 21.558 \cdot in \quad A_s := A_{s22} = 1.3333 \cdot in^2$

$a := A_s \cdot \frac{f_y}{0.85 \cdot f_c \cdot b} = 1.7429 \cdot in$ — depth of rectangular compressive stress block (ignoring compression steel)

$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 92 \cdot kip \cdot ft$ per foot — Nominal Moment Capacity

$M_A := \phi_{flexure} \cdot M_n = 83 \cdot kip \cdot ft$ — Allowable Moment Capacity

$DC_{bending} := \frac{M_{22}}{M_A} = 0.26$ — Demand to Capacity Ratio for Floor Bending

Check Shear:

$V_u := \max(V_{13}, V_{23}) = 15.73 \cdot kip$

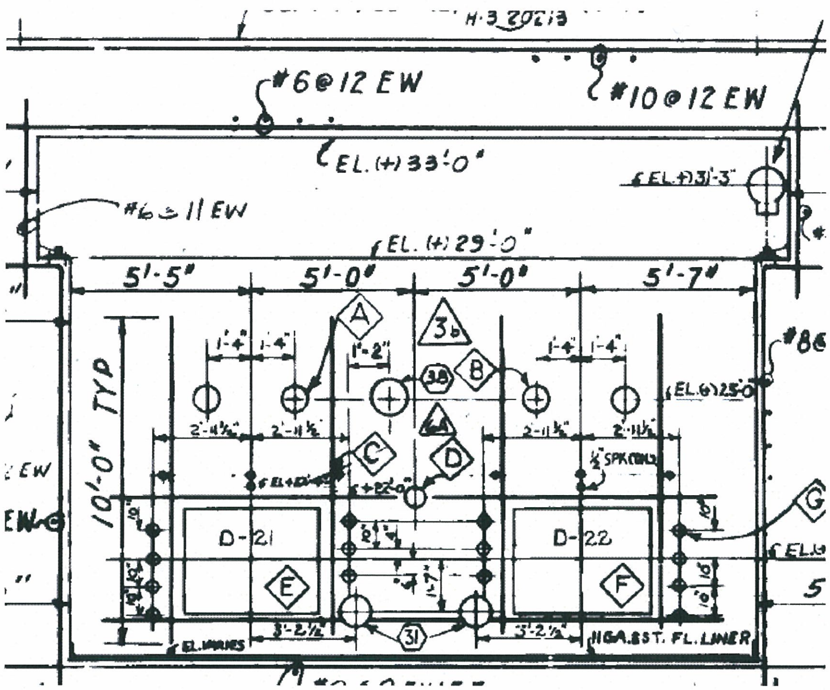
$V_c := 2 \cdot psi \cdot \sqrt{\frac{f_c}{psi}} \cdot b \cdot d = 28.34 \cdot kip$ per foot — ACI (11-3)

$\phi_{shear} \cdot V_c = 21.25 \cdot kip$

$DC_{shear} := \frac{V_u}{\phi_{shear} \cdot V_c} = 0.74$

B.7 Full Cell:

In addition to filling the cell with soil, it may be decided to fill the remaining voids with grout. The soil density is used to determine an area load corresponding to a full D-Cell. The results are then check against ACI Code Allowable.



$EL_{ceiling} := 33 ft$

Ref. H-3-20213, Section 252

$Clearance := EL_{ceiling} - EL_{TOC} = 16\,ft$

Clearance between top of concrete and ceiling

$w_{soil} := Clearance \cdot \gamma_{soil} = 1840 \cdot psf$

uniformly distributed soil load on cell floor

SAP2000 Element Output for FULL D-Cell

TABLE: Element Forces - Area Shells								
Area	ShellType	Joint	OutputCase	CaseType	M11	M22	V13	V23
Text	Text	Te›	Text	Text	Kip-ft,	Kip-ft,	Kip/f	Kip/f
4	Shell-Thin	10	1.2D+1.6L	Combination	1.50	1.91	-17.43	0.41
4	Shell-Thin	11	1.2D+1.6L	Combination	-43.05	-8.54	-17.43	0.43
5	Shell-Thin	11	1.2D+1.6L	Combination	-43.05	-8.54	-17.43	-0.43
5	Shell-Thin	10	1.2D+1.6L	Combination	1.50	1.91	-17.43	-0.41
9	Shell-Thin	19	1.2D+1.6L	Combination	-5.54	-27.48	2.21	-11.81
10	Shell-Thin	21	1.2D+1.6L	Combination	14.95	8.68	-5.14	-3.27
12	Shell-Thin	23	1.2D+1.6L	Combination	21.28	8.13	-8.06	0.10
13	Shell-Thin	23	1.2D+1.6L	Combination	21.28	8.13	-8.06	-0.10
15	Shell-Thin	25	1.2D+1.6L	Combination	14.95	8.68	-5.14	3.27
16	Shell-Thin	27	1.2D+1.6L	Combination	-5.54	-27.48	2.21	11.81
17	Shell-Thin	19	1.2D+1.6L	Combination	-5.54	-27.48	0.00	-12.16
17	Shell-Thin	28	1.2D+1.6L	Combination	-5.54	-27.48	0.00	-12.16
17	Shell-Thin	29	1.2D+1.6L	Combination	5.94	2.19	0.00	-12.16
17	Shell-Thin	20	1.2D+1.6L	Combination	5.94	2.19	0.00	-12.16
24	Shell-Thin	26	1.2D+1.6L	Combination	5.94	2.19	0.00	12.16
24	Shell-Thin	35	1.2D+1.6L	Combination	5.94	2.19	0.00	12.16
24	Shell-Thin	36	1.2D+1.6L	Combination	-5.54	-27.48	0.00	12.16
24	Shell-Thin	27	1.2D+1.6L	Combination	-5.54	-27.48	0.00	12.16
25	Shell-Thin	28	1.2D+1.6L	Combination	-5.54	-27.48	-2.21	-11.81
26	Shell-Thin	30	1.2D+1.6L	Combination	14.95	8.68	5.14	-3.27
28	Shell-Thin	32	1.2D+1.6L	Combination	21.28	8.13	8.06	0.10
29	Shell-Thin	32	1.2D+1.6L	Combination	21.28	8.13	8.06	-0.10
32	Shell-Thin	34	1.2D+1.6L	Combination	14.95	8.68	5.14	3.27
33	Shell-Thin	36	1.2D+1.6L	Combination	-5.54	-27.48	-2.21	11.81
37	Shell-Thin	49	1.2D+1.6L	Combination	-43.05	-8.54	17.43	0.43
37	Shell-Thin	41	1.2D+1.6L	Combination	1.50	1.91	17.43	0.41
38	Shell-Thin	41	1.2D+1.6L	Combination	1.50	1.91	17.43	-0.41
38	Shell-Thin	49	1.2D+1.6L	Combination	-43.05	-8.54	17.43	-0.43
				Min	-43.05	-27.48	-17.43	-12.16
				Max	21.28	8.68	17.43	12.16

*The following are maximum element forces from ACI load combination 1.2D+1.6L:

$M_{11} := 43.05\text{kip}\cdot\text{ft}$ $M_{22} := 27.48\text{kip}\cdot\text{ft}$ $V_{13} := 17.43\text{kip}$ $V_{23} := 12.16\text{kip}$

* Note: All units are presented as per foot. This agrees with use of b=1 ft. for ACI strength determination.

B.7.1 ACI Code Evaluation:

ACI Design Factors: $\phi_{shear} := 0.75$ — Strength Reduction Factor for Shear (ACI 318, 9.3.2.3)

$\phi_{flexure} := 0.9$ — Strength Reduction Factor (ACI 318, 9.3.2.1)

Flexure in the 11 Direction:

$$d := d_{11} = 22.686 \cdot in \quad A_s := A_{s11} = 1.3333 \cdot in^2$$

$$a := A_s \cdot \frac{f_y}{0.85 \cdot f_c \cdot b} = 1.7429 \cdot in$$

depth of rectangular compressive stress block (ignoring compression steel)

$$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 97 \cdot kip \cdot ft$$ per foot

Nominal Moment Capacity

$$M_A := \phi_{flexure} \cdot M_n = 87 \cdot kip \cdot ft$$

Allowable Moment Capacity

$$DC_{bending} := \frac{M_{11}}{M_A} = 0.49$$

Demand to Capacity Ratio for Floor Bending

Flexure in the 22 Direction:

$$d := d_{22} = 21.558 \cdot in \quad A_s := A_{s22} = 1.3333 \cdot in^2$$

$$a := A_s \cdot \frac{f_y}{0.85 \cdot f_c \cdot b} = 1.7429 \cdot in$$

depth of rectangular compressive stress block (ignoring compression steel)

$$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 92 \cdot kip \cdot ft$$ per foot

Nominal Moment Capacity

$$M_A := \phi_{flexure} \cdot M_n = 83 \cdot kip \cdot ft$$

Allowable Moment Capacity

$$DC_{bending} := \frac{M_{22}}{M_A} = 0.33$$

Demand to Capacity Ratio for Floor Bending

Check Shear:

$$V_u := \max(V_{13}, V_{23}) = 17 \cdot kip$$

$$V_c := 2 \cdot psi \cdot \sqrt{\frac{f_c}{psi}} \cdot b \cdot d = 28 \cdot kip$$ per foot

ACI (11-3)

$$\phi_{shear} \cdot V_c = 21 \cdot kip$$

$$DC_{shear} := \frac{V_u}{\phi_{shear} \cdot V_c} = 0.82$$

Appendix C - C-Cell Floor Structural Evaluation

C.1 MATERIAL Properties

$\gamma_{steel} := 490pcf$ — Unit weight - steel

$\gamma_{concrete} := 150pcf$ — Unit weight - reinforced concrete

$E_s := 29000ksi$ — Modulus of Elasticity for steel

$f_y := 40ksi$ — Yield stress of ASTM A15 Intermediate grade rebar

$f_c := 3000psi$ — Specified 28 day concrete compressive strength

$$E_c := \left(\frac{\gamma_{concrete}}{pcf}\right)^{\frac{3}{2}} \cdot \left(33\,psi \cdot \sqrt{\frac{f_c}{psi}}\right) = 3321 \cdot ksi \qquad E_c = 3320561\,psi$$

Modulus of Elasticity for 3000-psi normal weight concrete. (ACI 8.5.1)

$$n := \frac{E_s}{E_c} = 8.7335$$

modular ratio

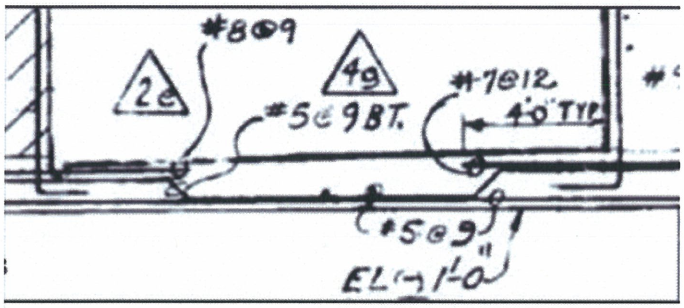
$b := 1ft$ — width of concrete section

$\upsilon := 0.2$ — Concrete Poisson Ratio

Steel Reinforcement Information: ACI 318 Appendix E

$d_4 := 0.5in$	$A_4 := 0.2in^2$	$d_9 := 1.128in$	$A_9 := 1in^2$
$d_5 := 0.625in$	$A_5 := 0.31in^2$	$d_{10} := 1.270in$	$A_{10} := 1.27in^2$
$d_6 := 0.75in$	$A_6 := 0.44in^2$	$d_{11} := 1.410in$	$A_{11} := 1.56in^2$
$d_7 := 0.875in$	$A_7 := 0.6in^2$	$d_{14} := 1.693in$	$A_{14} := 2.25in^2$
$d_8 := 1in$	$A_8 := 0.79in^2$	$d_{18} := 2.257in$	$A_{18} := 4.00in^2$

C.2 C-Cell Floor UNCRACKED Concrete Section Properties:

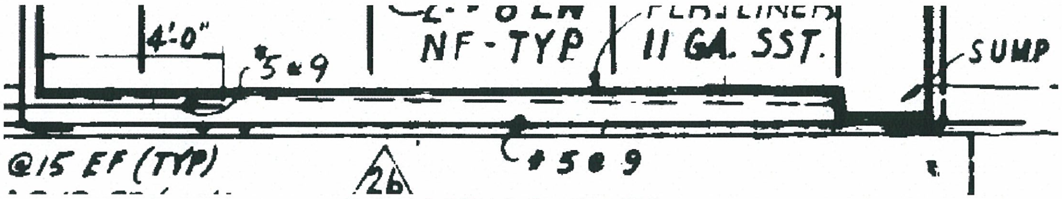


Ref: H-3-20213, Section 251

Plan dimensions shown on H-3-20205:

E-W Dimension $L_{22} := 19ft + 4in$

N-S Dimension $L_{11} := 12ft$



Ref: H-3-20214, Section 262

The floor is nominally 1-ft thick reinforced concrete with #5@9EW on Bottom Face and Top Face Rebar extending 48 inches from the connecting wall face as follows:

- #8@9 from C-Cell South Wall
- #7@12 from C-Cell North Wall
- #5 @9 from C-Cell East and West Walls

$t := 12in$ H-3-20213

$cover := 0.75in$ Concrete cover for interior members (Ref. H-3-20198 Note 6)

$y_c := \frac{t}{2} = 0.5\,ft$ location of centroid of concrete

$A_c := b \cdot t = 1\,ft^2$ Gross area of concrete

North-South (11) and East-West Direction at Midspan (4'x11'4" Area)

Bottom: #5@9

$spacing := 9in$ — rebar spacing

$db_{b11} := d_5$ $Ab_{b11} := A_5$ — bottom bar diameter and Area

$d_{11} := t - cover - \frac{db_{b11}}{2} = 10.9375 \cdot in$ — Depth to centroid of tension steel

$A_{s11} := \frac{b}{spacing} \cdot Ab_{b11} = 0.4133 \cdot in^2$ — Area of bottom steel

$A_{stran11} := A_{s11} \cdot (n - 1) = 3.1965 \cdot in^2$ — Transformed area of steel

Transformed Section:

$y_{bar} := \frac{A_c \cdot y_c + A_{stran11} \cdot d_{11}}{A_c + A_{stran11}} = 0.5089\,ft$ — Location of tansformed section centroid (measured from top)

$\Delta y_c := y_{bar} - y_c = 0.0089\,ft$ $I_c := \frac{b \cdot t^3}{12} = 1728 \cdot in^4$ $\Delta y_c^{\,2} \cdot A_c = 1.6555 \cdot in^4$

$\Delta y_s := y_{bar} - d_{11} = -4.8303 \cdot in$ $I_s := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{b11}^{\,4}}{64} = 0.01 \cdot in^4$ $\Delta y_s^{\,2} \cdot A_{stran11} = 74.6 \cdot in^4$

$I_{11South} := I_c + I_s + \Delta y_c^{\,2} \cdot A_c + \Delta y_s^{\,2} \cdot A_{stran11} = 1804 \cdot in^4$ — Transformed Moment of Inertia

Stiffness modifiers for SAP2000 model:

$mod_{mid} := \frac{I_{11South}}{I_c} = 1.0441$ $E_{mod1122\_mid} := mod_{mid} \cdot E_c = 3467075 \cdot psi$

North-South (11) Direction at South Wall

Bottom: #5@9

$spacing := 9in$ — rebar spacing

$db_{b11} := d_5$ $\quad Ab_{b11} := A_5$ — bottom bar diameter and Area

$$d_{11} := t - cover - \frac{db_{b11}}{2} = 10.9375 \cdot in$$ Depth to centroid of tension steel

$$A_{s11} := \frac{b}{spacing} \cdot Ab_{b11} = 0.4133 \cdot in^2$$ Area of bottom steel

$$A_{stran11} := A_{s11} \cdot (n - 1) = 3.1965 \cdot in^2$$ Transformed area of steel

Top Steel: at South Wall #8@9

$spacing := 9in$ — rebar spacing

$db_{t11} := d_8$ $\quad Ab_{t11} := A_8$ — top bar diameter and Area

$$d'_{11} := cover + \frac{db_{t11}}{2} = 1.25 \cdot in$$ Depth to centroid of compression steel

$$A_{s'11} := \frac{b}{spacing} \cdot Ab_{t11} = 1.0533 \cdot in^2$$ Area of top steel

$$A_{stran'11} := A_{s'11} \cdot (n - 1) = 8.1459 \cdot in^2$$ Transformed area of steel

Transformed Section:

$$y_{bar} := \frac{A_c \cdot y_c + A_{stran'11} \cdot d'_{11} + A_{stran11} \cdot d_{11}}{A_c + A_{stran'11} + A_{stran11}} = 0.4877\,ft$$ Location of tansformed section centroid (measured from top)

$$\Delta y_c := y_{bar} - y_c = -0.0123\,ft \qquad I_c := \frac{b \cdot t^3}{12} = 1728 \cdot in^4 \qquad \Delta y_c{}^2 \cdot A_c = 3.1322 \cdot in^4$$

$$\Delta y_{s'} := y_{bar} - d'_{11} = 4.6025 \cdot in \qquad I_{s'} := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t11}{}^4}{64} = 0.0654 \cdot in^4 \qquad \Delta y_{s'}{}^2 \cdot A_{stran'11} = 172.6 \cdot in^4$$

$$\Delta y_s := y_{bar} - d_{11} = -5.085 \cdot in \qquad I_s := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{b11}{}^4}{64} = 0.01 \cdot in^4 \qquad \Delta y_s{}^2 \cdot A_{stran11} = 82.7 \cdot in^4$$

$$I_{11South} := I_c + I_{s'} + I_s + \Delta y_c{}^2 \cdot A_c + \Delta y_{s'}{}^2 \cdot A_{stran'11} + \Delta y_s{}^2 \cdot A_{stran11} = 1986 \cdot in^4$$ Transformed Moment of Inertia

Stiffness modifiers for SAP2000 model:

$$mod_{11South} := \frac{I_{11South}}{I_c} = 1.1495 \qquad E_{mod11\_South} := mod_{11South} \cdot E_c = 3817138 \cdot psi$$

North-South (11) Direction at North Wall

Bottom: #5@9

$spacing := 9in$ — rebar spacing

$db_{b11} := d_5$ $\quad Ab_{b11} := A_5$ — bottom bar diameter and Area

$d_{11} := t - cover - \frac{db_{b11}}{2} = 10.9375 \cdot in$ — Depth to centroid of tension steel

$A_{s11} := \frac{b}{spacing} \cdot Ab_{b11} = 0.4133 \cdot in^2$ — Area of bottom steel

$A_{stran11} := A_{s11} \cdot (n - 1) = 3.1965 \cdot in^2$ — Transformed area of steel

Top Steel: at South Wall #7@12

$spacing := 12in$ — rebar spacing

$db_{t11} := d_7$ $\quad Ab_{t11} := A_7$ — top bar diameter and Area

$d'_{11} := cover + \frac{db_{t11}}{2} = 1.1875 \cdot in$ — Depth to centroid of compression steel

$A_{s'11} := \frac{b}{spacing} \cdot Ab_{t11} = 0.6 \cdot in^2$ — Area of top steel

$A_{stran'11} := A_{s'11} \cdot (n - 1) = 4.6401 \cdot in^2$ — Transformed area of steel

Transformed Section:

$$y_{bar} := \frac{A_c \cdot y_c + A_{stran'11} \cdot d'_{11} + A_{stran11} \cdot d_{11}}{A_c + A_{stran'11} + A_{stran11}} = 0.4964\,ft$$

Location of tansformed section centroid (measured from top)

$\Delta y_c := y_{bar} - y_c = -0.0036\,ft$ $\quad I_c := \frac{b \cdot t^3}{12} = 1728 \cdot in^4$ $\quad \Delta y_c^{\,2} \cdot A_c = 0.2678 \cdot in^4$

$\Delta y_{s'} := y_{bar} - d'_{11} = 4.7694 \cdot in$ $\quad I_{s'} := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t11}^{\,4}}{64} = 0.0288 \cdot in^4$ $\quad \Delta y_{s'}^{\,2} \cdot A_{stran'11} = 105.5 \cdot in^4$

$\Delta y_s := y_{bar} - d_{11} = -4.9806 \cdot in$ $\quad I_s := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{b11}^{\,4}}{64} = 0.0075 \cdot in^4$ $\quad \Delta y_s^{\,2} \cdot A_{stran11} = 79.3 \cdot in^4$

$$I_{11North} := I_c + I_{s'} + I_s + \Delta y_c^{\,2} \cdot A_c + \Delta y_{s'}^{\,2} \cdot A_{stran'11} + \Delta y_s^{\,2} \cdot A_{stran11} = 1913 \cdot in^4$$

Transformed Moment of Inertia

Stiffness modifiers for SAP2000 model:

$mod_{11North} := \frac{I_{11North}}{I_c} = 1.1071$ $\quad E_{mod11\_North} := mod_{11North} \cdot E_c = 3676341 \cdot psi$

East-West (22) DirectionAt East and West Walls

Top Steel: #5@9

$spacing := 9in$

$db_{t22} := d_5$ $Ab_{t22} := A_5$ — top bar diameter and Area

$$^{*}\quad d'_{22} := cover + d_8 + \frac{db_{t22}}{2} = 2.0625 \cdot in$$ — Depth to centroid of compression steel

*Uses larger intersecting bar at corner locations

$$A_{s'22} := \frac{b}{spacing} \cdot Ab_{t22} = 0.4133 \cdot in^2$$ — Area of top steel

$$A_{stran'22} := A_{s'22} \cdot (n - 1) = 3.1965 \cdot in^2$$ — Transformed area of steel

Bottom: #5@9

$spacing := 9in$

$db_{b22} := d_5$ $Ab_{b22} := A_5$ — bottom bar diameter and Area

$$d_{22} := t - cover - db_{b11} - \frac{db_{b22}}{2} = 10.3125 \cdot in$$ — Depth to centroid of tension steel

$$A_{s22} := \frac{b}{spacing} \cdot Ab_{b22} = 0.4133 \cdot in^2$$ — Area of bottom steel

$$A_{stran22} := A_{s22} \cdot (n - 1) = 3.1965 \cdot in^2$$ — Transformed area of steel

Transformed Section:

$$y_{bar} := \frac{A_c \cdot y_c + A_{stran'22} \cdot d'_{22} + A_{stran22} \cdot d_{22}}{A_c + A_{stran'22} + A_{stran22}} = 0.5007\,ft$$ — Location of tansformed section centroid (measured from top)

$$\Delta y_c := y_{bar} - y_c = 0.0007\,ft \qquad I_c := \frac{b \cdot t^3}{12} = 1728 \cdot in^4 \qquad \Delta y_c^{\,2} \cdot A_c = 0.0091 \cdot in^4$$

$$\Delta y_{s'} := y_{bar} - d'_{22} = 3.9455 \cdot in \qquad I_{s'} := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t22}^{\,4}}{64} = 0.01 \cdot in^4 \qquad \Delta y_{s'}^{\,2} \cdot A_{stran'22} = 49.8 \cdot in^4$$

$$\Delta y_s := y_{bar} - d_{22} = -4.3045 \cdot in \qquad I_s := \frac{b}{spacing} \cdot \frac{\pi \cdot db_{t22}^{\,4}}{64} = 0.01 \cdot in^4 \qquad \Delta y_s^{\,2} \cdot A_{stran22} = 59.2 \cdot in^4$$

$$I_{22} := I_c + I_{s'} + I_s + \Delta y_c^{\,2} \cdot A_c + \Delta y_{s'}^{\,2} \cdot A_{stran'22} + \Delta y_s^{\,2} \cdot A_{stran22} = 1837 \cdot in^4$$ — Transformed Moment of Inertia

Stiffness modifiers for SAP2000 model:

$$mod_{22} := \frac{I_{22}}{I_c} = 1.0631 \qquad E_{mod22} := mod_{22} \cdot E_c = 3530048 \cdot psi$$

SAP2000 Material Properties:

All Material Definitions

$E_3 := E_c = 3320561\ \text{psi}$ $\quad G_{12} := \dfrac{E_3}{(1+\upsilon)2} = 1383567\ \text{psi}$

C-Cell1 = Concrete at midspan:

$E_1 := E_{mod1122\_mid} = 3467075\ \text{psi}$ $\quad G_{13} := \dfrac{E_1}{(1+\upsilon)2} = 1444614\ \text{psi}$

$E_2 := E_1 = 3467075\ \text{psi}$ $\quad G_{23} := \dfrac{E_2}{(1+\upsilon)2} = 1444614\ \text{psi}$

C-Cell2 = Concrete at North Wall:

$E_1 := E_{mod11\_North} = 3676341\ \text{psi}$ $\quad G_{13} := \dfrac{E_1}{(1+\upsilon)2} = 1531809\ \text{psi}$

$E_2 := E_{mod1122\_mid} = 3467075\ \text{psi}$ $\quad G_{23} := \dfrac{E_2}{(1+\upsilon)2} = 1444614\ \text{psi}$

C-Cell3 = Concrete at South Wall:

$E_1 := E_{mod11\_South} = 3817138\ \text{psi}$ $\quad G_{13} := \dfrac{E_1}{(1+\upsilon)2} = 1590474\ \text{psi}$

$E_2 := E_{mod1122\_mid} = 3467075\ \text{psi}$ $\quad G_{23} := \dfrac{E_2}{(1+\upsilon)2} = 1444614\ \text{psi}$

C-Cell4 = Concrete at West and East Walls:

$E_1 := E_{mod1122\_mid} = 3467075\ \text{psi}$ $\quad G_{13} := \dfrac{E_1}{(1+\upsilon)2} = 1444614\ \text{psi}$

$E_2 := E_{mod22} = 3530048\ \text{psi}$ $\quad G_{23} := \dfrac{E_2}{(1+\upsilon)2} = 1470853\ \text{psi}$

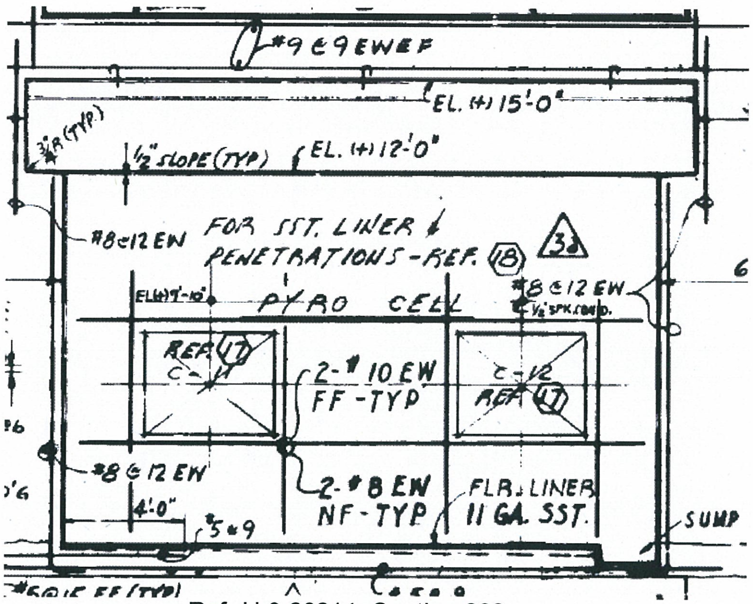
Loads for SAP2000 model:

$weight := \gamma_{concrete} \cdot t \cdot L_{11} \cdot L_{22} = 34.8 \cdot kip$

Use for comparison to SAP base reactions

$\gamma_{soil} := 115pcf$

unit weight of excavated soil and bags. (KUR-1782F-RPT-002, Section 4.2)



$EL_{Ceiling} := 15ft$

$EL_{TOR} := 12ft$

$EL_{Floor} := 0ft$

Ref. H-3-20214, Section 262

$Clearance := EL_{Ceiling} - EL_{Floor} = 15\ ft$

Clearance between ceiling and floor

$w_{max} := Clearance \cdot \gamma_{soil} = 1725 \cdot psf$

uniformly distributed soil load on cell floor

Incremental loading

$$h := \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \end{pmatrix} ft =$$

	0
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
10	11
11	12
12	13
13	14
14	15

ft

$$w := h \cdot \gamma_{soil} =$$

	0
0	115
1	230
2	345
3	460
4	575
5	690
6	805
7	920
8	1035
9	1150
10	1265
11	1380
12	1495
13	1610
14	1725

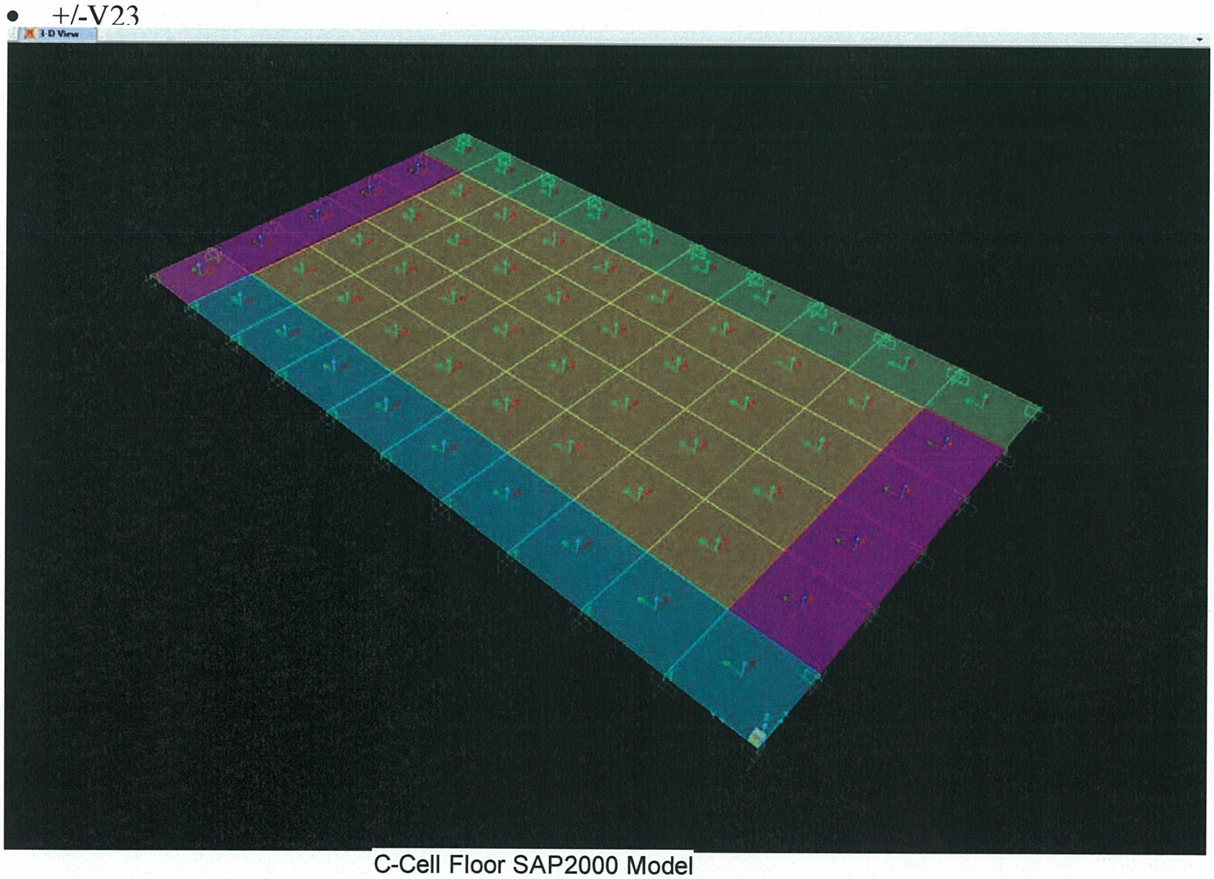
$\cdot psf$

C.3 SAP20000 Structural Analysis Results

Using the material properties determined for the the reinforced concrete slab, a SAP2000 finite element model is generated. The self weight of the concrete and additional weight of the soil are considered. The self weight is considered as a dead load and the added weight of the soil is considered as a live load. Therefore, according to ACI, the reinforced concrete section is checked for strength using the load combination of 1.2D+1.6L.

The results from the SAP2000 analysis of C-Cell are broken down into seven categories relating to the different element directions and reinforcement layout:

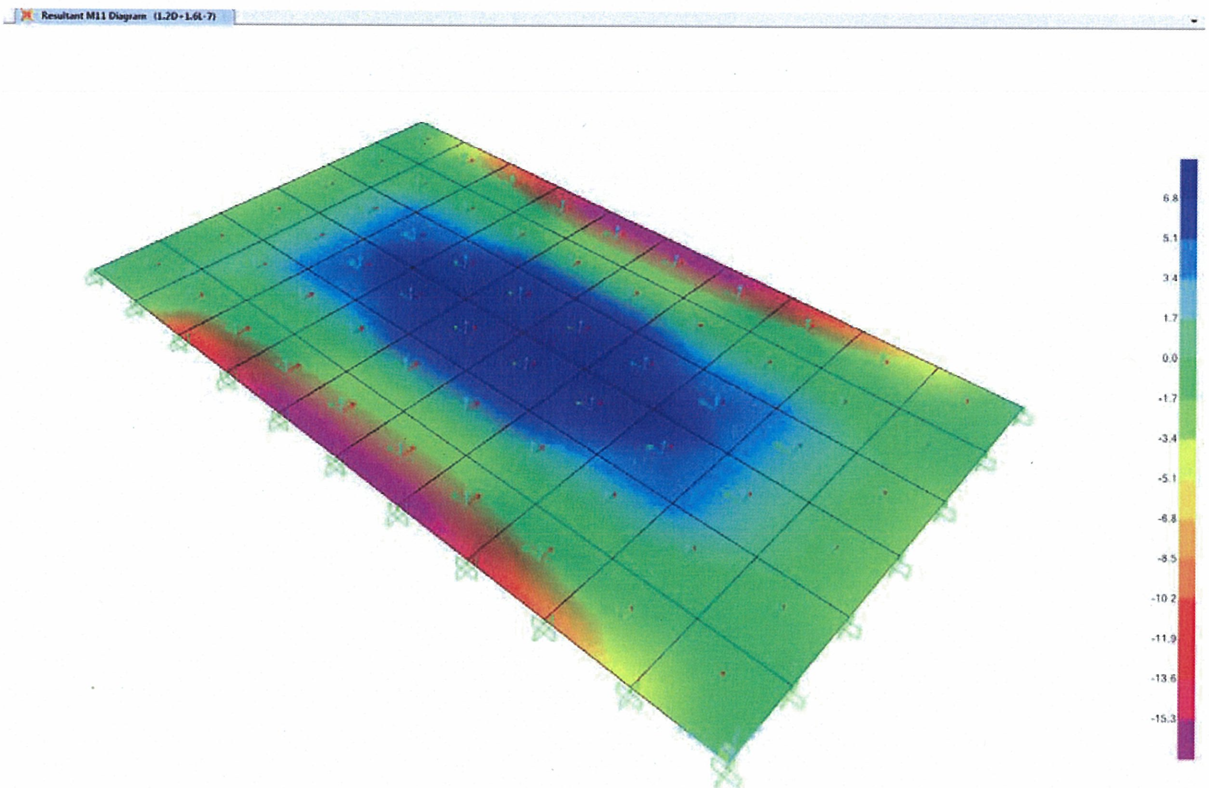
- -M11 at South Wall
- -M11 at North Wall
- -M22 at East or West Wall
- +M11 at midspan
- +M22 at midspan
- +/-V13
- +/-V23



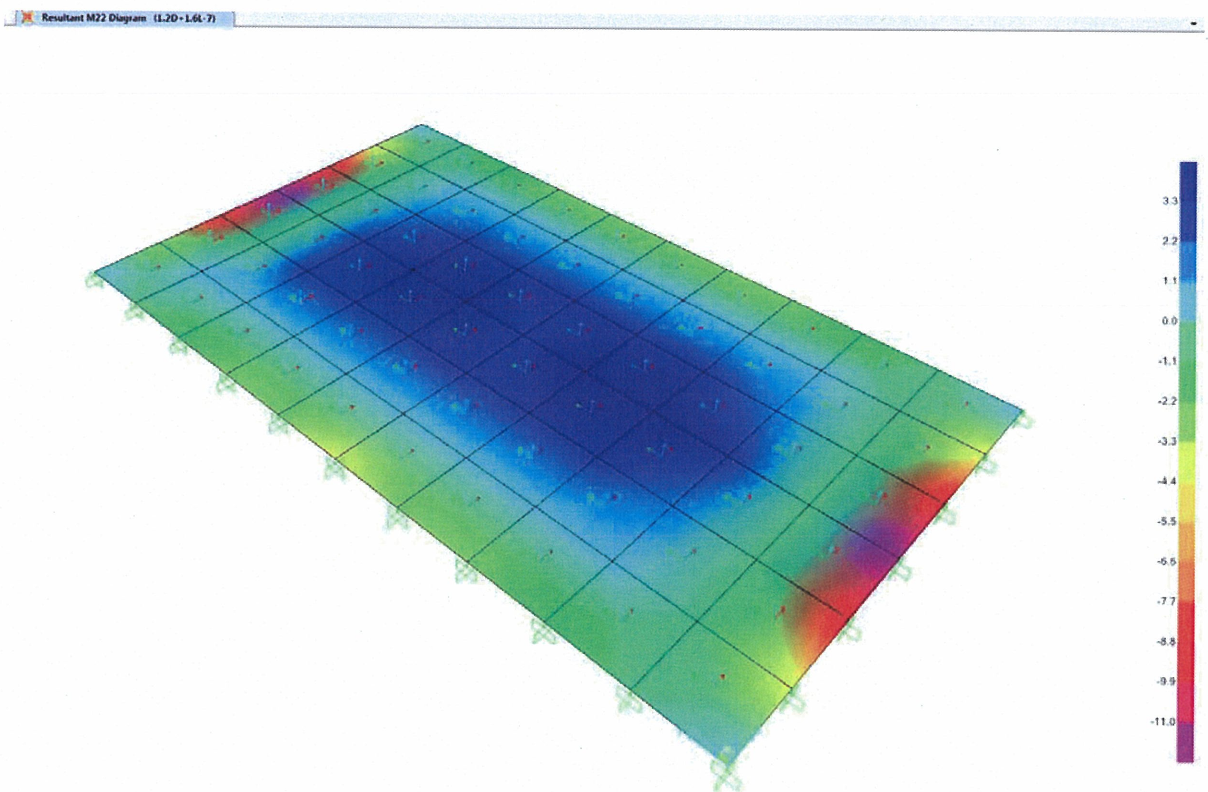
C-Cell Floor SAP2000 Model

Model Orientation uses the following:

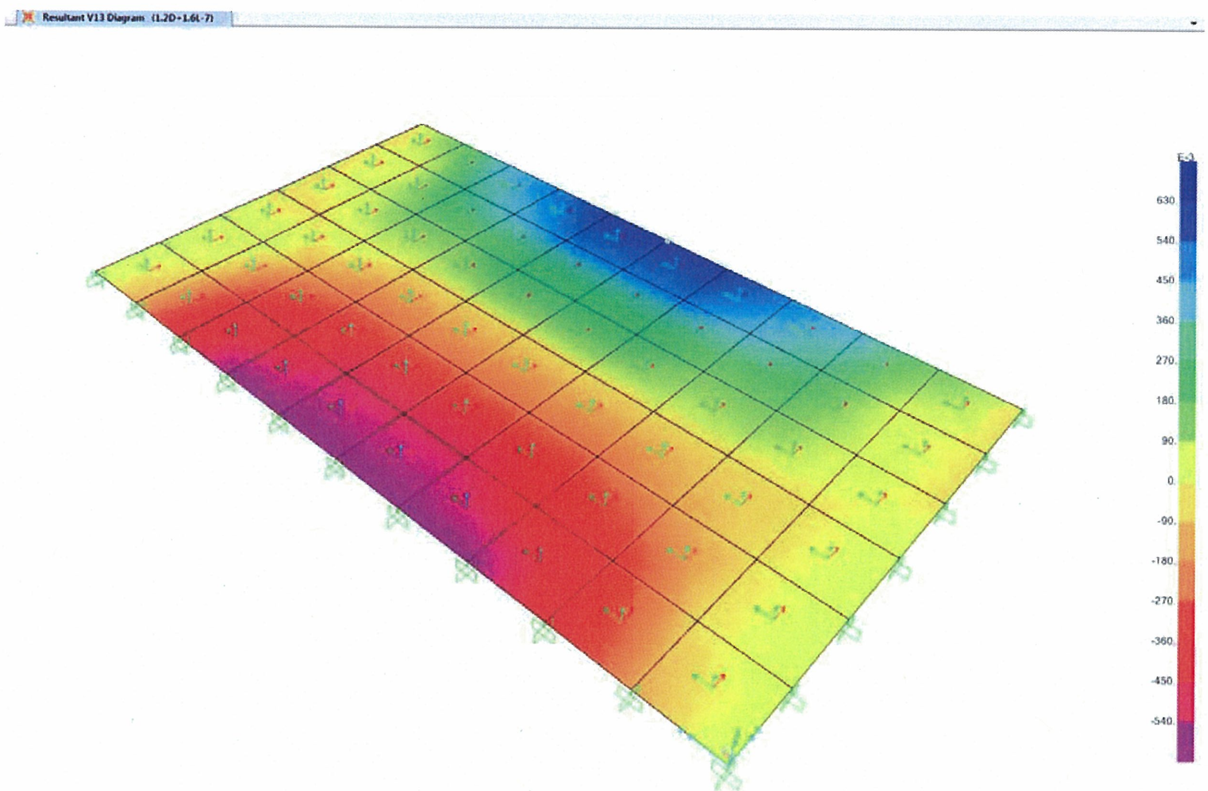
Global X = Local 1
Global Y = Local 2
Global Z = Local 3



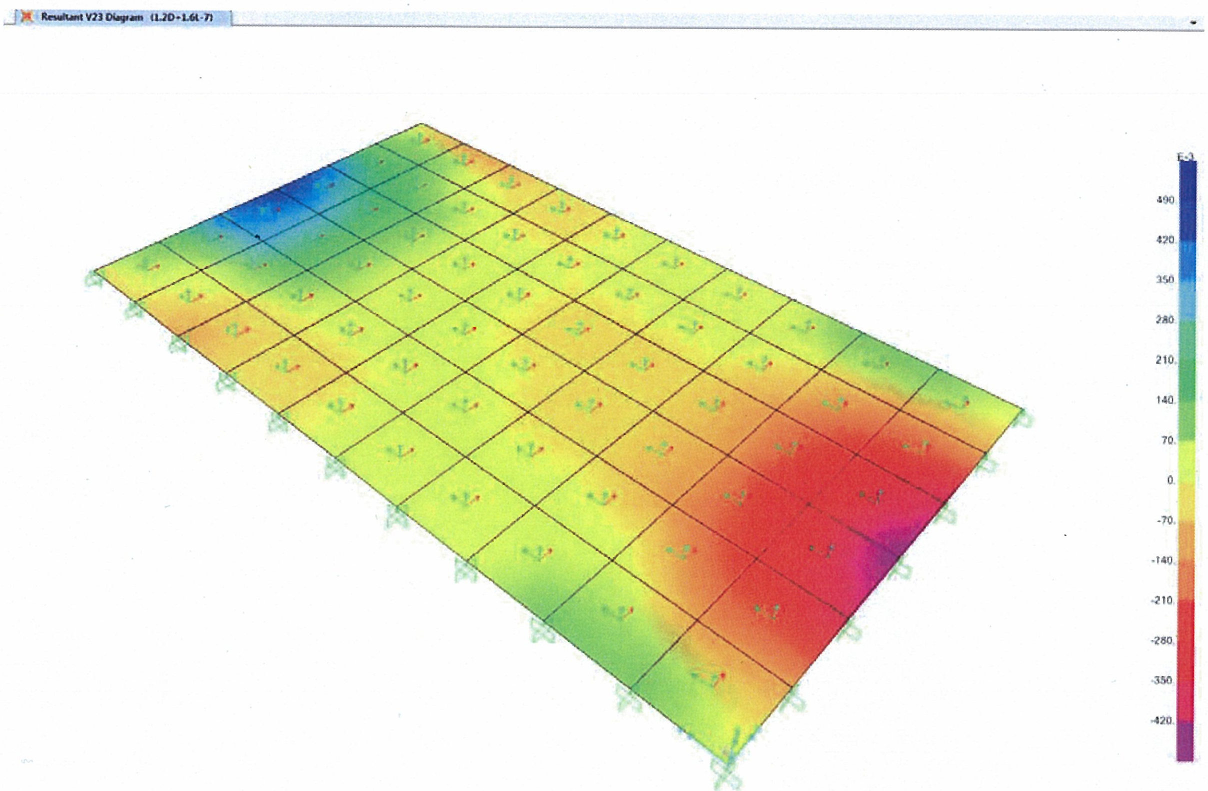
Resulting Moment M11 (kip-ft) (North-South Direction)



Resulting Moment M22 (kip-ft) (East-West Direction)



Resulting Shear V13 (kip)



Resulting Shear V23 (kip)

SAP2000 Element Output

TABLE: Element Forces - Area Shells								
Area	ShellType	Joint	OutputCase	CaseType	M11	M22	V13	V23
Text	Text	Text	Text	Text	Kip-ft/	Kip-ft/	Kip/f	Kip/f
6	Shell-Thin	12	1.2D+1.6L-7	Combination	-2.14	0.01	-7.49	0.14
6	Shell-Thin	13	1.2D+1.6L-7	Combination	-16.93	-3.36	-7.49	0.14
7	Shell-Thin	13	1.2D+1.6L-7	Combination	-16.93	-3.36	-7.49	-0.14
7	Shell-Thin	12	1.2D+1.6L-7	Combination	-2.14	0.01	-7.49	-0.13
22	Shell-Thin	34	1.2D+1.6L-7	Combination	-2.25	-11.56	0.45	-5.74
22	Shell-Thin	35	1.2D+1.6L-7	Combination	1.29	-0.98	0.12	-5.74
26	Shell-Thin	39	1.2D+1.6L-7	Combination	8.48	3.26	-1.36	-0.01
27	Shell-Thin	39	1.2D+1.6L-7	Combination	8.48	3.26	-1.36	0.00
29	Shell-Thin	41	1.2D+1.6L-7	Combination	6.85	3.52	-1.01	0.77
31	Shell-Thin	44	1.2D+1.6L-7	Combination	-2.26	-11.65	0.40	5.75
32	Shell-Thin	34	1.2D+1.6L-7	Combination	-2.25	-11.56	-0.44	-5.74
32	Shell-Thin	35	1.2D+1.6L-7	Combination	1.29	-0.98	-0.12	-5.74
36	Shell-Thin	39	1.2D+1.6L-7	Combination	8.48	3.26	1.31	-0.01
37	Shell-Thin	39	1.2D+1.6L-7	Combination	8.48	3.26	1.31	0.00
39	Shell-Thin	41	1.2D+1.6L-7	Combination	6.85	3.52	1.01	0.77
41	Shell-Thin	43	1.2D+1.6L-7	Combination	1.25	-1.01	-0.14	5.77
41	Shell-Thin	44	1.2D+1.6L-7	Combination	-2.26	-11.65	-0.45	5.77
56	Shell-Thin	72	1.2D+1.6L-7	Combination	-16.59	-3.29	7.43	0.14
56	Shell-Thin	62	1.2D+1.6L-7	Combination	-1.93	0.06	7.43	0.13
57	Shell-Thin	62	1.2D+1.6L-7	Combination	-1.93	0.06	7.43	-0.13
57	Shell-Thin	72	1.2D+1.6L-7	Combination	-16.59	-3.29	7.43	-0.14
				Min	-16.93	-11.65	-7.49	-5.74
				Max	8.48	3.52	7.43	5.77

Results from 15 different load combination were reviewed. The element forces were compared to the capacities of the C-Cell floor, based on location. The following results corresponding to the maximum soil height at which all flexural and shear Demand to Capacity ratios are ≤ 1.0. In this case, **Load Combination 7 (Soil Height = 7-ft)** is the governing combination.

With Soil treated as a Live Load and using the ACI Load Combination 1.2D+1.6L, the maximum soil height is:

Height: $h_6 = 7\,ft$ OR $w_6 = 805 \cdot psf$

*The following are maximum element forces from ACI load combination 1.2D+1.6L:

(Negative) (Negative) (Positive)

$M_{11S} := 16.93 kip \cdot ft$ $M_{22EW} := 11.65 kip \cdot ft$ $M_{22mid} := 3.52 kip \cdot ft$ $V_{13} := 7.49 kip$

$M_{11N} := 16.93 kip \cdot ft$ $M_{11mid} := 8.48 kip \cdot ft$ $V_{23} := 5.77 kip$

* Note: All units are presented as per foot. This agrees with use of b=1 ft. for ACI strength determination.

C.4 ACI Code Evaluation:

ACI Design Factors: $\phi_{shear} := 0.75$ — Strength Reduction Factor for Shear (ACI 318, 9.3.2.3)

$\phi_{flexure} := 0.9$ — Strength Reduction Factor (ACI 318, 9.3.2.1)

Flexure in the 11 Direction: -M11S

Top Steel: at South Wall #8@9

$spacing := 9in$ — rebar spacing

$db_{t11} := d_8$ $Ab_{t11} := A_8$ — top bar diameter and Area

$$d'_{11} := cover + \frac{db_{t11}}{2} = 1.25 \cdot in$$ Depth to centroid of compression steel

$$A_{s'11} := \frac{b}{spacing} \cdot Ab_{t11} = 1.0533 \cdot in^2$$ Area of top steel

$$A_{stran'11} := A_{s'11} \cdot (n - 1) = 8.1459 \cdot in^2$$ Transformed area of steel

$$d := t - d'_{11} = 10.75 \cdot in \qquad A_s := A_{s'11} = 1.0533 \cdot in^2$$

$$a := A_s \cdot \frac{f_y}{0.85 \cdot f_c \cdot b} = 1.3769 \cdot in$$ depth of rectangular compressive stress block (ignoring compression steel)

$$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 35 \cdot kip \cdot ft$$ per foot — Nominal Moment Capacity

$$M_A := \phi_{flexure} \cdot M_n = 32 \cdot kip \cdot ft$$ Allowable Moment Capacity

$$DC_{bending11S} := \frac{M_{11S}}{M_A} = 0.53$$ Demand to Capacity Ratio for Floor Bending

Flexure in the 11 Direction: -M11N

Top Steel: at North Wall #7@12

$spacing := 12in$ — rebar spacing

$db_{t11} := d_7$ $Ab_{t11} := A_7$ — top bar diameter and Area

$$d'_{11} := cover + \frac{db_{t11}}{2} = 1.1875 \cdot in$$
Depth to centroid of compression steel

$$A_{s'11} := \frac{b}{spacing} \cdot Ab_{t11} = 0.6 \cdot in^2$$
Area of top steel

$$A_{stran'11} := A_{s'11} \cdot (n - 1) = 4.6401 \cdot in^2$$
Transformed area of steel

$$d := t - d'_{11} = 10.8125 \cdot in \quad A_s := A_{s'11} = 0.6 \cdot in^2$$

$$a := A_s \cdot \frac{f_y}{0.85 \cdot f_c \cdot b} = 0.7843 \cdot in$$
depth of rectangular compressive stress block (ignoring compression steel)

$$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 21 \cdot kip \cdot ft$$ per foot
Nominal Moment Capacity

$$M_A := \phi_{flexure} \cdot M_n = 19 \cdot kip \cdot ft$$
Allowable Moment Capacity

$$DC_{bending11N} := \frac{M_{11N}}{M_A} = 0.9$$
Demand to Capacity Ratio for Floor Bending

Flexure in the 11 Direction: M11mid

Bottom: #5@9

$spacing := 9in$ — rebar spacing

$db_{b11} := d_5$ $\quad Ab_{b11} := A_5$ — bottom bar diameter and Area

$$d_{11} := t - cover - \frac{db_{b11}}{2} = 10.9375 \cdot in$$
Depth to centroid of tension steel

$$A_{s11} := \frac{b}{spacing} \cdot Ab_{b11} = 0.4133 \cdot in^2$$
Area of bottom steel

$$A_{stran11} := A_{s11} \cdot (n - 1) = 3.1965 \cdot in^2$$
Transformed area of steel

$$d := d_{11} = 10.9375 \cdot in \qquad A_s := A_{s11} = 0.4133 \cdot in^2$$

$$a := A_s \cdot \frac{f_y}{0.85 \cdot f_c \cdot b} = 0.5403 \cdot in$$
depth of rectangular compressive stress block (ignoring compression steel)

$$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 15 \cdot kip \cdot ft$$ per foot
Nominal Moment Capacity

$$M_A := \phi_{flexure} \cdot M_n = 13 \cdot kip \cdot ft$$
Allowable Moment Capacity

$$DC_{bending11mid} := \frac{M_{11mid}}{M_A} = 0.64$$
Demand to Capacity Ratio for Floor Bending

Flexure in the 22 Direction: M22EW

Top Steel: #5@9

$spacing := 9in$

$db_{t22} := d_5$ $Ab_{t22} := A_5$ — top bar diameter and Area

$$^{*}d'_{22} := cover + d_8 + \frac{db_{t22}}{2} = 2.0625 \cdot in$$

Depth to centroid of compression steel

*Uses larger intersecting bar at corner locations

$$A_{s'22} := \frac{b}{spacing} \cdot Ab_{t22} = 0.4133 \cdot in^2$$

Area of top steel

$$d := t - d'_{22} = 9.9375 \cdot in \quad A_s := A_{s'22} = 0.4133 \cdot in^2$$

$$a := A_s \cdot \frac{f_y}{0.85 \cdot f_c \cdot b} = 0.5403 \cdot in$$

depth of rectangular compressive stress block (ignoring compression steel)

$$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 13 \cdot kip \cdot ft \quad \text{per foot}$$

Nominal Moment Capacity

$$M_A := \phi_{flexure} \cdot M_n = 12 \cdot kip \cdot ft$$

Allowable Moment Capacity

$$DC_{bending22EW} := \frac{M_{22EW}}{M_A} = 0.97$$

Demand to Capacity Ratio for Floor Bending

Flexure in the 22 Direction: M22mid

Bottom: #5@9

$spacing := 9in$

$db_{b22} := d_5$ $\quad Ab_{b22} := A_5$ $\quad db_{b11} = 0.625 \cdot in$ — bottom bar diameter and Area

$d_{22} := t - cover - db_{b11} - \frac{db_{b22}}{2} = 10.3125 \cdot in$ — Depth to centroid of tension steel

$A_{s22} := \frac{b}{spacing} \cdot Ab_{b22} = 0.4133 \cdot in^2$ — Area of bottom steel

$d := d_{22} = 10.3125 \cdot in$ $\quad A_s := A_{s22} = 0.4133 \cdot in^2$

$a := A_s \cdot \frac{f_y}{0.85 \cdot f_c \cdot b} = 0.5403 \cdot in$ — depth of rectangular compressive stress block (ignoring compression steel)

$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 14 \cdot kip \cdot ft$ per foot — Nominal Moment Capacity

$M_A := \phi_{flexure} \cdot M_n = 12 \cdot kip \cdot ft$ — Allowable Moment Capacity

$DC_{bending22mid} := \frac{M_{22mid}}{M_A} = 0.28$ — Demand to Capacity Ratio for Floor Bending

Check Shear:

$d := 10.3125in$

$V_u := \max(V_{13}, V_{23}) = 7 \cdot kip$

$V_c := 2 \cdot psi \cdot \sqrt{\frac{f_c}{psi}} \cdot b \cdot d = 14 \cdot kip$ per foot ACI (11-3)

$\phi_{shear} \cdot V_c = 10 \cdot kip$

$DC_{shear} := \frac{V_u}{\phi_{shear} \cdot V_c} = 0.74$

Summary:

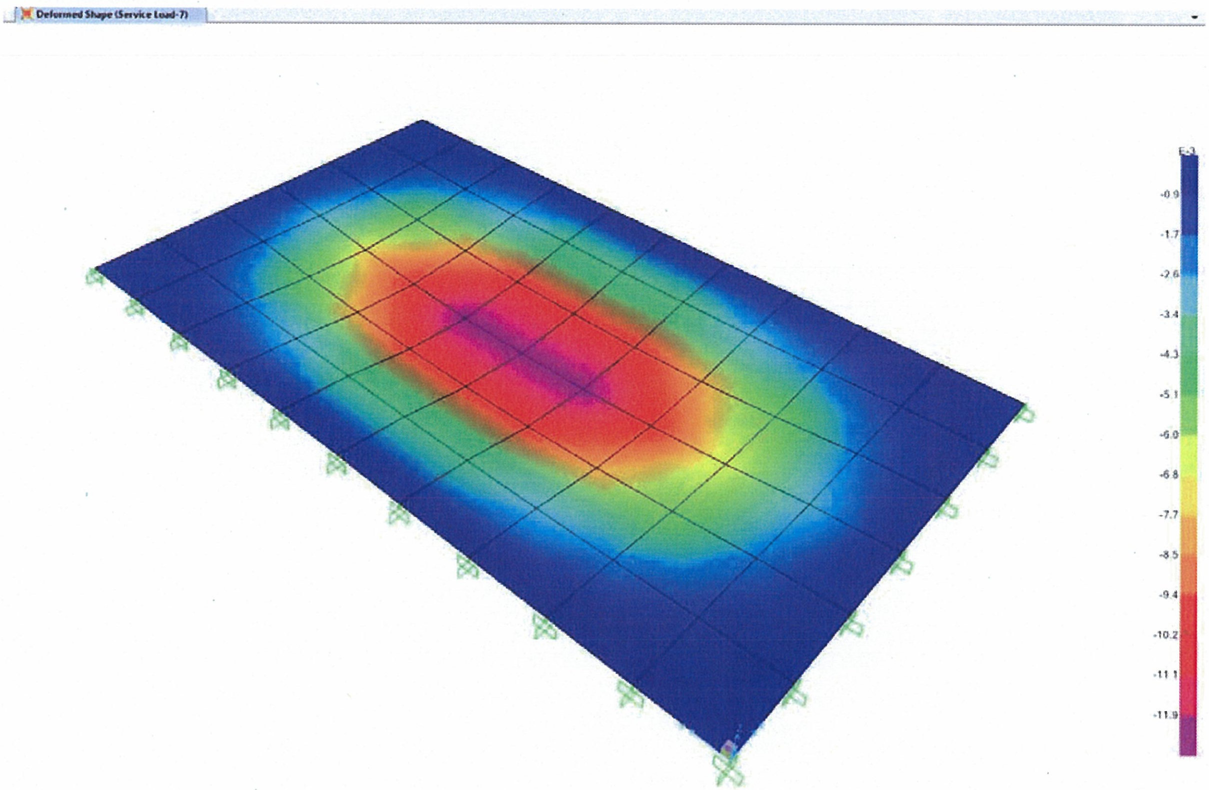
(Negative)	(Negative)	(Positive)	
$M_{11S} = 16.93 \cdot kip \cdot ft$	$M_{22EW} = 11.65 \cdot kip \cdot ft$	$M_{22mid} = 3.52 \cdot kip \cdot ft$	$V_u = 7.49 \cdot kip$
$DC_{bending11S} = 0.53$	$DC_{bending22EW} = 0.97$	$DC_{bending22mid} = 0.28$	$DC_{shear} = 0.74$
$M_{11N} = 16.93 \cdot kip \cdot ft$		$M_{11mid} = 8.48 \cdot kip \cdot ft$	
$DC_{bending11N} = 0.9$		$DC_{bending11mid} = 0.64$	

KURION
Isolating Waste from the Environment

Calc. # KUR-1782F-CALC-C003
Revision: C

Calculation Title: A, C, and D-Cell Floor Structural Analysis
Originator: R.S. Rast Date: 24 July 2014
Checker: J. Small Date: 24 July 2014

C.5 Slab Deflection:



Deformed Shape under Service Load Combination (in)

SAP2000 Joint Displacement

TABLE: Joint Displacements					
Joint	OutputCase	CaseType	U1	U2	U3
Text	Text	Text	in	in	in
1	Service Load-7	Combination	0	0	0.00E+00
2	Service Load-7	Combination	0	0	0.00E+00
3	Service Load-7	Combination	0	0	0.00E+00
5	Service Load-7	Combination	0	0	0.00E+00
7	Service Load-7	Combination	0	0	0.00E+00
9	Service Load-7	Combination	0	0	0.00E+00
11	Service Load-7	Combination	0	0	0.00E+00
13	Service Load-7	Combination	0	0	0.00E+00
15	Service Load-7	Combination	0	0	0.00E+00
17	Service Load-7	Combination	0	0	0.00E+00
19	Service Load-7	Combination	0	0	0.00E+00
21	Service Load-7	Combination	0	0	0.00E+00
22	Service Load-7	Combination	0	0	0.00E+00
23	Service Load-7	Combination	0	0	0.00E+00
33	Service Load-7	Combination	0	0	0.00E+00
34	Service Load-7	Combination	0	0	0.00E+00
39	Service Load-7	Combination	0	0	-1.25E-02
44	Service Load-7	Combination	0	0	0.00E+00
45	Service Load-7	Combination	0	0	0.00E+00
55	Service Load-7	Combination	0	0	0.00E+00
56	Service Load-7	Combination	0	0	0.00E+00
61	Service Load-7	Combination	0	0	0.00E+00
67	Service Load-7	Combination	0	0	0.00E+00
68	Service Load-7	Combination	0	0	0.00E+00
69	Service Load-7	Combination	0	0	0.00E+00
70	Service Load-7	Combination	0	0	0.00E+00
71	Service Load-7	Combination	0	0	0.00E+00
72	Service Load-7	Combination	0	0	0.00E+00
73	Service Load-7	Combination	0	0	0.00E+00
74	Service Load-7	Combination	0	0	0.00E+00
75	Service Load-7	Combination	0	0	0.00E+00
76	Service Load-7	Combination	0	0	0.00E+00
105	Service Load-7	Combination	0	0	0.00E+00
				max up	**0.00E+00**
				max dow	**-1.25E-02**

$\Delta := 1.25 \times 10^{-2}\,\text{in}$ $\quad \frac{L_{11}}{360} = 4 \times 10^{-1} \cdot \text{in}$ $\quad \frac{L_{22}}{360} = 6.444 \times 10^{-1} \cdot \text{in}$

$$ACI_{\Delta} := \min\left(\frac{L_{22}}{360}, \frac{L_{11}}{360}\right)$$

Deflection Criteria
(ACI 318 Table 9.5(b))

Serviceability := | "OK" if $\Delta < ACI_{\Delta}$ = "OK"
| "Too Much Deflection" otherwise

KUR-1782F-CALC-M001

300-296 Soil Remediation Project Phase I & II

30% Design Scoping Calculation

Revision: **B**

Issue Date: **7-24-14**

Prepared for:

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Wade Singleton, PE
Project Engineer

Report #: KUR-1782F-CALC-M001

Revision: B

Report Title: 30% Design Scoping Calculation

Project Title: 300-296 Soil Remediation Project Phase I & II

Status: ☒ **In-Process** ☐ **Final**

Contains assumptions and/or inputs which require verification: ☒ **Yes** ☐ **No**

Report History

Revision #	Reason for Revision	Approvals/Date
A	Initial Issue	Originator: J. Frei Checker: R Heim PM: Other:
B	Incorporated comments from AFS	Originator: J Frei Checker: R Heim PM: Other:
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:

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Terms

Acronym	*Definition*
CAD	Computer Aided Design
FEA	Finite Element Analysis
REA	Remote Excavator Arm

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1.0 Objective/Purpose

The purpose of this calculation is to determine the major loads that will affect the mounting of the lower REA and the transfer barrier frame. These loads will be applied to the major load bearing components to validate the design in its current state.

This report records the analyses performed on various components of the REA mounting and transfer barrier frame assemblies. These are high level analyses based on incomplete information that will be refined as the design progresses. The applied loads are based on input data from the John Deere excavator catalog and model weights found in the 3D Solidworks model.

2.0 Introduction/Background

This report is divided into two sections. One section will cover the REA supports while the other will cover the transfer barrier frame. Each of these pieces of equipment act independently of one another and have completely separate loading scenarios. As a result, these will each be discussed in separate sections of this report.

2.1 REA Support

The REA support assembly will support the REA through the walls containing B-cell. 12" diameter holes will be drilled in the B-cell wall where the REA support assembly is inserted. The REA support assembly will be secured in place by an expansive material that will fill the gap between the REA support tube and the B-cell wall. Once the REA support assembly is secure in the B-cell wall, it will be attached to the REA support structure via 2" diameter screws. REA loads will be applied to the load bearing components of the REA support assembly to evaluate the stress.

2.2 Transfer Barrier Frame

The transfer barrier frame will facilitate the transfer of material from B-cell through the airlock and into A-cell. Located in the doorway between the airlock and B-cell, the transfer barrier frame will support a full container of B-cell debris cantilevered over the B-cell floor. Once loaded by a REA, the transfer barrier cart will be moved along the frame rails into the airlock where the container will be unloaded and moved into the appropriate cell for storage.

3.0 Input Data

Free body diagrams were created to determine the loads that would act on each structure. After determining the global loads for the structures, 3D solid models were created and analyzed using FEA. Inputs for the REA analyses come from the John Deere compact excavator catalog and the 3D solid models generated for the REA support assembly and transfer barrier frame designs. Based on information found in the catalog, it was determined that the worst case load for the REA support assembly comes when the REA is reaching straight down and digging. This generates a moment of 1.05 x 10^6 in-lbs to be resisted by the horizontal tubes. The horizontal tubes are spaced on 24 centers to resist the moment created by the REA. The moment arm for the REA digging in this position is considered to be 23ft to the lower horizontal REA support.

The worst case load for the transfer barrier frame was considered to be a fully loaded waste container located at the end of the frame that hangs over the B-cell. A load of 4000lbs was applied at this point.

3.1 Material Properties

The material properties used for each model can be found in Table 3-1 below. The plain carbon steel and AISI 1020, Cold Rolled Steel were used for all components in the Transfer Barrier Frame and REA support analyses respectively.

Table 3-1 Material Properties

Material	E-Modulus (psi)	Poisson's Ratio	Density (lbm/in^3)	Yield Strength (ksi)
Plain Carbon Steel	30.4 x 10^6	0.28	0.281	32.0
AISI 1020, Cold Rolled Steel	29.7 x 10^6	0.29	0.284	50.7

3.2 3D Solid Model

A simplified 3D solid model was created in Solidworks 2013 for each of the REA support and transfer barrier frame assemblies. These models were used for FEA and can be seen below Figure 3-1 and Figure 3-2 below.

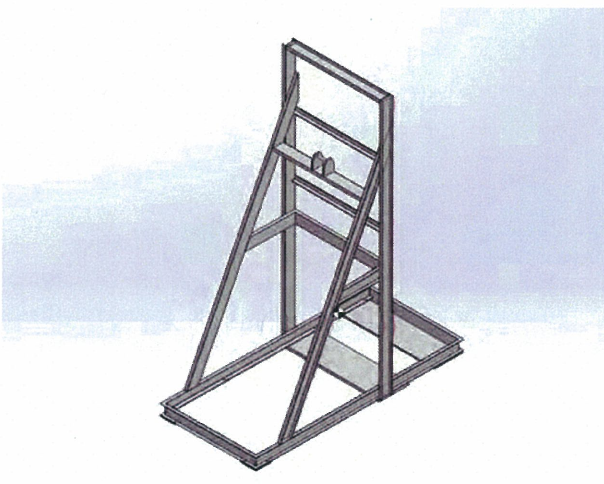


Figure 3-1 Transfer Barrier Frame Iso

Figure 3-2 REA support Iso

3.2.1 REA support Loads/Constraints

The REA support assembly considered 3 separate loading conditions. The constraints for each of the loading conditions were identical with the only exception being the direction of the excavator bucket force. The excavator bucket force was applied in the direction shown in Figure 3-3, directly opposite and 90 degrees out of plane into the image. A friction contact was used to model the interface between the two horizontal tubes and the vertical tube. The static coefficient of friction was taken to be 0.74.

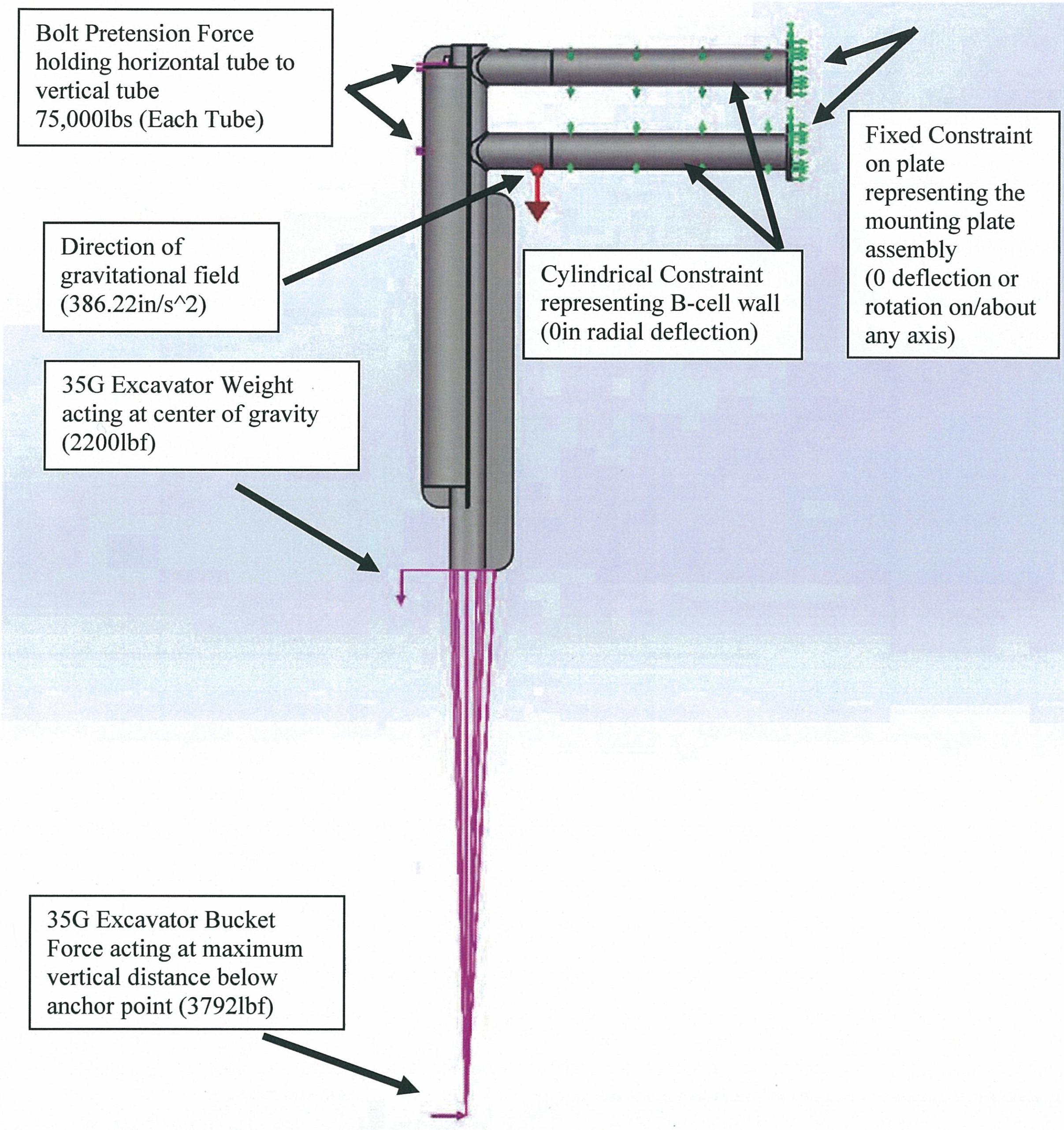


Figure 3-3 REA support Loads/Constraints

3.2.2 Transfer Barrier Frame Loads/Constraints

The transfer barrier frame considered a single loading condition in which the frame was inserted into the airlock-B-cell doorway and loaded with a full container of debris. A full container of debris was considered to weigh approximately 3200lbs. A weight of 4000lbs was conservatively applied to account for additional weight that the frame could see when the container is set on the frame.

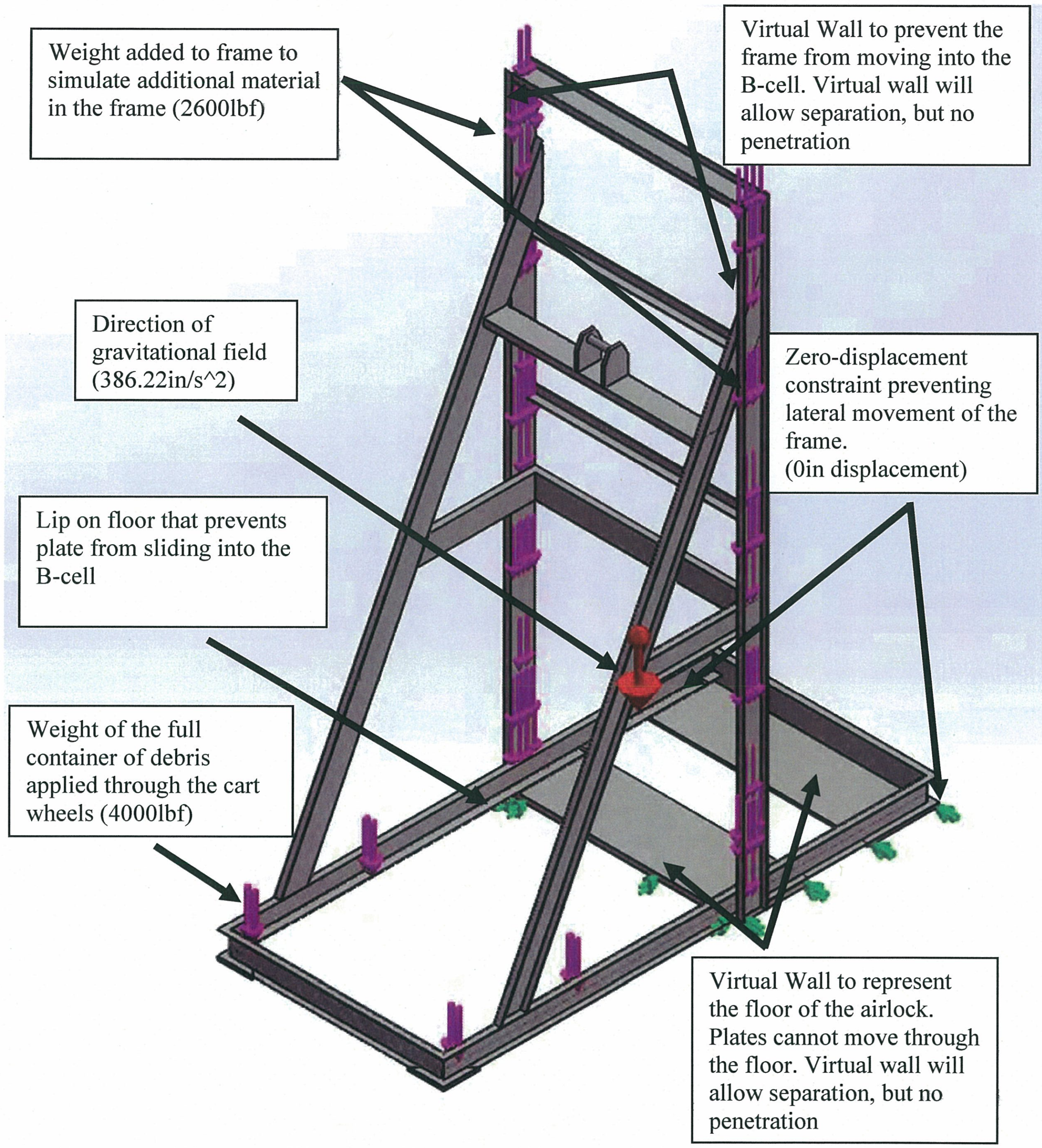
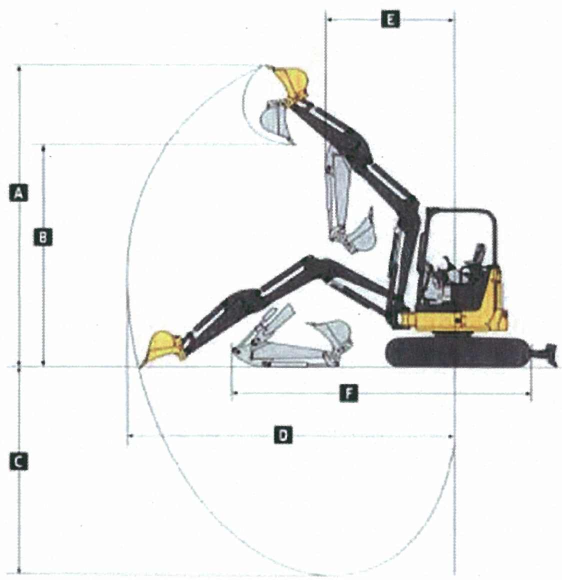


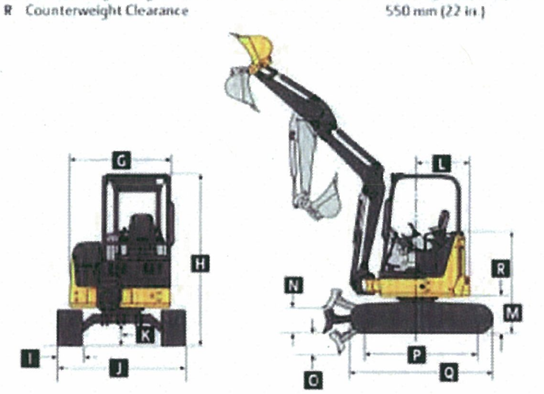
Figure 3-4 Transfer Barrier Frame Loads/Constraints

3.3 REA Loads

The REA loads were taken from the John Deere "G-Series Compact Excavators" catalogue. The principle load was the arm digging force of 3792lbs. The operating dimensions and values are given in Figure 3-5 below.

Operating Dimensions	**35G**			
	1315-mm (4 ft. 4 in.) Standard Arm and Canopy	*1715-mm (5 ft. 8 in.) Long Arm and Canopy*	*1315-mm (4 ft. 4 in.) Standard Arm and Cab*	*1715-mm (5 ft. 8 in.) Long Arm and Cab*
A Maximum Cutting Height	4.87 m (16 ft. 0 in.)	4.95 m (16 ft. 3 in.)	4.70 m (15 ft. 5 in.)	4.74 m (15 ft. 7 in.)
B Maximum Dumping Height	3.46 m (11 ft. 4 in.)	3.57 m (11 ft. 9 in.)	3.31 m (10 ft. 10 in.)	3.39 m (11 ft. 1 in.)
C Maximum Digging Depth	3.06 m (10 ft. 0 in.)	3.46 m (11 ft. 4 in.)	3.06 m (10 ft. 0 in.)	3.46 m (11 ft. 4 in.)
D Maximum Digging Reach	5.21 m (17 ft. 1 in.)	5.52 m (18 ft. 1 in.)	5.21 m (17 ft. 1 in.)	5.52 m (18 ft. 1 in.)
E Minimum Front Swing Radius	2.08 m (6 ft. 10 in.)	2.19 m (7 ft. 2 in.)	2.24 m (7 ft. 4 in.)	2.30 m (7 ft. 7 in.)
F Transport Length	4.64 m (15 ft. 3 in.)	4.75 m (15 ft. 7 in.)	4.64 m (15 ft. 3 in.)	4.75 m (15 ft. 7 in.)
Digging Force (ISO)				
Arm	19.0 kN (4,277 lb.)	16.9 kN (3,792 lb.)	19.0 kN (4,277 lb.)	16.9 kN (3,792 lb.)
Bucket	27.1 kN (6,085 lb.)	27.1 kN (6,085 lb.)	27.1 kN (6,085 lb.)	27.1 kN (6,085 lb.)
Machine Dimensions				
G Upperstructure Width	1.55 m (5 ft. 1 in.)			
H Overall Height				
Canopy	2.48 m (8 ft. 2 in.)			
Cab	2.48 m (8 ft. 2 in.)			
I Track Width	300 mm (12 in.)			
J Undercarriage Width	1.74 m (5 ft. 9 in.)			
K Ground Clearance	280 mm (11 in.)			
L Tail Swing Radius				
With Standard Arm	870 mm (34 in.)			
With Long Arm and Extra Counterweight	980 mm (39 in.)			
M Engine Cover Height	1.53 m (5 ft. 0 in.)			
N Maximum Blade Lift Above Ground	360 mm (14.2 in.)			
O Maximum Blade Drop Below Ground	400 mm (15.7 in.)			
Blade				
Width	1.74 m (5 ft. 9 in.)			
Height	373 mm (14.7 in.)			
P Sprocket Center to Idler Center	1.66 m (5 ft. 5 in.)			
Q Undercarriage Length	2.11 m (6 ft. 11 in.)			
R Counterweight Clearance	550 mm (22 in.)			





Lift Capacities								
Ground Level at 3.05-m (10 ft.) Radius	*Canopy and Standard Counterweight*		*Canopy and Extra Counterweight*		*Cab and Standard Counterweight*		*Cab and Extra Counterweight*	
Arm	*Over Front**	*Over Side*	*Over Front**	*Over Side*	*Over Front**	*Over Side*	*Over Front**	*Over Side*
1315-mm (4 ft. 4 in.) Standard	1568 kg (3,453 lb.)	641 kg (1,412 lb.)	1568 kg (3,453 lb.)	765 kg (1,686 lb.)	1568 kg (3,453 lb.)	684 kg (1,506 lb.)	1568 kg (3,453 lb.)	808 kg (1,780 lb.)
1715-mm (5 ft. 8 in.) Long	1501 kg (3,307 lb.)	630 kg (1,388 lb.)	1501 kg (3,307 lb.)	755 kg (1,662 lb.)	1501 kg (3,307 lb.)	672 kg (1,481 lb.)	1501 kg (3,307 lb.)	797 kg (1,756 lb.)

*Blade down (limited by hydraulics).

Figure 3-5 John Deere 35G Dimensions and Capacities

4.0 Assumptions

4.1 REA support

- Assumptions requiring verification:
  - The mounting plate assembly on the B-cell wall penetration is strong enough to support the REA support assembly.
  - Excavator bucket force was taken as 3792lbs instead of 6085lbs under the assumption that the REA would back-drive at or above 3792lbs.
  - The weight of the excavator components added to the support is 2200 lbs.
- Assumptions not requiring verification:
  - The portion of the horizontal tubes within the B-cell wall is supported radially by the wall reducing the unsupported length of the horizontal tubes to ~18in.
  - The coefficient of static friction for steel-steel is 0.74.
  - The shear strength of the epoxy surrounding the horizontal REA supports provides no axial resistance/support for the horizontal tube or the flat plate outside of the B-cell.

4.2 Transfer Barrier Frame

- Assumptions requiring verification:
  - There are no assumptions requiring verification.
- Assumptions not requiring verification:
  - The force acting on the transfer cart rails is spread across a 1.7in^2 area at 4 equally spaced locations.

5.0 Method of Analysis

The generic process for design and analysis used in this calculation is described below.

5.1 Methodology for performing FEA in Solidworks Simulation

- Create model geometry in Solidworks 2013.
- Simplify model (ignore/suppress any non-structural parts/parts not pertinent to analysis).
- Import simplified model into Solidworks Simulation.
- Select analysis type (static structural).
- Define material, contact, loads and constraints.

- Mesh the model and perform FEA.
- Review, interpret and document analysis results. Compare results against a design factor of 2 based on dynamic loading where loads, materials, and stresses are well understood.

6.0 Computer Software

This calculation utilized 3D CAD modeling and FEA software. Solidworks 2013 was used to create the 3D solid model and Solidworks Simulation was used for the FEA.

6.1 Computer/Software Verification

Due to its nature as a scoping calculation, computer/software verification has been excluded. When more information becomes available as the design progresses, computer/software verification will be included for future calculations (prior to the 60% design).

7.0 Results

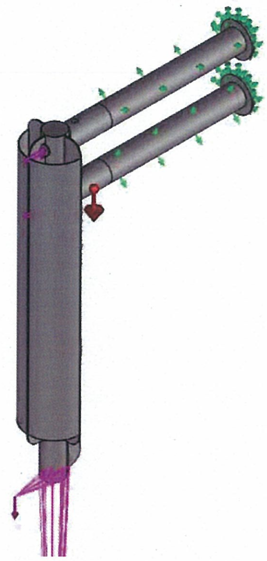
The setup and results for the REA support assembly and the transfer barrier frame are given below. Only the simulation results and force reactions are varied for the REA support assembly portion of the results section. This is because the only variable in the setup for the three load conditions was the direction of the excavator force.

7.1 REA support

7.1.1 Model Information

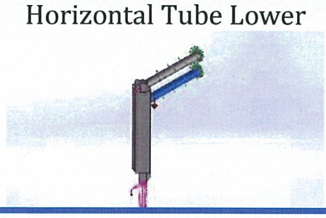
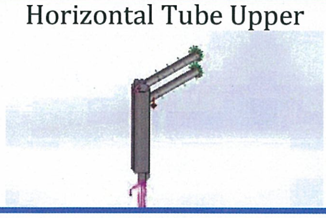
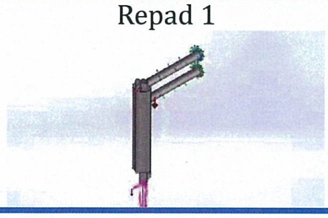
The mass and volume properties are given for each of the components that were included in the REA support FEA simulation. These are shown in Table 7-1 below.

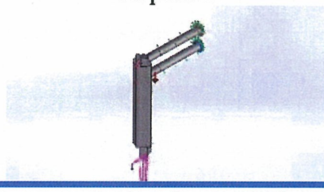
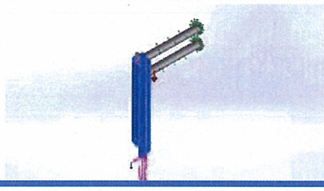
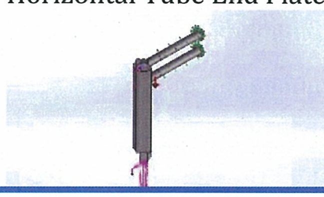
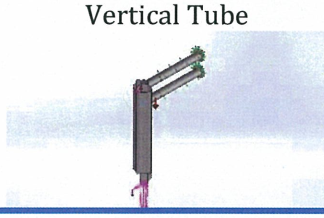
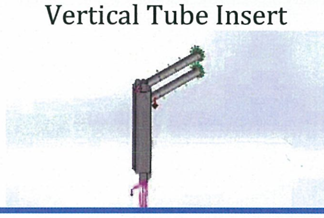
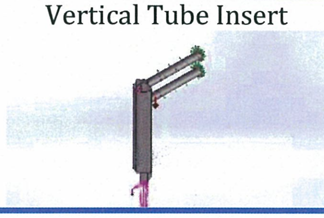
Table 7-1 Model Information



Model name: REA support Assembly FEA
Current Configuration: Default

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties
Horizontal Tube Lower 	Solid Body	Mass:695.793 lb Volume:2447.2 in^3 Density:0.284322 lb/in^3 Weight:695.321 lbf
Horizontal Tube Upper 	Solid Body	Mass:694.86 lb Volume:2443.92 in^3 Density:0.284322 lb/in^3 Weight:694.389 lbf
Repad 1 	Solid Body	Mass:10.3314 lb Volume:36.3371 in^3 Density:0.284322 lb/in^3 Weight:10.3244 lbf

Repad 2 	Solid Body	Mass:10.3314 lb Volume:36.3371 in^3 Density:0.284322 lb/in^3 Weight:10.3244 lbf
Horizontal Tube End Plate 	Solid Body	Mass:42.8747 lb Volume:150.796 in^3 Density:0.284322 lb/in^3 Weight:42.8456 lbf
Horizontal Tube End Plate 	Solid Body	Mass:42.8747 lb Volume:150.796 in^3 Density:0.284322 lb/in^3 Weight:42.8456 lbf
Vertical Tube 	Solid Body	Mass:2075.82 lb Volume:7300.97 in^3 Density:0.284322 lb/in^3 Weight:2074.42 lbf
Vertical Tube Insert 	Solid Body	Mass:15.9201 lb Volume:55.9934 in^3 Density:0.284322 lb/in^3 Weight:15.9094 lbf
Vertical Tube Insert 	Solid Body	Mass:15.9201 lb Volume:55.9934 in^3 Density:0.284322 lb/in^3 Weight:15.9094 lbf

7.1.2 Study Properties

The setup and analysis controls for the FEA are listed below in Table 7-2. The FEA used a static study on a solid mesh.

Table 7-2 FEA Properties

Study name	In Plane Excavator Full Down Reach In
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SolidWorks Flow Simulation	Off
Solver type	FFEPlus
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SolidWorks document (C:\Users\Jascha\Box Sync\Jascha Frei\324 Tube Assembly FEA)

7.1.3 Units

The unit system for the analysis is given below in Table 7-3.

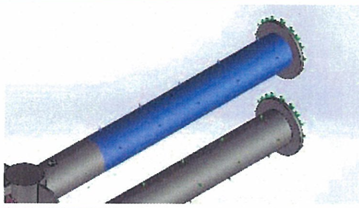
Table 7-3 Units

Unit system:	English (IPS)
Length/Displacement	in
Temperature	Fahrenheit
Angular velocity	Rad/sec
Pressure/Stress	psi

7.1.4 Loads and Constraints

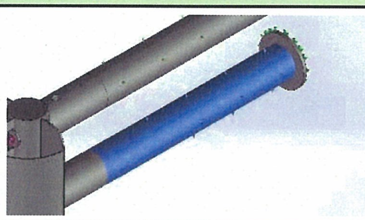
Table 7-4 thru Table 7-59 list the loads and constraints that were used to model the REA support assembly. The loads and resultant forces are relative to the global coordinate system.

Table 7-4 Constraints REA pulling towards B-cell wall

Constraint name	Constraint Image	Constraint Details
On Cylindrical Faces-1		Entities: 1 face(s) Type: On Cylindrical Faces Translation: 0, ---, --- Units: in

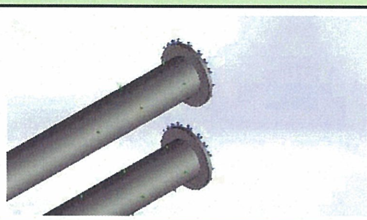
Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	-0.0261894	-115.858	-11746.5	11747
Reaction Moment(lbf·in)	0	0	0	0

Constraint name	Constraint Image	Constraint Details
On Cylindrical Faces-2		Entities: 1 face(s) Type: On Cylindrical Faces Translation: 0, ---, --- Units: in

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	-0.321325	-56.2724	5944.26	5944.53
Reaction Moment(lbf·in)	0	0	0	0

Constraint name	Constraint Image	Constraint Details
Fixed-3		Entities: 2 face(s) Type: Fixed Geometry

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	-153792	172.172	-4.05751	153792
Reaction Moment(lbf·in)	0	0	0	0

Table 7-5 Loads REA pulling towards B-cell wall

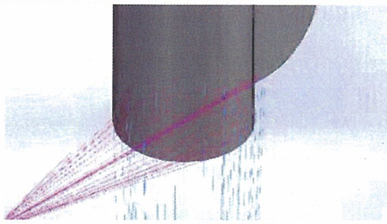
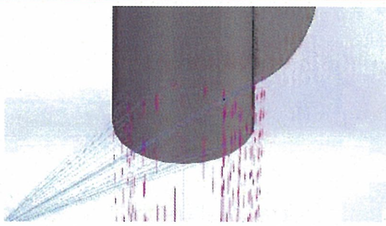
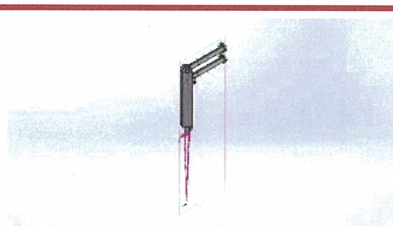
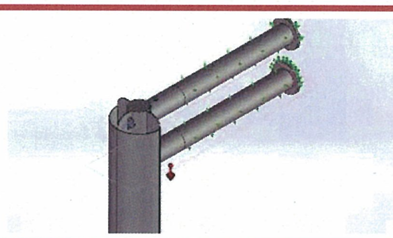
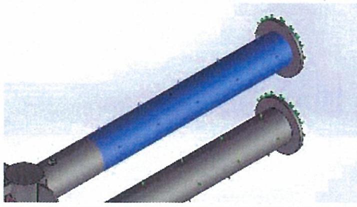
Load name	Load Image	Load Details
Remote Load (Direct transfer)-1		Entities: 1 face(s) Type: Load (Direct transfer) Coordinate System: Excavator Dig Force Values: -3792, ---, --- lbf Moment Values: ---, ---, --- lbf·in Reference coordinates: 0 0 0 in Components transferred: Force
Remote Load (Direct transfer)-2		Entities: 1 face(s) Type: Load (Direct transfer) Coordinate System: Global cartesian coordinates Force Values: ---, ---, 2200 lbf Moment Values: ---, ---, --- lbf·in Reference coordinates: -19 0 120 in Components transferred: Force
Force-3		Entities: 2 face(s), 1 plane(s) Reference: Top Assy Type: Apply force Values: 75000, ---, --- lbf
Gravity-1		Reference: Front Assy Values: 0 0 386.22 Units: English (IPS)

Table 7-6 Constraints REA pulling away from B-cell wall

Constraint name	Constraint Image	Constraint Details
On Cylindrical Faces-1		**Entities:** 1 face(s) **Type:** On Cylindrical Faces **Translation:** 0, ---, --- **Units:** in

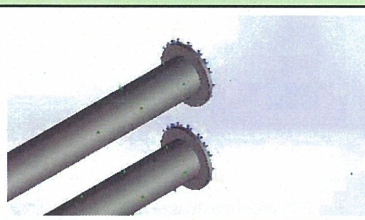
Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	0.167675	-297.017	-1371.65	1403.44
Reaction Moment(lbf·in)	0	0	0	0

Constraint name	Constraint Image	Constraint Details
On Cylindrical Faces-2		**Entities:** 1 face(s) **Type:** On Cylindrical Faces **Translation:** 0, ---, --- **Units:** in

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	-0.00751049	5.12377	-4377.69	4377.69
Reaction Moment(lbf·in)	0	0	0	0

Constraint name	Constraint Image	Constraint Details
Fixed-3		**Entities:** 2 face(s) **Type:** Fixed Geometry

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	-146208	292.069	-56.7633	146208
Reaction Moment(lbf·in)	0	0	0	0

Table 7-7 Loads REA pulling away from B-cell wall

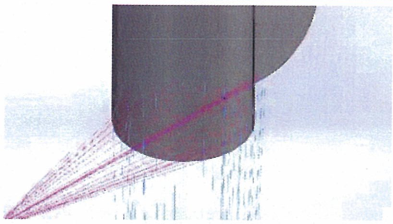
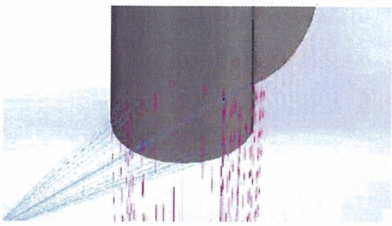
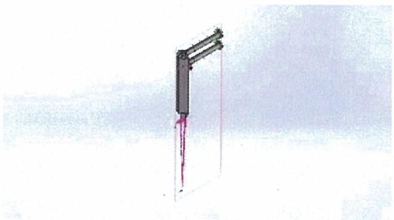
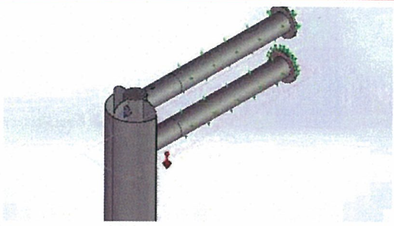
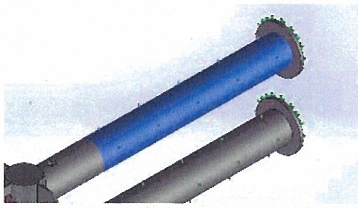
Load name	Load Image	Load Details
Remote Load (Direct transfer)-1		Entities: 1 face(s) Type: Load (Direct transfer) Coordinate System: Excavator Dig Force Values: 3792, ---, --- lbf Moment Values: ---, ---, --- lbf·in Reference coordinates: 0 0 0 in Components transferred: Force
Remote Load (Direct transfer)-2		Entities: 1 face(s) Type: Load (Direct transfer) Coordinate System: Global cartesian coordinates Force Values: ---, ---, 2200 lbf Moment Values: ---, ---, --- lbf·in Reference coordinates: -19 0 120 in Components transferred: Force
Force-3		Entities: 2 face(s), 1 plane(s) Reference: Top Assy Type: Apply force Values: 75000, ---, --- lbf
Gravity-1		Reference: Front Assy Values: 0 0 386.22 Units: English (IPS)

Table 7-8 Constraints REA pulling parallel to the B-cell wall

Constraint name	Constraint Image	Constraint Details
On Cylindrical Faces-1		Entities: 1 face(s) Type: On Cylindrical Faces Translation: 0, ---, --- Units: in

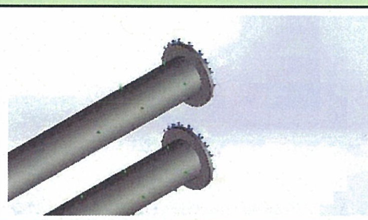
Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	-0.0541324	32112.5	-5497.07	32579.6
Reaction Moment(lbf·in)	0	0	0	0

Constraint name	Constraint Image	Constraint Details
On Cylindrical Faces-2		Entities: 1 face(s) Type: On Cylindrical Faces Translation: 0, ---, --- Units: in

Resultant Forces

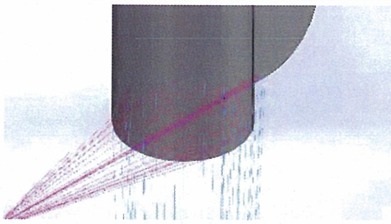
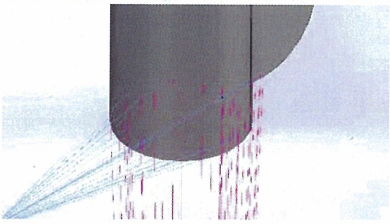
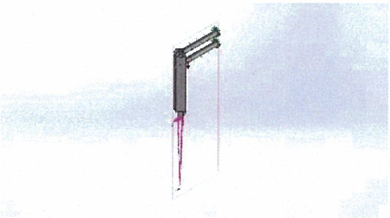
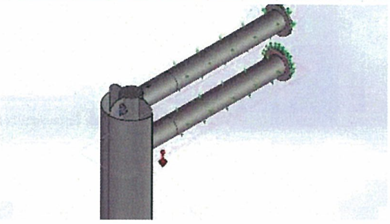
Components	X	Y	Z	Resultant
Reaction force(lbf)	0.0348302	-36139.9	-251.496	36140.8
Reaction Moment(lbf·in)	0	0	0	0

Constraint name	Constraint Image	Constraint Details
Fixed-3		Entities: 2 face(s) Type: Fixed Geometry

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	-150000	236.112	-56.8151	150000
Reaction Moment(lbf·in)	0	0	0	0

Table 7-9 Loads REA pulling parallel to the B-cell wall

Load name	Load Image	Load Details
Remote Load (Direct transfer)-1		Entities: 1 face(s) Type: Load (Direct transfer) Coordinate System: Excavator Dig Force Values: ---, 3792, --- lbf Moment Values: ---, ---, --- lbf·in Reference coordinates: 0 0 0 in Components transferred: Force
Remote Load (Direct transfer)-2		Entities: 1 face(s) Type: Load (Direct transfer) Coordinate System: Global cartesian coordinates Force Values: ---, ---, 2200 lbf Moment Values: ---, ---, --- lbf·in Reference coordinates: -19 0 120 in Components transferred: Force
Force-3		Entities: 2 face(s), 1 plane(s) Reference: Top Assy Type: Apply force Values: 75000, ---, --- lbf
Gravity-1		Reference: Front Assy Values: 0 0 386.22 Units: English (IPS)

7.1.5 Contact Information

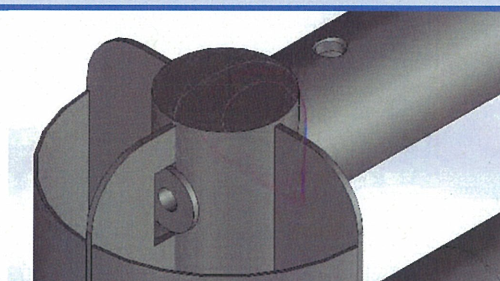
In order to properly model the REA support assembly, various contact conditions were implemented. These are given below in Table 7-10.

Table 7-10 Contact Information

Contact	Contact Image	Contact Properties
Contact Set-1		Type: No Penetration contact pair Entites: 2 face(s) Friction Value: 0.74 Advanced: Surface to surface

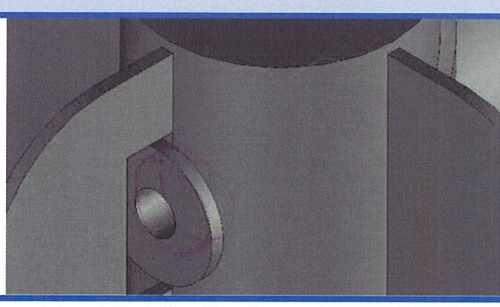
Contact/Friction forces

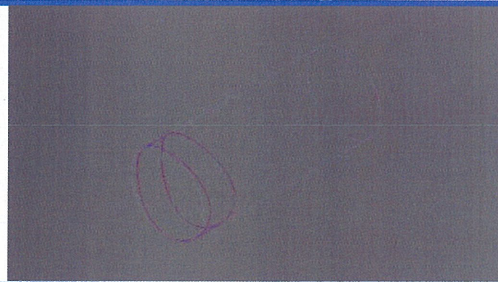
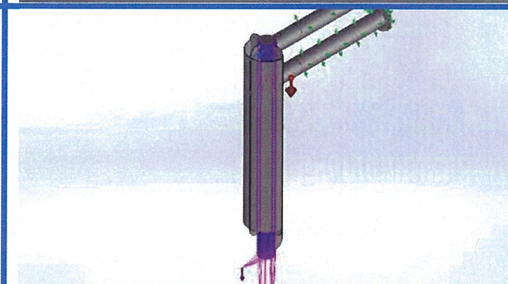
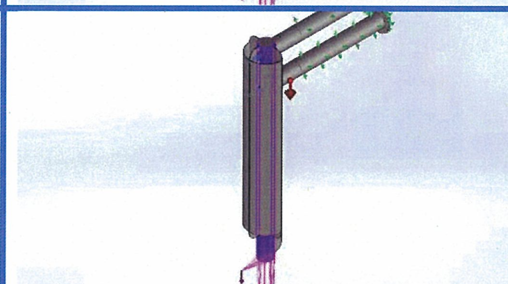
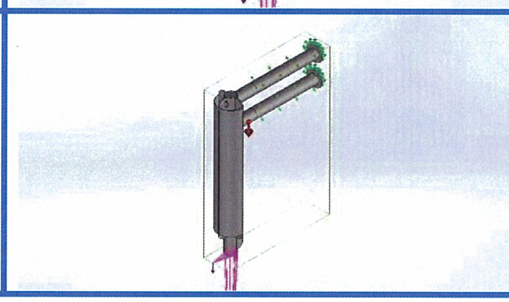
Components	X	Y	Z	Resultant
Contact Force(lbf)	1.0612E-010	-2.4536E-012	-2.2363E-014	1.0614E-010
Friction Force(lbf)	1.0376E-011	-6.645E-013	1.7635E-012	1.0546E-011

Contact	Contact Image	Contact Properties
Contact Set-4		Type: No Penetration contact pair Entites: 2 face(s) Friction Value: 0.74 Advanced: Surface to surface

Contact/Friction forces

Components	X	Y	Z	Resultant
Contact Force(lbf)	-6.7473E-012	-1.2012E-012	4.8194E-015	6.8534E-012
Friction Force(lbf)	-1.0431E-011	-2.5558E-013	6.0061E-013	1.0452E-011

Contact	Contact Image	Contact Properties
Contact Set-5		Type: Bonded contact pair Entites: 2 face(s)

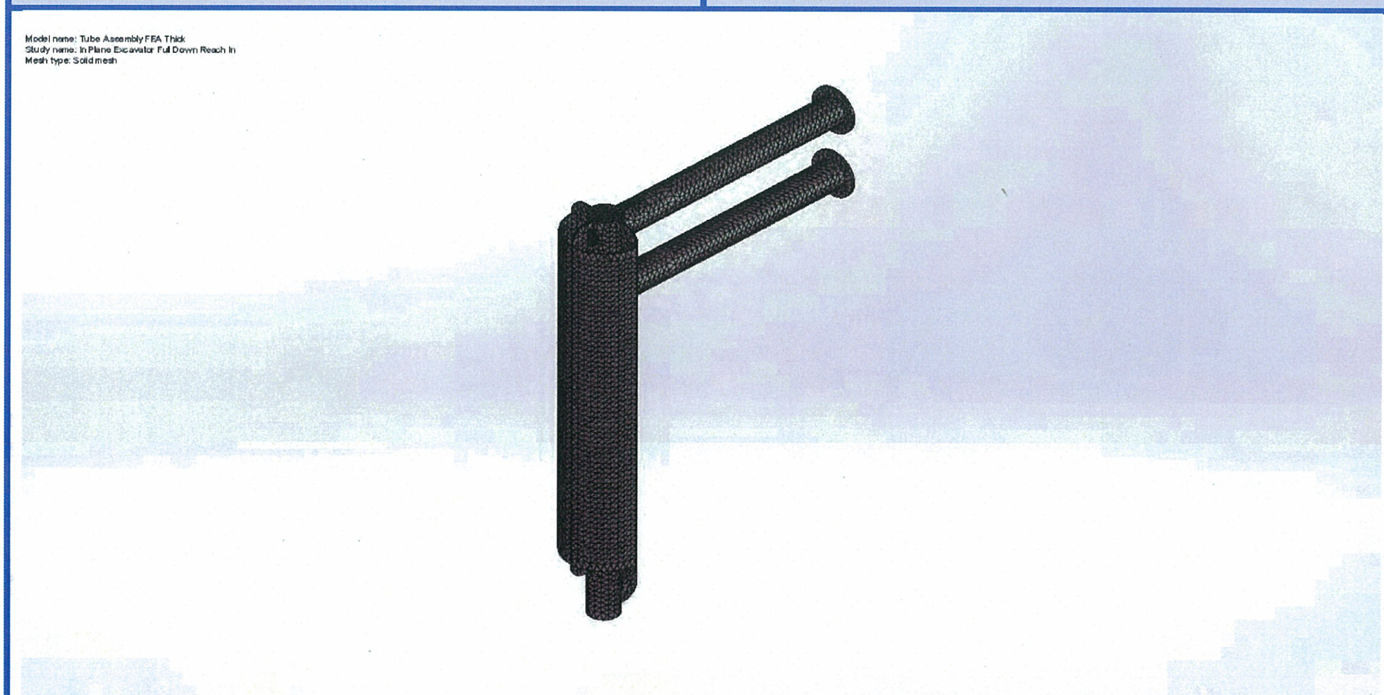
Contact	Contact Image	Contact Properties
Contact Set-6		Type: Bonded contact pair Entites: 2 face(s)
Contact Set-7		Type: Bonded contact pair Entites: 2 face(s)
Contact Set-8		Type: Bonded contact pair Entites: 2 face(s)
Global Contact		Type: Bonded Components: 1 component(s) Options: Compatible mesh

7.1.6 Mesh Information

A solid mesh was used to model the components of the REA support assembly. The mesh details are given below in Table 7-11.

Table 7-11 Mesh Details

Mesh type	Solid Mesh
Mesher Used:	Curvature based mesh
Jacobian points	4 Points
Maximum element size	0 in
Minimum element size	0 in
Mesh Quality	High
Remesh failed parts with incompatible mesh	On
Total Nodes	63465
Total Elements	31854
Maximum Aspect Ratio	107.73
% of elements with Aspect Ratio < 3	47.5
% of elements with Aspect Ratio > 10	1.14
% of distorted elements(Jacobian)	0
Time to complete mesh(hh;mm;ss):	00:00:06
Computer name:	9XSOHO2



7.1.7 Simulation Results

The simulation results for each of the three excavator load directions are presented in the following tables below.

- REA support Assembly REA pulling towards the B-cell wall.

  The maximum stress of 37.4ksi occurs in the vertical tube insert on the lower horizontal tube. An Iso-clipping image is provided in Figure 7-1 and Figure 7-2 to show the affected area. The stress shown is the result of the combination of the bolt pretension and the prying action that occurs when the REA pulls towards the B-cell wall. In this instance, the top horizontal tube is subjected to very little loading because the excavator force is relieving the bolt preload in the joint. Conversely the lower horizontal tube resists additional compressive force from the prying action caused by the REA and the bolt pretension. The areas shown in red in the horizontal tube are in excess of 25ksi, however, they are below the yield strength of 50ksi. These are compressive stresses that occur at extreme edges of elements within the model and are not a cause for concern. Many codes and standards provide for higher allowable stresses in compression. Also, this analysis is based on the worst load case. It is estimated that the number cycles these components see will be low (several thousand) and most will be a levels considerably less than that analyzed.

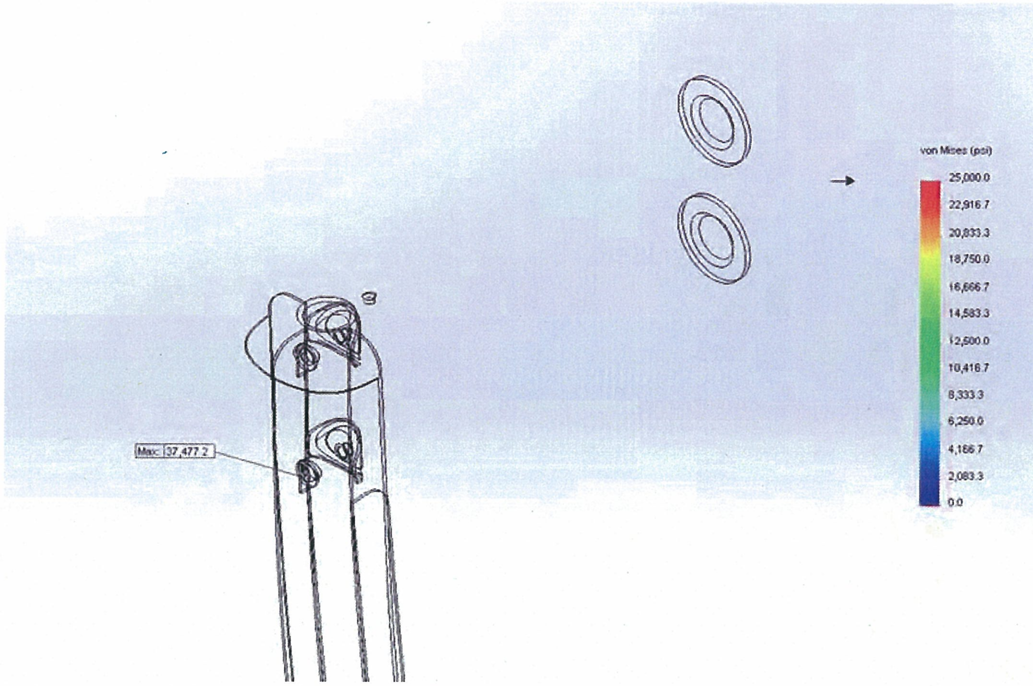


Figure 7-1 Iso Clipping Max Von-Mises In

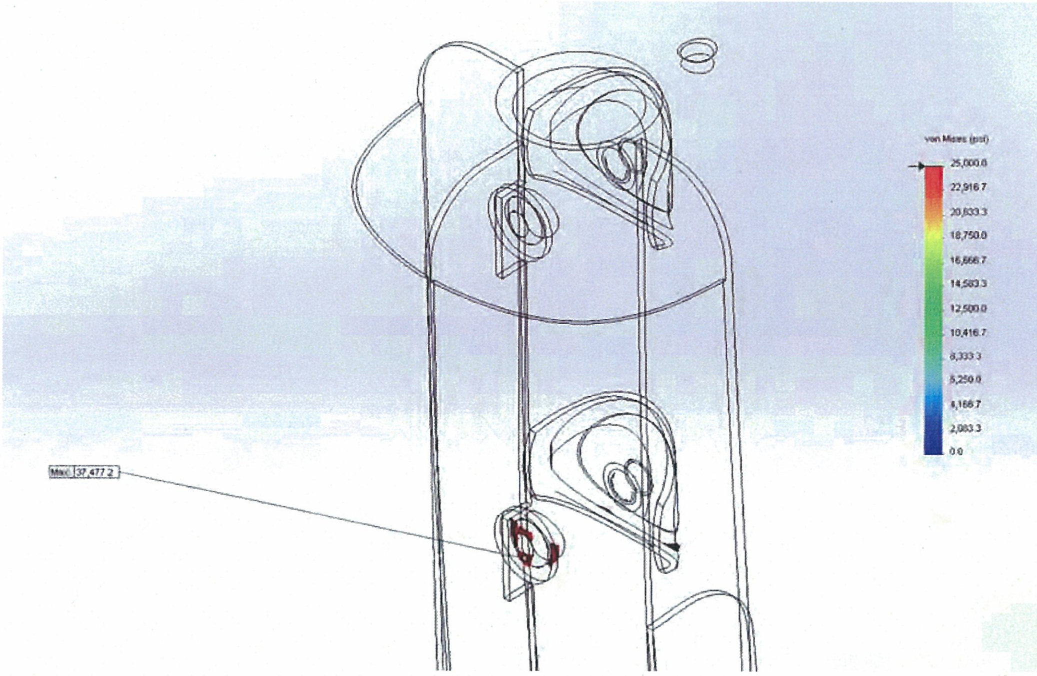


Figure 7-2 Iso Clipping Max Von Mises In Zoom

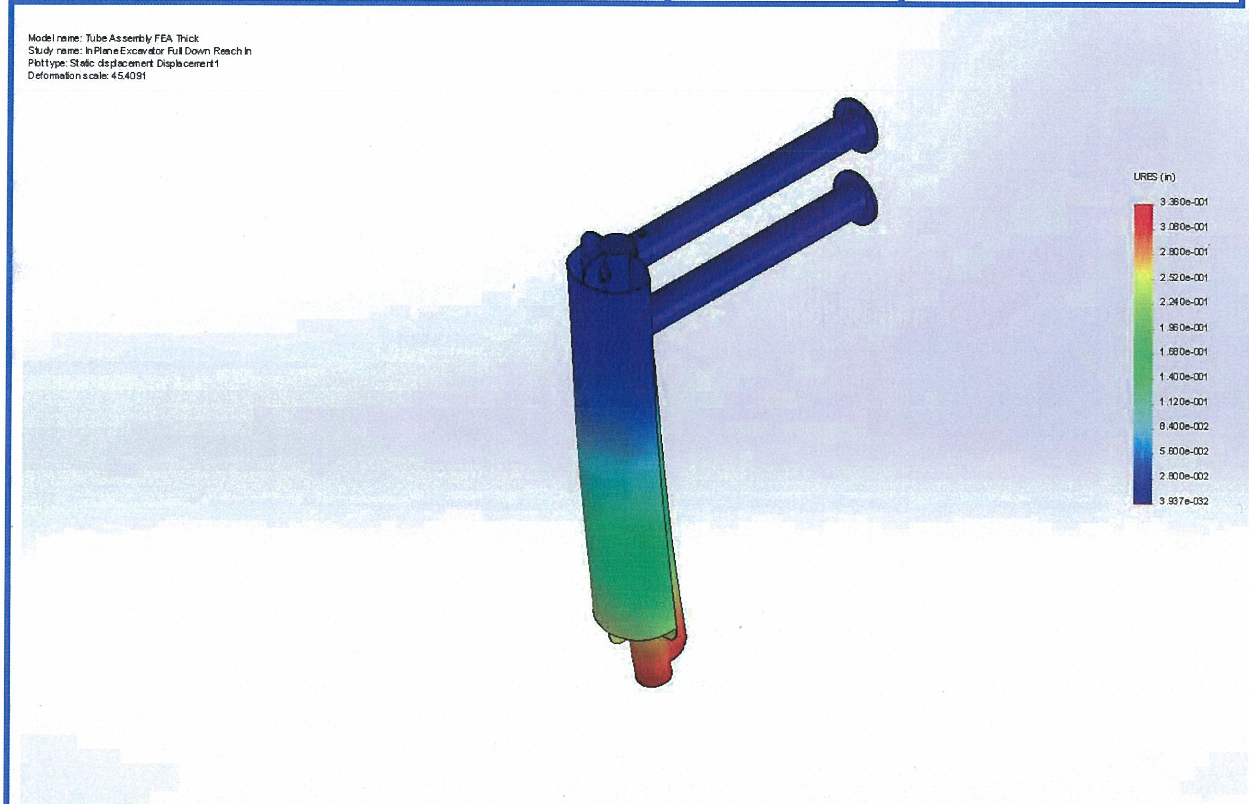
Table 7-12 Von-Mises Stress in REA support Assembly towards B-cell wall

Name	Type	Min	Max
Stress1	Von Mises Stress	2.64763 psi Node: 17140	37477.2 psi Node: 63033

Tube Assembly FEA Thick-In Plane Excavator Full Down Reach In-Stress-Stress1

Table 7-13 Total Deflection in REA support Assembly towards B-cell wall

Name	Type	Min	Max
Displacement1	Resultant Displacement	0 in Node: 16540	0.335996 in Node: 19657



Tube Assembly FEA Thick-In Plane Excavator Full Down Reach In-Displacement-Displacement1

- REA support Assembly REA pulling away from the B-cell wall.

The maximum stress of 31.8ksi occurs in the vertical tube insert at the top horizontal tube. An Iso-clipping image is provided in Figure 7-3 and Figure 7-4 to show the affected area. The stress shown is the result of the combination of the bolt pretension and the prying action that occurs when the REA pulls away from the B-cell wall. In this instance, the bottom horizontal tube is subjected to very little loading because the excavator force is relieving the bolt preload in the joint. However, the upper horizontal tube resists additional compressive force from the prying action caused by the REA and the bolt pretension. The areas shown in red in the horizontal tube and the reinforcement fin are in excess of 25ksi, however, they are below the yield strength of 50ksi. These are compressive stresses that occur at extreme edges of elements within the model and are not a cause for concern. Many codes and standards provide for higher allowable stresses in compression. Also, this analysis is based on the worst load case. It is estimated that the number cycles these components see will be low (several thousand) and most will be a levels considerably less than that analyzed.

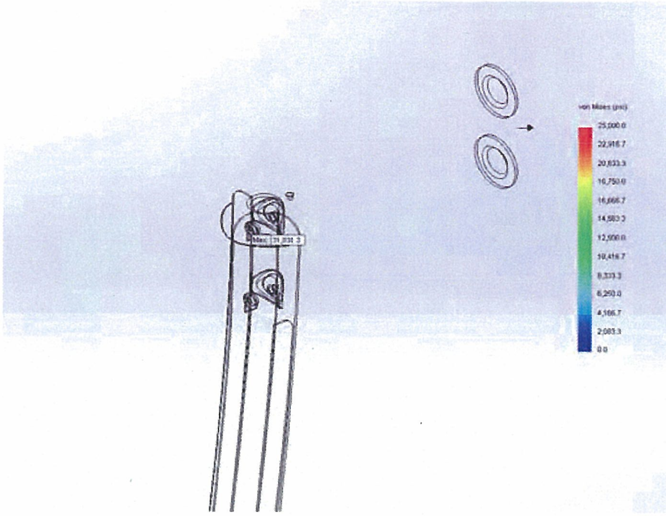


Figure 7-3 Iso Clipping Max Von-Mises Out

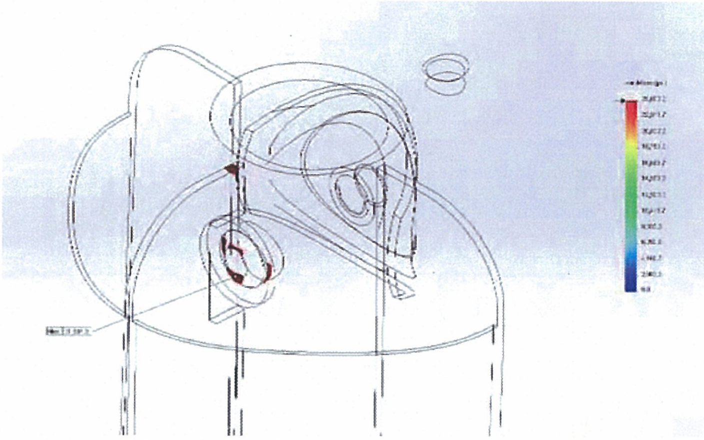
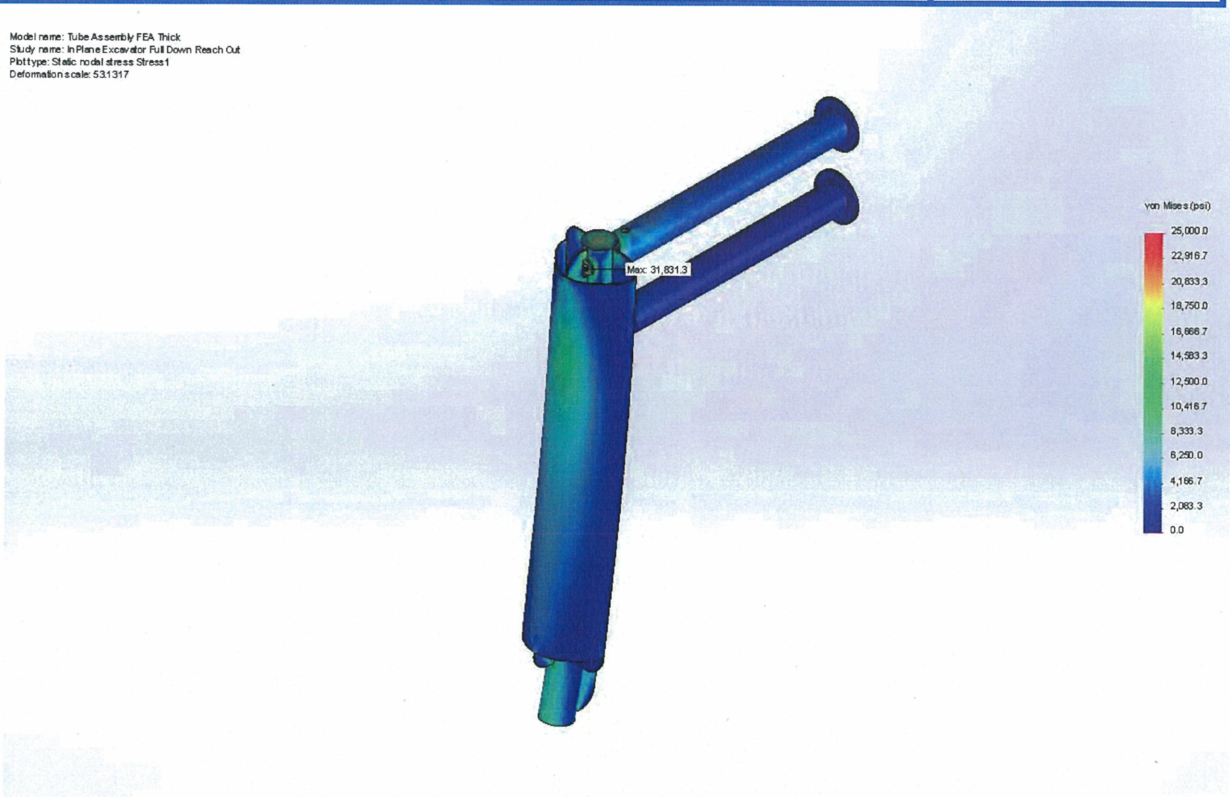


Figure 7-4 Iso Clipping Max Von Mises Out Zoom

Table 7-14 Von-Mises Stress in REA support Assembly away from B-cell wall

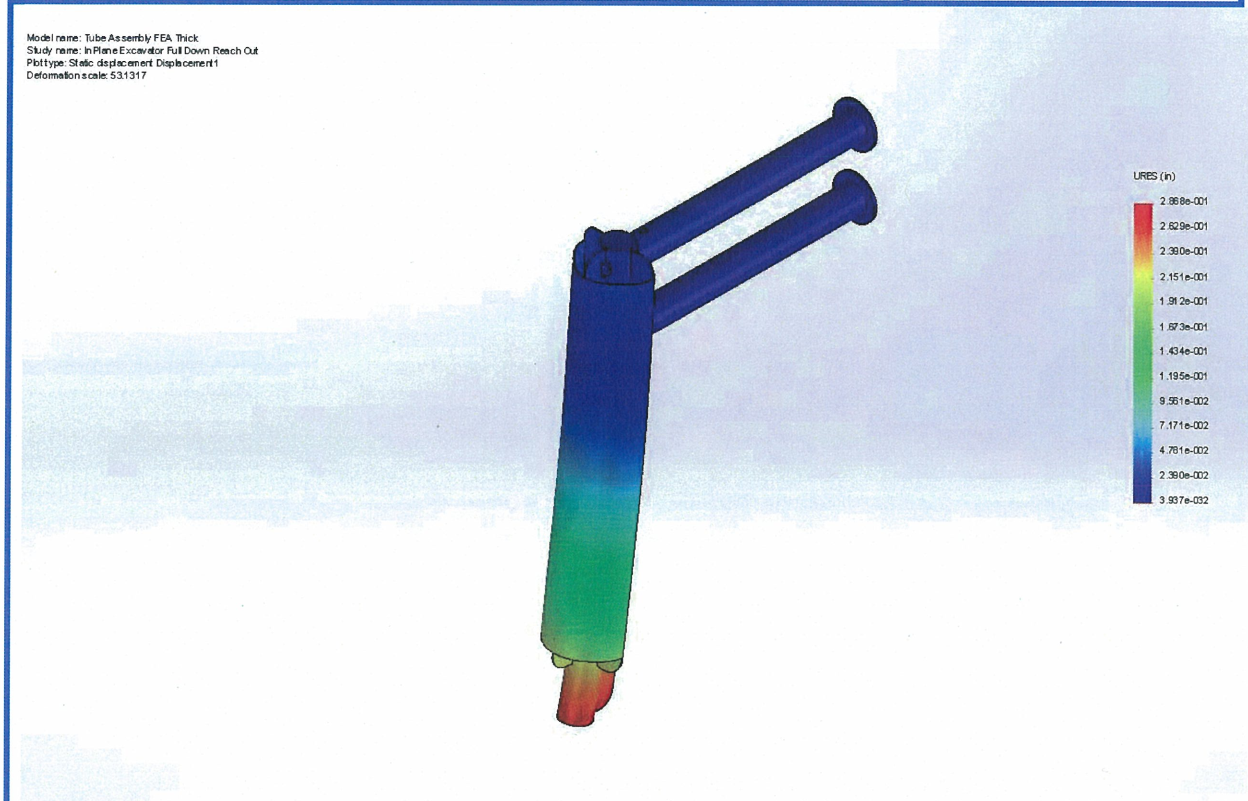
Name	Type	Min	Max
Stress1	Von Mises Stress	2.74192 psi Node: 17631	31831.3 psi Node: 62118



Tube Assembly FEA Thick-In Plane Excavator Full Down Reach Out-Stress-Stress1

Table 7-15 Total Deflection in REA support Assembly away from B-cell wall

Name	Type	Min	Max
Displacement1	Resultant Displacement	0 in Node: 16540	0.286832 in Node: 19657



Tube Assembly FEA Thick-In Plane Excavator Full Down Reach Out-Displacement-Displacement1

- REA support Assembly REA pulling parallel to the B-cell wall.

  The maximum stress of 31.7ksi occurs in the vertical tube insert at the lower horizontal tube. An Iso-clipping image is provided in Figure 7-5 and Figure 7-6 to show the affected area. In this case, both horizontal tubes are able to share the load and the prying action is reduced. However, the prying action is not completely eliminated causing the stress to be slightly higher in the lower horizontal tube. The areas shown in red are in excess of 25ksi, however, they are below the yield strength of 50ksi. These are compressive stresses that occur at extreme edges of elements within the model and are not a cause for concern. Many codes and standards provide for higher allowable stresses in compression. Also, this analysis is based on the worst load case. It is estimated that the number cycles these components see will be low (several thousand) and most will be a levels considerably less than that analyzed.

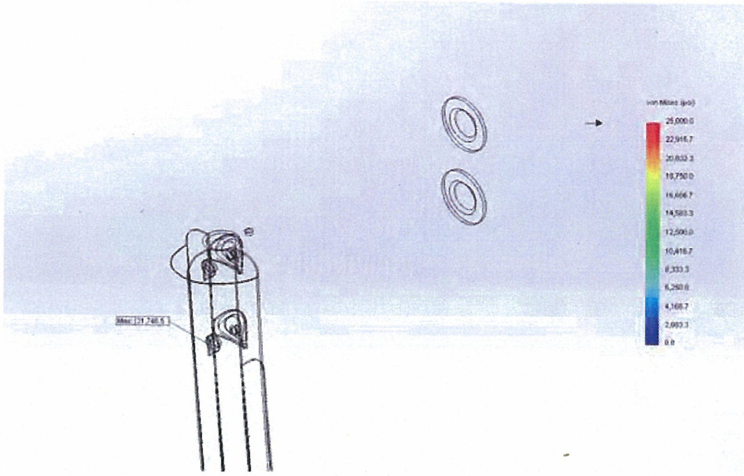


Figure 7-5 Iso Clipping Max Von Mises Parallel

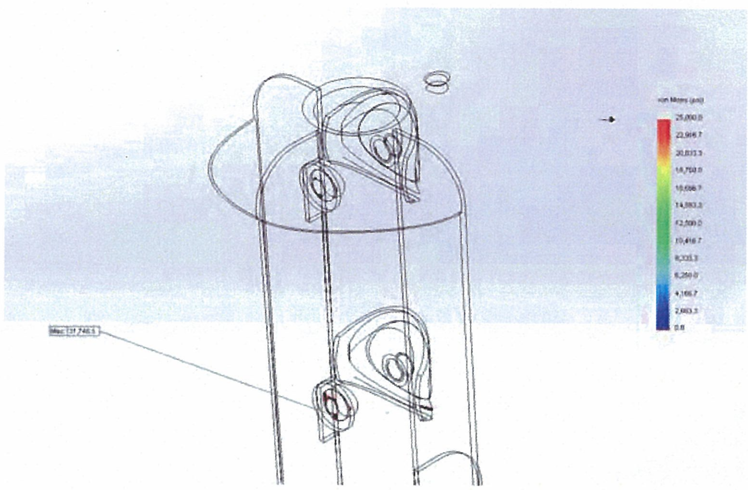
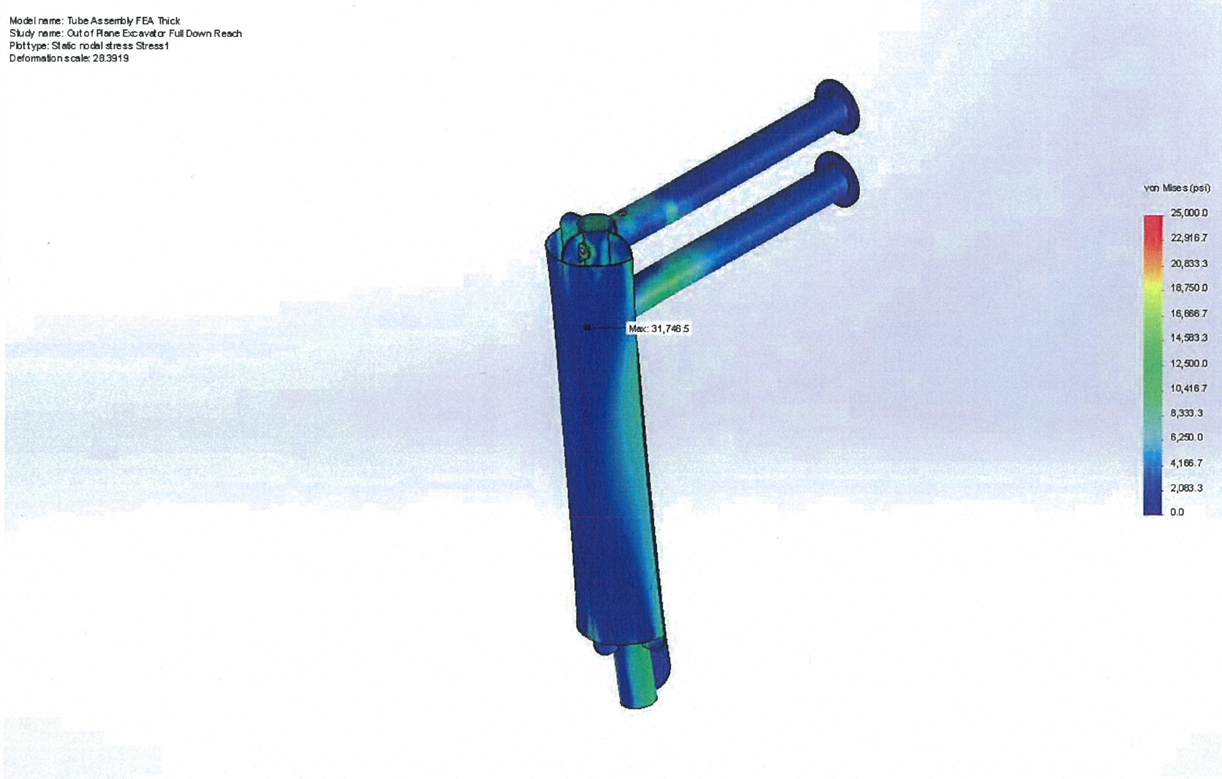


Figure 7-6 Iso Clipping Max Von Mises Parallel Zoom

Table 7-16 Von-Mises Stress in REA support Assembly parallel to B-cell wall

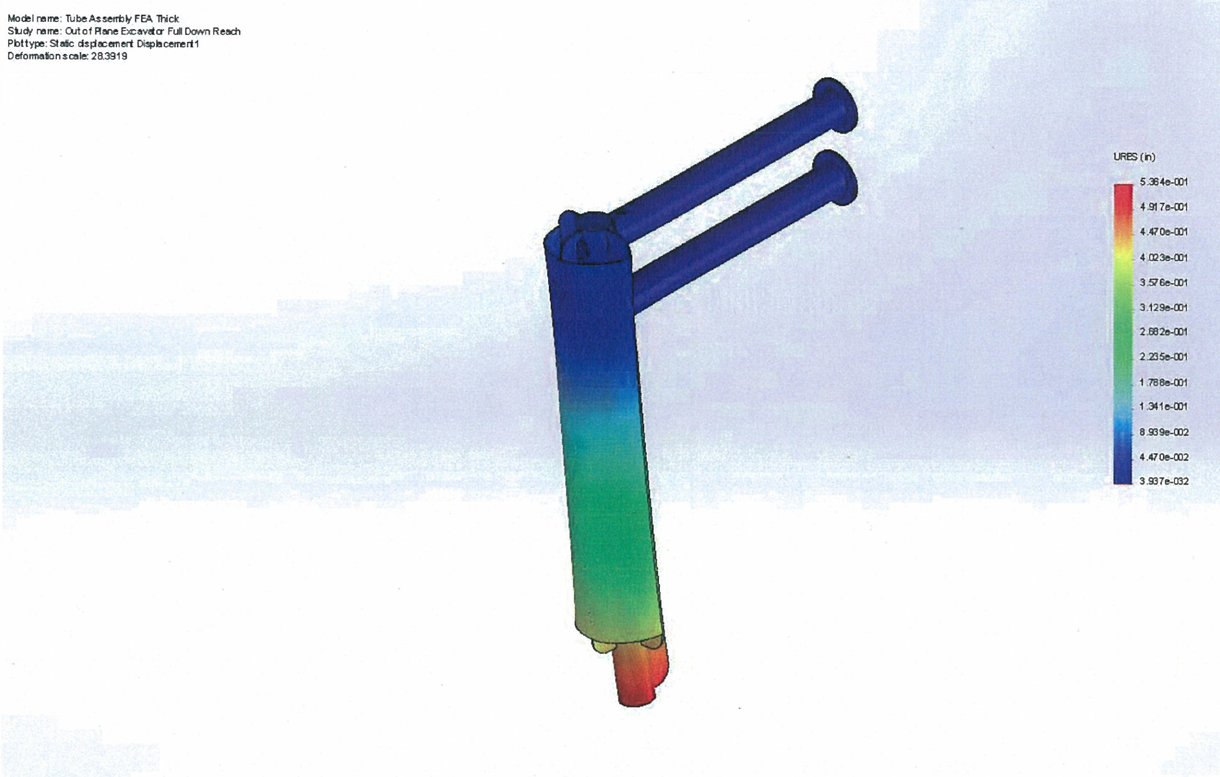
Name	Type	Min	Max
Stress1	Von Mises Stress	6.25522 psi Node: 17140	31746.5 psi Node: 63033



Tube Assembly FEA Thick-Out of Plane Excavator Full Down Reach-Stress-Stress1

Table 7-17 Total Deflection in REA support Assembly parallel to B-cell wall

Name	Type	Min	Max
Displacement1	Resultant Displacement	0 in Node: 16540	0.536362 in Node: 19657



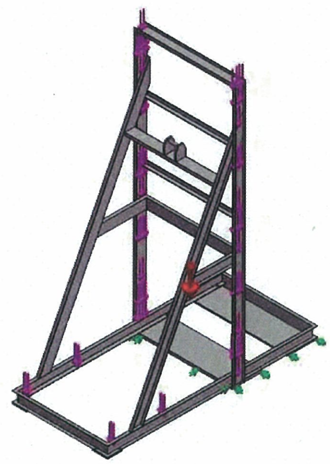
Tube Assembly FEA Thick-Out of Plane Excavator Full Down Reach-Displacement-Displacement1

7.2 Transfer Barrier Frame

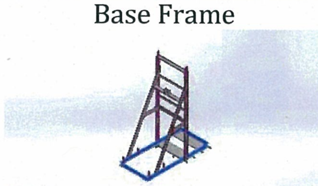
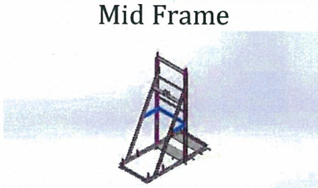
7.2.1 Model Information

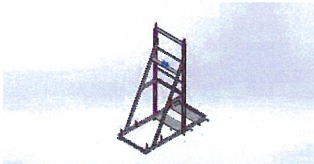
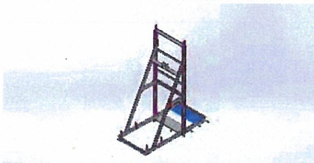
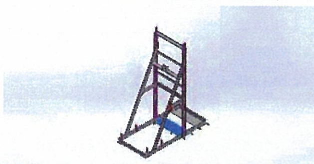
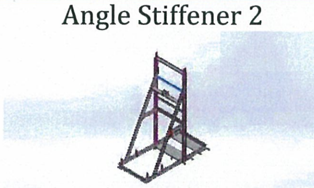
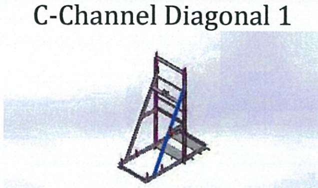
The mass and volume properties are given for each of the components that were included in the transfer barrier frame FEA simulation. These are shown in Table 7-18 below.

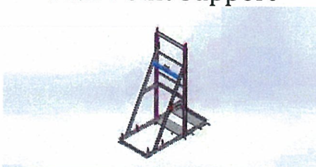
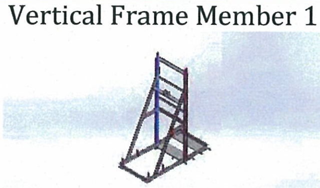
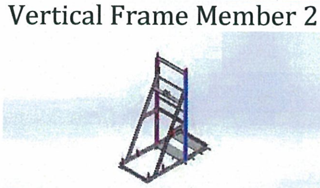
Table 7-18 Component Information for Transfer Barrier



Model name: Transfer Barrier FEA
Current Configuration: Default

Solid Bodies		
Document Name and Reference	Treated As	Volumetric Properties
Base Frame 	Solid Body	Mass:447.547 lb Volume:1588.21 in^3 Density:0.281793 lb/in^3 Weight:447.243 lbf
Mid Frame 	Solid Body	Mass:141.444 lb Volume:501.942 in^3 Density:0.281793 lb/in^3 Weight:141.348 lbf

Pick Point 	Solid Body	Mass:47.6604 lb Volume:169.133 in^3 Density:0.281793 lb/in^3 Weight:47.6281 lbf
1" Thick Plate 	Solid Body	Mass:513.855 lb Volume:1823.52 in^3 Density:0.281793 lb/in^3 Weight:513.506 lbf
2" Thick Plate 	Solid Body	Mass:1027.71 lb Volume:3647.04 in^3 Density:0.281793 lb/in^3 Weight:1027.01 lbf
Angle Stiffener 1 	Solid Body	Mass:45.1749 lb Volume:160.313 in^3 Density:0.281793 lb/in^3 Weight:45.1443 lbf
Angle Stiffener 2 	Solid Body	Mass:45.1749 lb Volume:160.313 in^3 Density:0.281793 lb/in^3 Weight:45.1443 lbf
Angle Track 1 	Solid Body	Mass:96.0324 lb Volume:340.791 in^3 Density:0.281793 lb/in^3 Weight:95.9673 lbf
Angle Track 2 	Solid Body	Mass:96.0324 lb Volume:340.791 in^3 Density:0.281793 lb/in^3 Weight:95.9673 lbf
C-Channel Diagonal 1 	Solid Body	Mass:179.28 lb Volume:636.211 in^3 Density:0.281793 lb/in^3 Weight:179.158 lbf

C-Channel Diagonal 2 	Solid Body	Mass:179.28 lb Volume:636.211 in^3 Density:0.281793 lb/in^3 Weight:179.158 lbf
Pick Point Support 	Solid Body	Mass:67.9038 lb Volume:240.971 in^3 Density:0.281793 lb/in^3 Weight:67.8578 lbf
Top Cross Member 	Solid Body	Mass:72.3698 lb Volume:256.819 in^3 Density:0.281793 lb/in^3 Weight:72.3207 lbf
Vertical Frame Member 1 	Solid Body	Mass:198.408 lb Volume:704.09 in^3 Density:0.281793 lb/in^3 Weight:198.273 lbf
Vertical Frame Member 2 	Solid Body	Mass:198.408 lb Volume:704.09 in^3 Density:0.281793 lb/in^3 Weight:198.273 lbf
Corner Support Plate 1 	Solid Body	Mass:20.2891 lb Volume:72 in^3 Density:0.281793 lb/in^3 Weight:20.2753 lbf
Corner Support Plate 2 	Solid Body	Mass:20.2891 lb Volume:72 in^3 Density:0.281793 lb/in^3 Weight:20.2753 lbf

7.2.2 Study Properties

The setup and analysis controls for the FEA are listed below in Table 7-19 below. The FEA used a static study on a solid mesh.

Table 7-19 FEA Properties

Study name	Cart Load
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	77 Fahrenheit
Include fluid pressure effects from SolidWorks Flow Simulation	Off
Solver type	FFEPlus
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SolidWorks document (C:\Users\Jascha\Documents\324 Transfer Barrier Cart FEA)

7.2.3 Units

The unit system for the analysis is given below in Table 7-20.

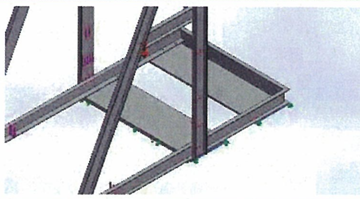
Table 7-20 Units

Unit system:	English (IPS)
Length/Displacement	in
Temperature	Fahrenheit
Angular velocity	Rad/sec
Pressure/Stress	psi

7.2.4 Loads and Constraints

Table 7-21 and Table 7-22 list the loads and constraints that were used to model the transfer barrier frame assembly. The loads and resultant forces are relative to the global coordinate system.

Table 7-21 Constraints

Constraint name	Constraint Image	Constraint Details
On Flat Faces-1		**Entities:** 4 face(s) **Type:** On Flat Faces **Translation:** ---, ---, 0 **Units:** in

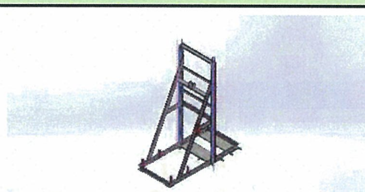
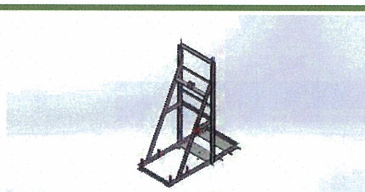
Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	0.000168943	0.000365244	-421.57	421.57
Reaction Moment(lbf·in)	0	0	0	0

Constraint name	Constraint Image	Constraint Details
On Flat Faces-2		**Entities:** 1 face(s) **Type:** On Flat Faces **Translation:** ---, ---, 0 **Units:** in

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	9.03492	0.000913292	2664.45	2664.47
Reaction Moment(lbf·in)	0	0	0	0

Constraint name	Constraint Image	Constraint Details
Virtual wall-8		**Type:** Virtual wall **Entites:** 2 face(s), 1 plane(s) **Wall Type:** Rigid **Axial Stiffness:** 0(N/m)/m^2 **Tangential Stiffness:** 0(N/m)/m^2
Virtual wall-9		**Type:** Virtual wall **Entites:** 1 face(s), 1 plane(s) **Wall Type:** Rigid **Axial Stiffness:** 0(N/m)/m^2 **Tangential Stiffness:** 0(N/m)/m^2

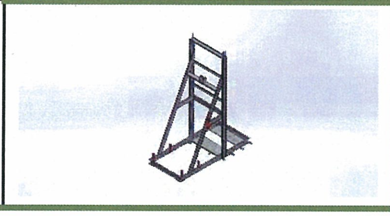
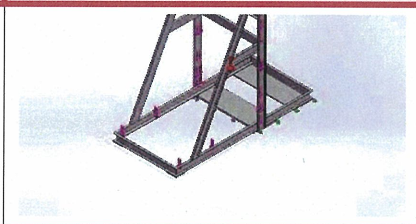
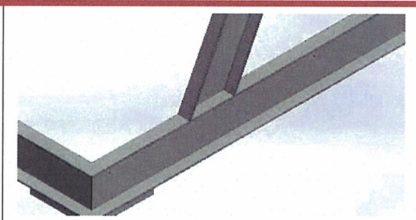
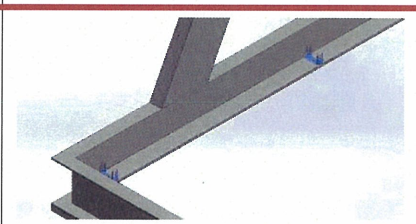
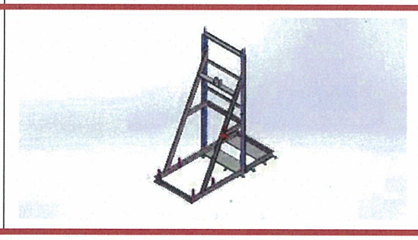
Constraint name	Constraint Image	Constraint Details
Virtual wall-10		**Type:** Virtual wall **Entites:** 1 face(s), 1 plane(s) **Wall Type:** Rigid **Axial Stiffness:** 0(N/m)/m^2 **Tangential Stiffness:** 0(N/m)/m^2

Table 7-22 Loads

Load name	Load Image	Load Details
Gravity-1		**Reference:** Top Assy **Values:** 0 0 -386.22 **Units:** English (IPS)
Force-3		**Entities:** 2 face(s) **Type:** Apply normal force **Value:** 2000 lbf
Force-4		**Entities:** 2 face(s) **Type:** Apply normal force **Value:** 2000 lbf
Force-5		**Entities:** 2 face(s), 1 plane(s) **Reference:** Top Assy **Type:** Apply force **Values:** ---, ---, -2600 lbf

7.2.5 Contact Information

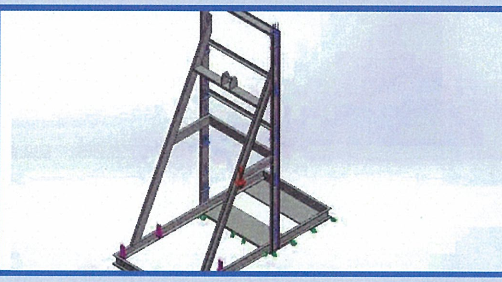
The transfer barrier frame assembly was modeled as a weldment. All contacts in this model were set to bonded to reflect this. These are given below in Table 7-23.

Table 7-23 Contacts Information

Contact	Contact Image	Contact Properties
Contact Set-1		**Type:** Bonded contact pair **Entites:** 3 face(s)

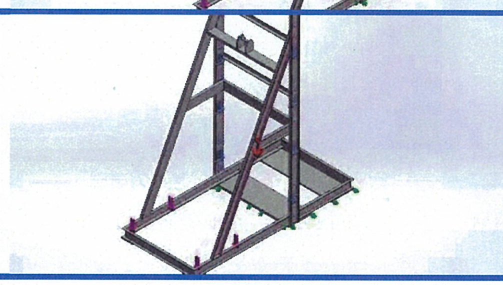
Contact/Friction forces

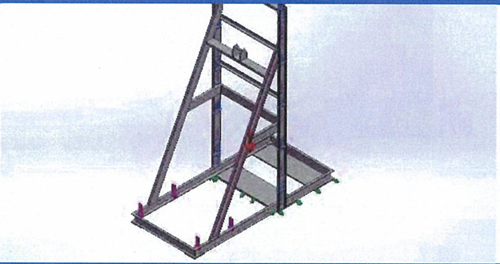
Components	X	Y	Z	Resultant
Contact Force(lbf)	0	0	-947.54	947.54

Contact	Contact Image	Contact Properties
Contact Set-2		**Type:** Bonded contact pair **Entites:** 3 face(s)

Contact/Friction forces

Components	X	Y	Z	Resultant
Contact Force(lbf)	0	0	-988.37	988.37

Contact	Contact Image	Contact Properties
Contact Set-3		**Type:** Bonded contact pair **Entites:** 2 face(s)
Contact Set-4		**Type:** Bonded contact pair **Entites:** 2 face(s)

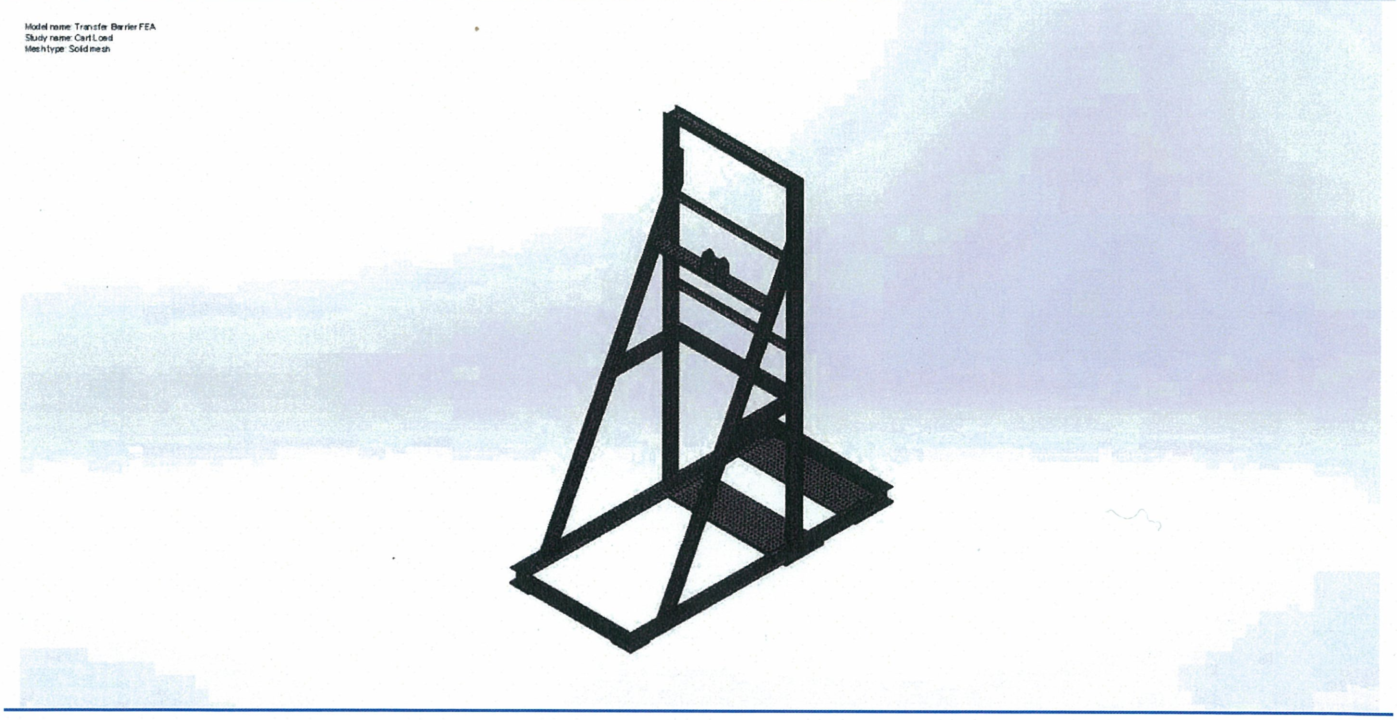
Contact	Contact Image	Contact Properties
Contact Set-5		**Type:** Bonded contact pair **Entites:** 2 face(s)
Contact Set-6		**Type:** Bonded contact pair **Entites:** 2 face(s)
Global Contact		**Type:** Bonded **Components:** 1 component(s) **Options:** Compatible mesh

7.2.6 Mesh Information

A solid mesh was used to model the components of the transfer barrier frame assembly. The mesh details are given below in Table 7-24.

Table 7-24 Mesh Details

Mesh type	Solid Mesh
Mesher Used:	Curvature based mesh
Jacobian points	4 Points
Maximum element size	0 in
Minimum element size	0 in
Mesh Quality	High
Remesh failed parts with incompatible mesh	Off
Total Nodes	63619
Total Elements	29995
Maximum Aspect Ratio	43.294
% of elements with Aspect Ratio < 3	15.8
% of elements with Aspect Ratio > 10	20.7
% of distorted elements(Jacobian)	0
Time to complete mesh(hh;mm;ss):	00:00:05
Computer name:	9XSOHO2

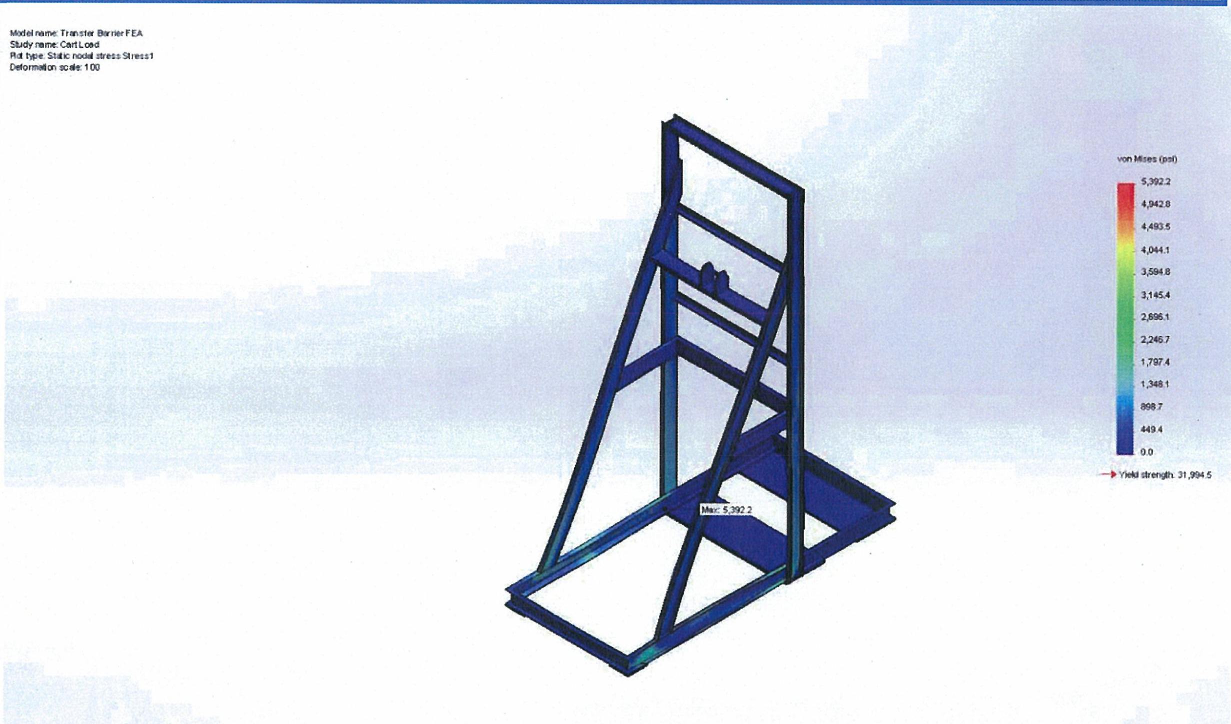


7.2.7 Simulation Results

The maximum Von-Mises stress in the transfer barrier frame was 5.4ksi. This stress is ~1/6th the yield strength of the mild steel used in the simulation. Table 7-26 shows a severely deformed model of the transfer barrier frame. This is unrealistic, however, it is beneficial for showing the movement tendencies of the transfer barrier frame as it is loaded by the waste container.

Table 7-25 Von-Mises Stress in Transfer Barrier Frame Assembly

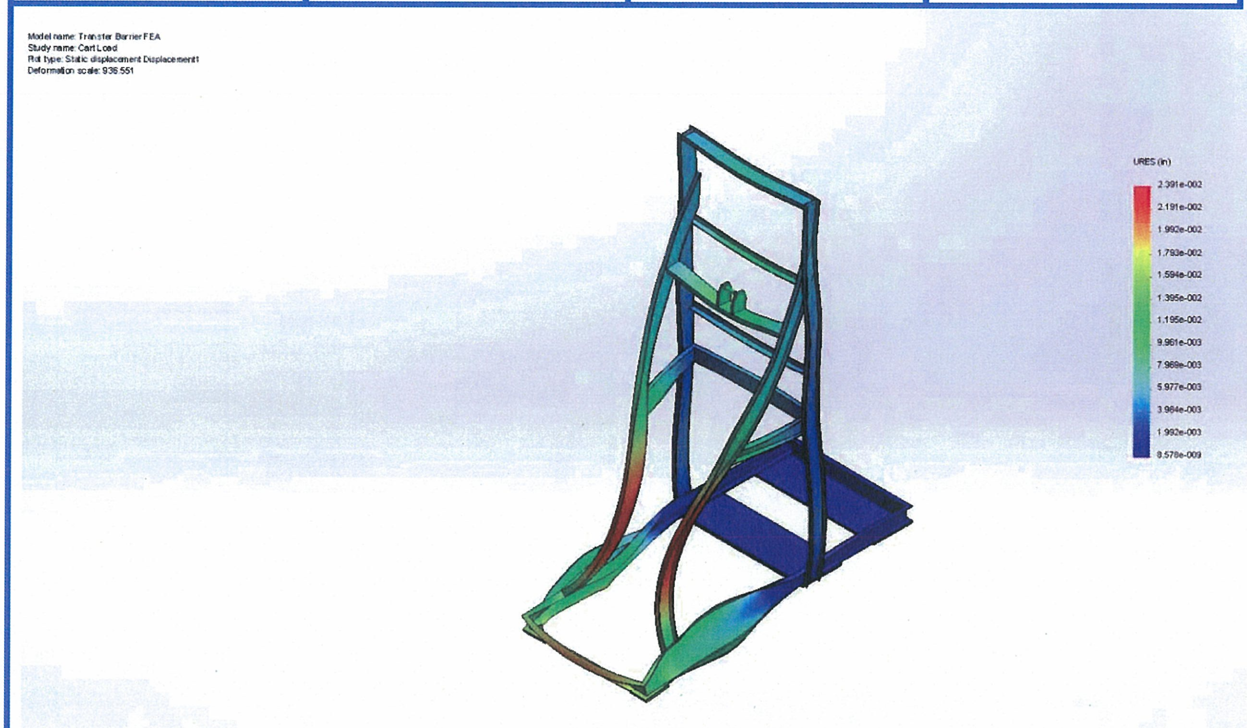
Name	Type	Min	Max
Stress1	Von Mises Stress	0.0135278 psi Node: 19813	5392.17 psi Node: 54080



Transfer Barrier FEA-Cart Load-Stress-Stress1

Table 7-26 Total Deflection in Transfer Barrier Frame

Name	Type	Min	Max
Displacement1	Resultant Displacement	8.5778e-009 in Node: 28741	0.0239065 in Node: 35119



Transfer Barrier FEA-Cart Load-Displacement-Displacement1

8.0 Conclusions/Recommendations

8.1 REA support Assembly

The vertical tube inserts were assumed to be made of AISI 1020 cold rolled steel with a yield strength of 50ksi. In order to meet the design factor of 2 for the vertical tube inserts, these components will be made of a higher strength steel, perhaps 12L14 cold rolled steel with a yield strength of 70 ksi. There were a couple of locations in the REA assembly that displayed single elements with stresses exceeding the design factor of 2. These stresses are all found in the throat of the horizontal tubes where they make contact with the vertical tube. In FEA, areas of contact between components tend to show stress concentrations as the distances between elements become smaller. Because the high stresses observed in this analysis were only seen in singular elements, and because they were less than yield, it is safe to assume that these stresses will not adversely affect the design. Also, this analysis is based on the worst load case. It is estimated that the number cycles these components see will be low (several thousand) and most will be a levels considerably less than that analyzed. The results of the REA support assembly analysis are acceptable based on a general design factor of 2.

8.2 Transfer Barrier Frame

The transfer barrier frame shows all stresses below 1/6th yield on the mild steel material used in the FEA. Therefore, the transfer barrier frame design is acceptable in its current state.

9.0 References

9.1.1 John Deere G-Series Compact Excavators Data Sheet

9.1.2 Solidworks 2013 Material Database

9.1.3 http://www.carbidedepot.com/formulas-frictioncoefficient.htm

KURION
Isolating Waste from the Environment

Calc. #: KUR-1782P-CALC-C001
Revision: 0 Page 1 of 32

Calculation Title: Support Structure Design for REA Proof of Principle Testing

Originator: R.S. Rast **Date:** 21May14 **Checker:** R. Rasmussen **Date:** 21May14

KURION
Isolating Waste from the Environment

Calc. #: KUR-1782P-CALC-C001
Revision: 0

Calculation Title: Support Structure Design for REA Proof of Principle Testing
Project Title: 300-296 Soil Remediation Project
Status: ☐ **In-Process** ☒ **Final**

Contains assumptions and/or inputs which require verification: ☐ **Yes** ☒ **No**

Calculation History

Revision #	Reason for Revision	Approvals/Date
0	Initial issue	Originator: R.S. Rast [signature] 21MAY2014 Checker: R. Rasmussen [signature] 5-21-14 PM: K. Quigley [signature] 5/22/14 Other: B. CARPENTER, PROJ. ENG. [signature] 5/22/14
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:

1.0 OBJECTIVE/PURPOSE

The purpose of this calculation is to perform structural analysis and design to support the testing of the Remote Excavator Arm (REA) for proof of principle testing to support the 300-296 Soil Remediation Project. The REA proof requires design of a support structure for operations testing. At this time, only the lower REA arm will be used on the designed support structure. In the event that this changes, the support structure is designed to accomodate Upper REA loads as well.

2.0 SUMMARY OF RESULTS AND CONCLUSIONS

The design of the support wall structure for the REA is controlled by stability. A 2000 psf bearing capacity is used to size the foundation. In addition to bearing capacity, the future accomodation of added weight to resist overturning is considered for sizing the left-hand side of the foundation.

The wall is 8-ft long, 16-ft tall, and 5-ft 4-in thick (B-cell dimension) supported on a 168-sq.ft., 2-ft thick foundation.

The results and conclusions of this calculation are as follows:

- The design of the supporting reinforced concrete wall is governed by ACI minimum steel required for the 64-inch thick wall
- Wall Column Demand to Capacity Ratios are less than 0.75
- Controlling Foundation Demand to Capacity Ratio is 0.6 for flexure
- The wall stability is suitable for the intended function

The REA Testing Support Structure has sufficient design capacity for the anticpated loading. The foundation supporting the REA structure design meets American Concrete Institute (ACI) requirements.

3.0 INTRODUCTION/BACKGROUND

There is a need to structurally support the installation and operation of the REA during a proof of principle mockup test. This calculation supports the design and installation of the REA Wall and Foundation structure at the mockup facility location. To support the cleanup mission of the 324 Building B-Cell, remote excavtors are to be used to remove contaminated soil. The REAs are modified John Deer excavator arms used for removing debris and soil and potentially lifting bags of excavated material.

The REAs require a support structure to support testing. The configuration of the REAs will closely match the design to be installed in the 324 Building B-cell. At the install locations, the B-cell walls are 64-inch thick reinforced concrete. This dimension is used as a basis for designing the support structure.
Additionally, the rebar spacing is controlled by the 12-inch diameter of the openings required to support the REAs.

4.0 INPUT DATA

Design inputs are based on the Conceptual Design Report (KUR-1782F-RPT-002). IBC 2012 is the code of record.

4.1 MATERIAL INPUTS

$\gamma_{steel} := 490pcf$	Unit weight - steel
$\gamma_{concrete} := 150pcf$	Unit weight - reinforced concrete
$E_{steel} := 29000ksi$	Modulus of Elasticity for steel
$f_y := 60ksi$	Yield stress of ASTM A615 Gr. 60 rebar
$f_c := 4000psi$	Specified 28 day concrete compressive strength

4.2 John Deere Excavator Data:

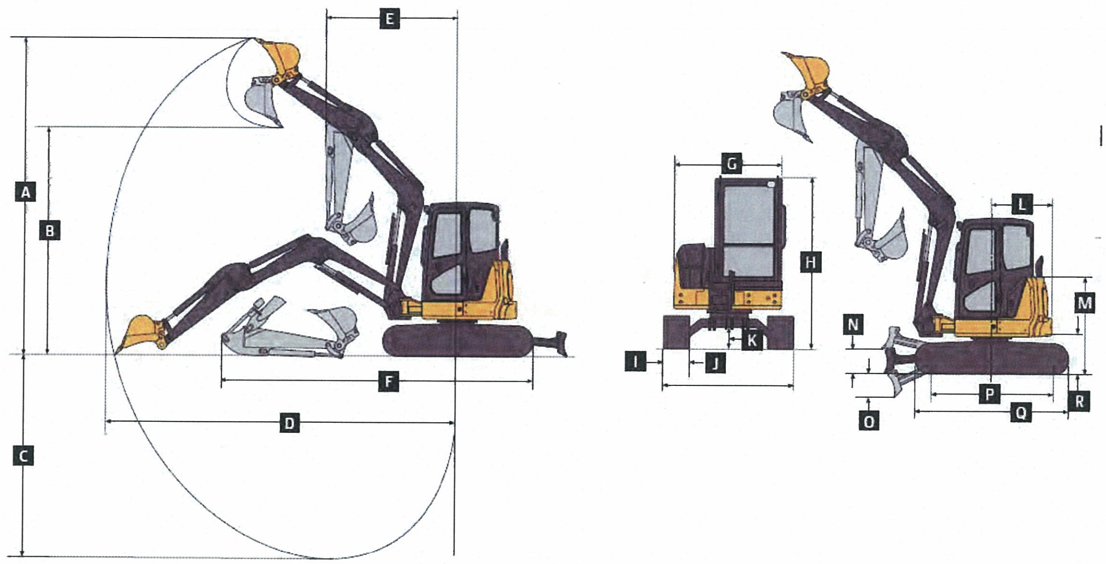


Figure 1 John Deere Excavator Geometry

35 G Excavator: Ref: Attachment 1

$D_{35G} := 18ft + 1in = 18.0833\ ft$ — Maximum Diggining Reach (Long Arm)

$P_{35G} := 5ft + 5in = 5.4167\ ft$ — Sprocket to Idler Distance

$LW_{35G} := 3307lbf$ — Maximum Lifting Weight (Long Arm, based on counterwight)

$Dig_{35G\_arm} := 4277lbf$ — Maximum force exerted based on arm (boom) articulation

$Dig_{35G\_bucket} := 6085lbf$ — Maximum force exerted based on bucket articulation

50 G Excavator: Ref: Attachment 2

$D_{50G} := 20ft + 6in = 20.5\ ft$ — Maximum Diggining Reach (Long Arm)

$P_{50G} := 6ft + 7in = 6.5833\ ft$ — Sprocket to Idler Distance

$LW_{50G} := 5456lbf$ — Maximum Lifting Weight (Long Arm, based on counterwight)

$Dig_{50G\_arm} := 5401lbf$ — Maximum force exerted based on arm (boom) articulation

$Dig_{50G\_bucket} := 8267lbf$ — Maximum force exerted based on bucket articulation

4.3 Remote Excavator Arm (REA) Data:

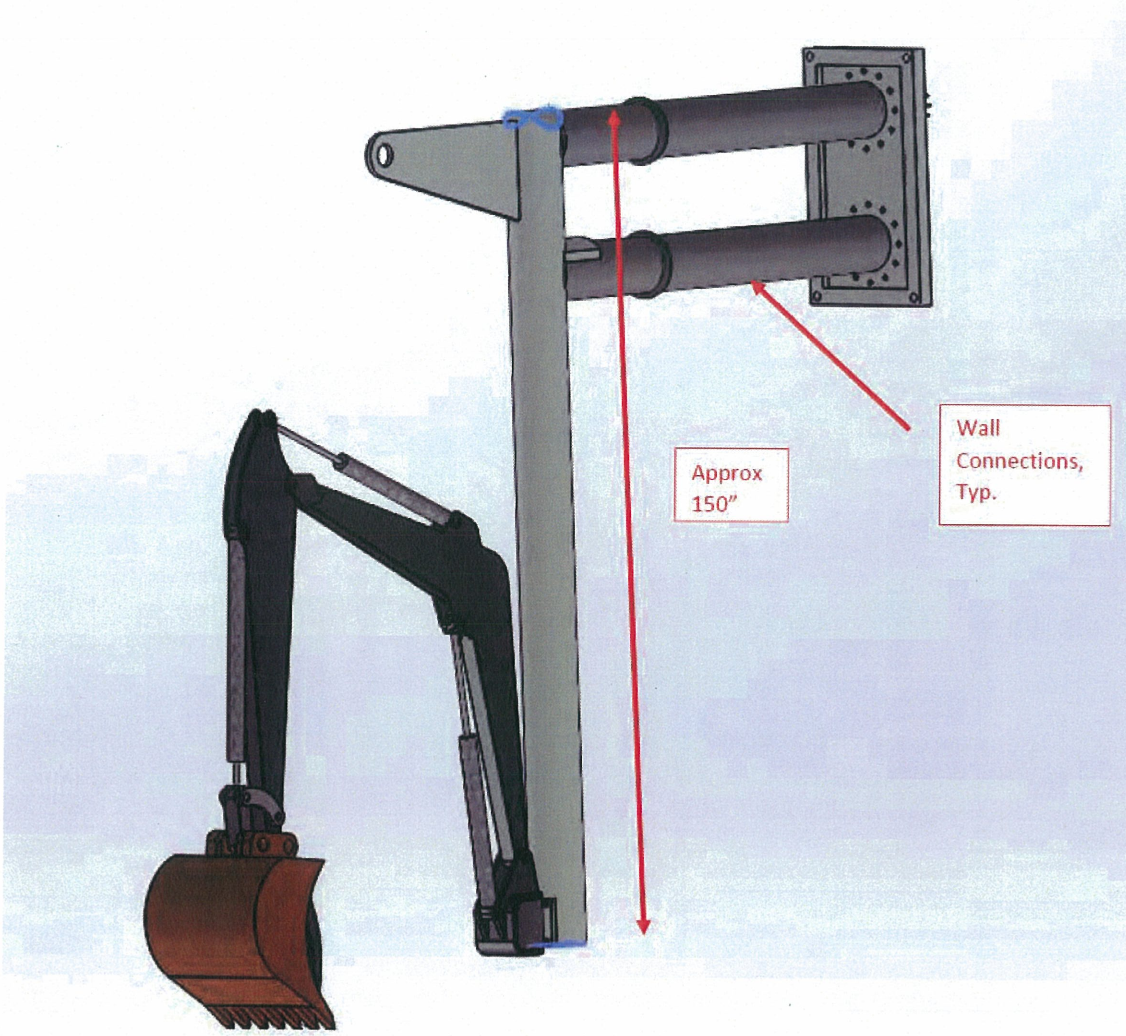


Figure 2 Lower REA Configuration

$L_{vertical} := 150in = 12.5\,ft$

Length of vertical lower REA support section

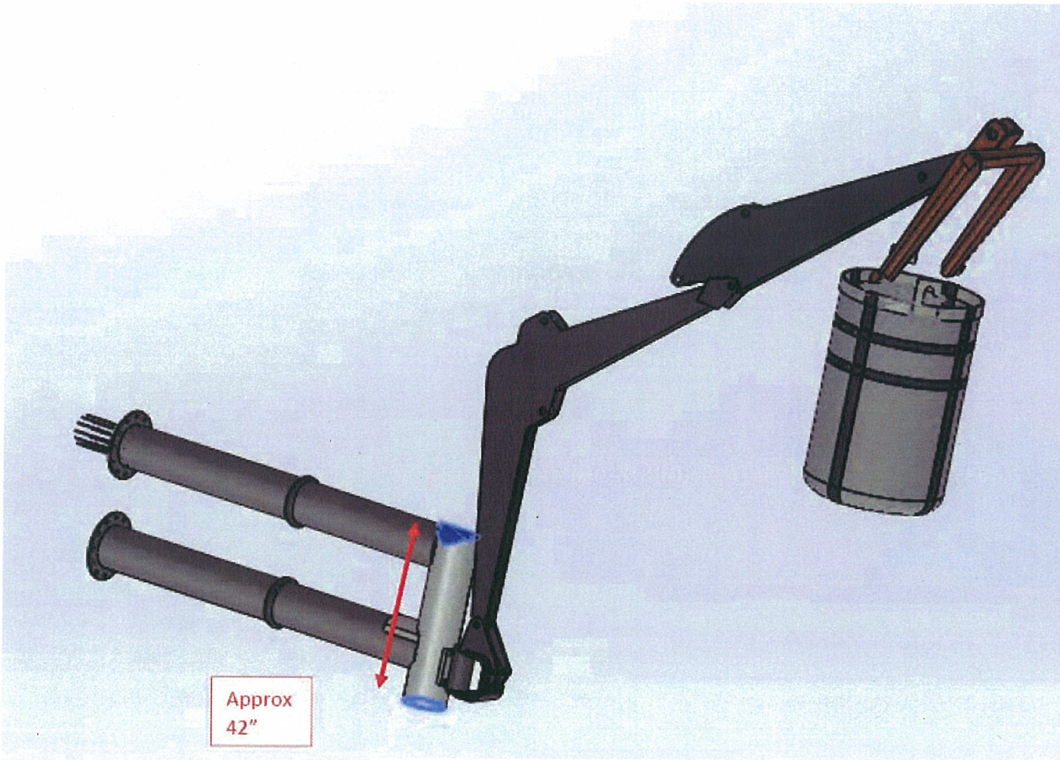


Figure 3 Upper REA Configuration

$L_{vertical2} := 42in$ Length of vertical upper REA support section

5. ASSUMPTIONS

There are no assumptions used in this calculation.

6. STRUCTURAL ANALYSIS

In accordance with the *Mockup Design Basis Requirements 300-296 Soil Remediation Project Phase I and II*, A-300-296-00113, the structural analysis and design is performed using American Society of Civil Engineers (ASCE) 7-10, *Minimum Design Loads for Buildings and other Structures* and American Institute of Steel Construction (AISC) 360-10, *Specification for Structural Steel Buildings,* and American Concrete Institute (ACI) 318-111, *Building Code Requirements for Structural Concrete.*

This calculation evaluates the REA support structure and its foundation.

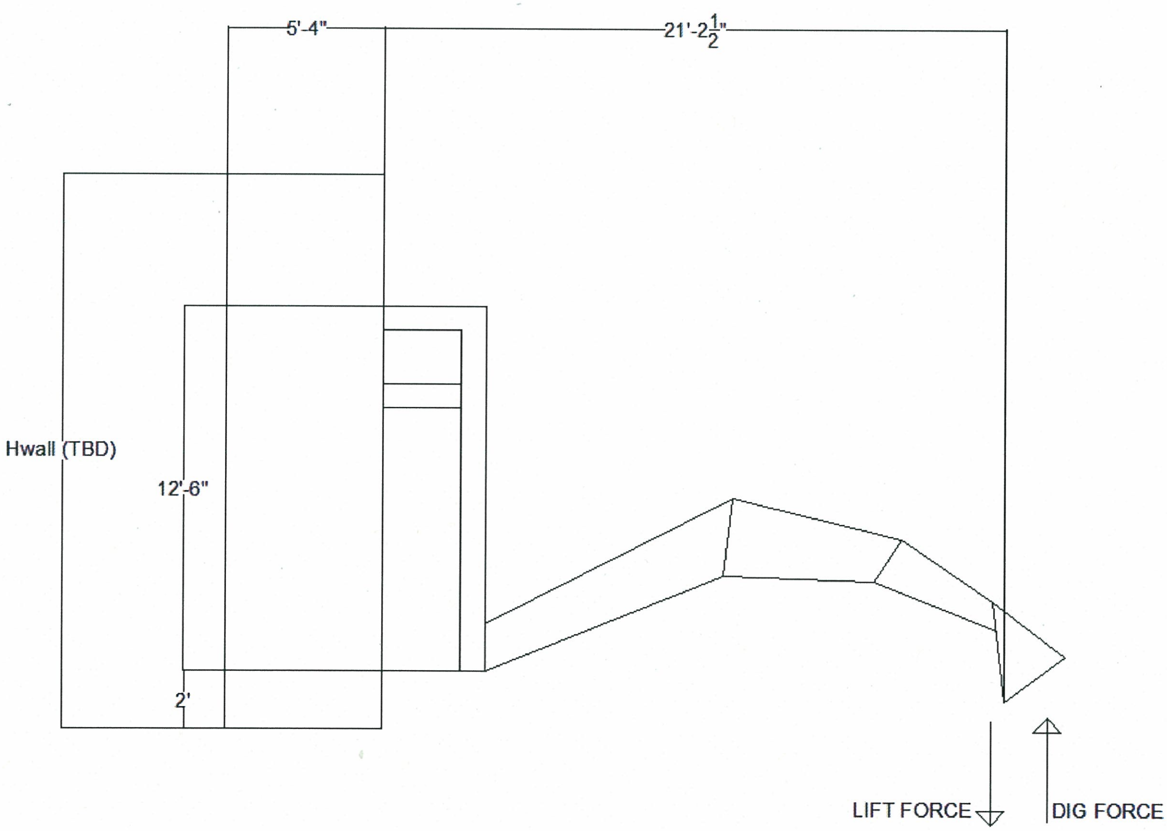


Figure 4 Excavator Load Configuration

6.1 Analytical Geometry:

This bending moment does not recognize two supports on the wall face. The thru-wall shear does consider the two supports to check concrete shear capacity in the location of the supports.

$l_{h\_support} := 48in$ — Estimated distance from face of support structure to connection point for excavator boom

$s_{support} := 24in$ — Vertical spacing between the supports

Lower REA:

$L_{LREA} := l_{h\_support} + D_{35G} - \frac{P_{35G}}{2} = 19.4\,ft$ — Moment Arm for Lower REA

$MAD_{LREA} := \frac{L_{LREA}}{2} = 9.7\,ft$ — Approximate length of lower REA moment arm for Dead Load

$MAL_{LREA} := L_{LREA} = 19.4\,ft$ — Approximate length of lower REA moment arm for Live Load (during excavation)

Upper REA:

$L_{UREA} := l_{h\_support} + D_{50G} - \frac{P_{50G}}{2} = 21.21\,ft$ — Moment Arm for Upper REA

$MAD_{UREA} := \frac{L_{UREA}}{2} = 10.6\,ft$ — Approximate length of upper REA moment arm for Dead Load

$MAL_{UREA} := L_{UREA} = 21.2\,ft$ — Approximate length of upper REA moment arm for Live Load (during excavation)

6.2 Equipment Weights:

For component weights from John Deere, see Attachment 3

$W_{component} := 75lbf$ Weight of hoses, pins, brackets, etc.

$W_{35G\_boomstruct} := 271lbf$

$W_{35G\_boomcyl} := 90lbf$ $W_{35G\_boom} := W_{35G\_boomstruct} + W_{35G\_boomcyl} = 361\ lbf$

$W_{35G\_armstruct} := 196lbf$

$W_{35G\_armcyl} := 75lbf$ $W_{35G\_arm} := W_{35G\_armstruct} + W_{35G\_armcyl} = 271\ lbf$

$W_{35G\_bucketstruct} := 177lbf$

$W_{35G\_bucketcyl} := 51lbf$ $W_{35G\_bucket} := W_{35G\_bucketstruct} + W_{35G\_bucketcyl} = 228\ lbf$

$W_{35G\_assembly} := W_{component} + W_{35G\_boom} + W_{35G\_arm} + W_{35G\_bucket} = 935\ lbf$

$W_{50G\_boomstruct} := 443lbf$

$W_{50G\_boomcyl} := 132lbf$ $W_{50G\_boom} := W_{50G\_boomstruct} + W_{50G\_boomcyl} = 575\ lbf$

$W_{50G\_armstruct} := 185lbf$

$W_{50G\_armcyl} := 95lbf$ $W_{50G\_arm} := W_{50G\_armstruct} + W_{50G\_armcyl} = 280\ lbf$

$W_{50G\_bucketstruct} := 245lbf$

$W_{50G\_bucketcyl} := 71lbf$ $W_{50G\_bucket} := W_{50G\_bucketstruct} + W_{50G\_bucketcyl} = 316\ lbf$

$W_{50G\_assembly} := W_{component} + W_{50G\_boom} + W_{50G\_arm} + W_{50G\_bucket} = 1246\ lbf$

6.3 Dead Loads:

Lower REA:

$W_{LREA\_Vsupport} := 62.64plf \cdot L_{vertical} = 783\,lbf$

Estimated Weight of Lower REA arm (using HSS 10x0.625 weight)

$W_{LREA\_Hsupport} := 62.64plf\, 2 \cdot l_{h\_support} = 501.12\,lbf$

Estimated Weight of Lower REA through wall supports (using HSS 10x0.625 weight)

$P_{D\_LREA} := W_{35G\_assembly} + W_{LREA\_Vsupport} + W_{LREA\_Hsupport} = 2219\,lbf$

Axial Load on support structure from weight of lower REA

$M_{D\_LREA} := P_{D\_LREA} \cdot MAD_{LREA} = 21.5 \cdot kip \cdot ft$

Bending Moment on support structure from eccentric weight of lower REA.

Upper REA:

$W_{UREA\_Vsupport} := 62.64plf \cdot L_{vertical2} = 219.24\,lbf$

Estimated Weight of Lower REA arm (using HSS 10x0.625 weight)

$W_{UREA\_Hsupport} := 62.64plf\, 2 \cdot l_{h\_support} = 501.12\,lbf$

Estimated Weight of Upper REA through wall supports (using HSS 10x0.625 weight)

$P_{D\_UREA} := W_{50G\_assembly} + W_{UREA\_Vsupport} + W_{UREA\_Hsupport} = 1966\,lbf$

Axial Load on support structure from weight of upper REA

$M_{D\_UREA} := P_{D\_UREA} \cdot MAD_{UREA} = 20.85 \cdot kip \cdot ft$

Bending Moment on support structure from eccentric weight of upper REA

6.4 Live Loads:

Recall the following inputs:

$LW_{35G} = 3307\,lbf$ $LW_{50G} = 5456\,lbf$

$Dig_{35G\_arm} = 4277\,lbf$ $Dig_{50G\_arm} = 5401\,lbf$

$Dig_{35G\_bucket} = 6085\,lbf$ $Dig_{50G\_bucket} = 8267\,lbf$

Lower REA:

$P_{L\_LREA} := -Dig_{35G\_bucket} = -6085\,lbf$

Axial Load on support structure from weight of lower REA during digging

$M_{L\_LREA} := P_{L\_LREA} \cdot MAL_{LREA} = -117.9 \cdot kip \cdot ft$

Bending Moment on support structure from eccentric weight of lower REA during digging

$P_{L2\_LREA} := LW_{35G} = 3307\,lbf$

Axial Load on support structure from weight of lower REA during lifting

$M_{L2\_LREA} := P_{L2\_LREA} \cdot MAL_{LREA} = 64.07 \cdot kip \cdot ft$

Bending Moment on support structure from eccentric weight of lower REA during lifting

Upper REA:

$P_{L\_UREA} := -Dig_{50G\_bucket} = -8267\,lbf$

Axial Load on support structure from weight of upper REA during digging

$M_{L\_UREA} := P_{L\_UREA} \cdot MAL_{UREA} = -175.33 \cdot kip \cdot ft$

Bending Moment on support structure from eccentric weight of upper REA during digging

$P_{L2\_UREA} := LW_{50G} = 5456\,lbf$

Axial Load on support structure from weight of upper REA during lifting

$M_{L2\_UREA} := P_{L2\_UREA} \cdot MAL_{UREA} = 115.71 \cdot kip \cdot ft$

Bending Moment on support structure from eccentric weight of upper REA during lifting

7. Concrete Wall Design

Combined loads per ACI Section 9.2:

Upper REA:

During Digging:

$P_{u\_LREA} := 1.2 \cdot P_{D\_LREA} + 1.6 \cdot P_{L\_LREA} = -7 \cdot kip$ ACI 318 (9-2)

$M_{u\_LREA} := 1.2 \cdot M_{D\_LREA} + 1.6 \cdot M_{L\_LREA} = -163 \cdot kip \cdot ft$ ACI 318 (9-2)

During Lifting:

$P_{u2\_LREA} := 1.2 \cdot P_{D\_LREA} + 1.6 \cdot P_{L2\_LREA} = 8 \cdot kip$ ACI 318 (9-2)

$M_{u2\_LREA} := 1.2 \cdot M_{D\_LREA} + 1.6 \cdot M_{L2\_LREA} = 128 \cdot kip \cdot ft$ ACI 318 (9-2)

Upper REA:

During Digging:

$P_{u\_UREA} := 1.2 \cdot P_{D\_UREA} + 1.6 \cdot P_{L\_UREA} = -11 \cdot kip$ ACI 318 (9-2)

$M_{u\_UREA} := 1.2 \cdot M_{D\_UREA} + 1.6 \cdot M_{L\_UREA} = -256 \cdot kip \cdot ft$ ACI 318 (9-2)

During Lifting:

$P_{u2\_UREA} := 1.2 \cdot P_{D\_UREA} + 1.6 \cdot P_{L2\_UREA} = 11 \cdot kip$ ACI 318 (9-2)

$M_{u2\_UREA} := 1.2 \cdot M_{D\_UREA} + 1.6 \cdot M_{L2\_UREA} = 210 \cdot kip \cdot ft$ ACI 318 (9-2)

$M_u := \max\left(\left|M_{u\_LREA}\right|, \left|M_{u2\_LREA}\right|, \left|M_{u\_UREA}\right|, \left|M_{u2\_UREA}\right|\right) = 256 \cdot kip \cdot ft$

Dimensions for concrete wall: Based on REC Geometry and required reinforcing

$h := 64in$ wall thickness

$b := 12in$ One foot of wall

ACI Design Factors:

$\phi_{shear} := 0.75$ Strength Reduction Factor for Shear (ACI 318, 9.3.2.3)

$\phi_{flexure} := 0.9$ Strength Reduction Factor for Tension Controlled Sections (ACI 318, 9.3.2.1)

$\lambda := 1.0$ Factor for Normal Weight Concrete (ACI 8.6.1)

Vertical Wall Rebar:

2 No. 9 @18" vertical

$d_{bar} := 1.128in \quad A_{bar} := 1in^2$

cover := 3in

layers := 1

ASTM STANDARD REINFORCING BARS

Bar size, no.	Nominal diameter, in.	Nominal area, in.^{2}	Nominal weight, lb/ft
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.650
18	2.257	4.00	13.600

Reinforcing Steel Data
ACI Appendix E

Concrete Protection for Cast in Place Concrete (ACI 7.7.1(a))

$$d := \begin{cases} h - cover - \dfrac{3d_{bar}}{2} & \text{if } layers = 1 \\ h - cover - 2d_{bar} & \text{otherwise} \end{cases} = 59.31 \cdot in$$

Bars are assumed to be Each Way / Each face for determining depth to tension centroid

spacing := 18in

$$count := \frac{ft}{spacing} = 0.6667$$

$$A_s := 2 \cdot count \cdot A_{bar} = 1.3333 \cdot in^2$$

Area os steel per foot

$$A_{s\_min} := max\left(\frac{3\sqrt{\dfrac{f_c}{psi}}}{\dfrac{f_y}{psi}} \cdot b \cdot d, 200 \cdot b \cdot \frac{d}{\dfrac{f_y}{psi}}\right) = 2.37 \cdot in^2$$

per foot of wall

Minimum Area of steel required for flexural members, ACI (10-3)

$$CHECK := \begin{cases} \text{"OK"} & \text{if } 2A_s > A_{s\_min} \\ \text{"Fail"} & \text{otherwise} \end{cases} = \text{"OK"}$$

$$a := \frac{A_s \cdot f_y}{0.85 f_c \cdot b} = 1.9608 \cdot in$$

depth of rectangular compressive stress block

$$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 389 \cdot kip \cdot ft$$

Nominal Moment Capacity

$$M_A := \phi_{flexure} \cdot M_n = 350 \cdot kip \cdot ft$$

Allowable Moment Capacity

$$^* DC_{bending} := \frac{M_u}{M_A} = 0.73$$

Demand to Capacity Ratio for Foundation Bending

* Based on inspection, there is no need to include axial load and develop interaction diagram.

Horizontal Wall Rebar: $b = 1\,ft$

$h = 5.33\,ft$

2 No. 9 @ 24" transverse

$A_{bart} := 1in^2$ $d_{bart} := 1.128in$

ASTM STANDARD REINFORCING BARS

Bar size, no.	Nominal diameter, in.	Nominal area, in.^{2}	Nominal weight, lb/ft
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.650
18	2.257	4.00	13.600

$$A_{st\_min} := \begin{cases} 0.002 \cdot b \cdot h & \text{if } A_{bart} \le 0.31in^2 \\ 0.0025 \cdot b \cdot h & \text{otherwise} \end{cases} = 1.92 \cdot in^2$$

per foot ACI (14.1.2 and 14.3.3)

$spacing_t := 24in$

$$count_t := 2\frac{ft}{spacing_t} = 1$$

$$A_{st} := 2 \cdot count_t \cdot A_{bart} = 2 \cdot in^2$$

$$CHECK_t := \begin{cases} \text{"OK"} & \text{if } A_{st} > A_{st\_min} \\ \text{"Fail"} & \text{otherwise} \end{cases} = \text{"OK"}$$

Check Wall Shear:

Recall: $s_{support} = 2\,ft \quad b = 1\,ft \quad d = 59.308 \cdot in$

$M_{u\_LREA} = -163 \cdot kip \cdot ft \quad M_{u\_UREA} = -256 \cdot kip \cdot ft \quad M_{u2\_LREA} = 128 \cdot kip \cdot ft \quad M_{u2\_UREA} = 210 \cdot kip \cdot ft$

$M_{u\_max} := \max\left(\left|M_{u\_LREA}\right|, \left|M_{u\_UREA}\right|, \left|M_{u2\_LREA}\right|, \left|M_{u2\_UREA}\right|\right) = 256 \cdot kip \cdot ft$

$$V_u := \frac{M_{u\_max}}{s_{support}} = 128 \cdot kip$$

$$V_c := 2 \cdot psi \cdot \sqrt{\frac{f_c}{psi}} \cdot b \cdot d = 90 \cdot kip$$ ACI (11-3)

$\phi_{shear} \cdot V_c = 68 \cdot kip$

$f_{yt} := f_y = 60000\,psi$

Shear ties to be the same rebar as flexural reinforcement

Assume 9inch spacing: $s_v := 9in$

$$A_{v\_min} := 0.75psi \cdot \sqrt{\frac{f_c}{psi}} \cdot \frac{b \cdot s_v}{f_{yt}} = 0.0854 \cdot in^2$$ Minimum shear reinforcement

$$A_{v\_required} := s_v \cdot \left(\frac{V_u - \phi_{shear} \cdot V_c}{\phi_{shear} \cdot f_{yt} \cdot d}\right) = 0.2031 \cdot in^2$$ Shear area required for 9" spacing

8. Concrete Wall Stability

Wall Dimensions:

Thickness (not to be changed)

$h = 5.3333\,ft$ Length: $L_{wall} := 8ft$ Height: $H_{wall} := 16ft$

Recall:

The length of the Lower REA Vertical Support is: $L_{vertical} = 12.5\,ft$

The REC wall footing height is: $H_{footing} := 2ft$ Attachment 4

Therefore, the minimum wall height is: $H_{min} := L_{vertical} + H_{footing} = 14.5\,ft$

Volume:

$V_{wall} := h \times L_{wall} \times H_{wall} = 682.67 \times ft^3$

Center of Gravity:

$CG_{wall} := \frac{h}{2} = 2.6667\,ft$

$$Check_{Height} := \begin{cases} \text{"OK"} & \text{if } H_{wall} > H_{min} \\ \text{"Too Short"} & \text{otherwise} \end{cases} = \text{"OK"}$$

$w_{wall} := \gamma_{concrete} \times V_{wall} = 102400\,lbf$ Weight of wall, alone

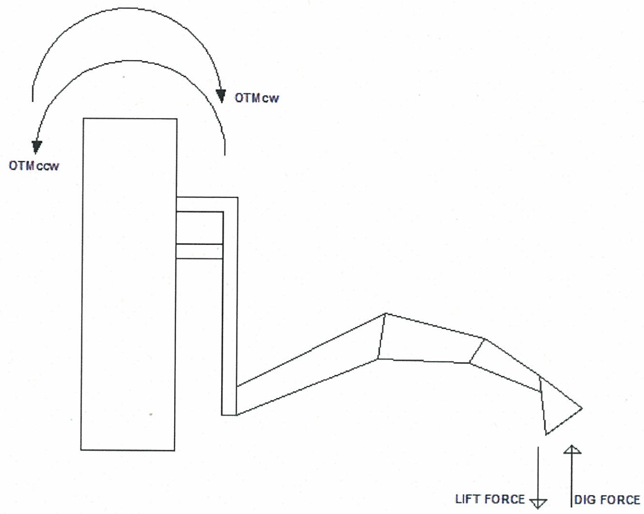


Figure 5 Overturning Moment Diagram

Recall:

	Dead	Dig	Lift
Upper REA	$M_{D\_UREA} = 20.85 \cdot kip \cdot ft$	$M_{L\_UREA} = -175.33 \cdot kip \cdot ft$	$M_{L2\_UREA} = 115.71 \cdot kip \cdot ft$
Lower REA	$M_{D\_LREA} = 21.5 \cdot kip \cdot ft$	$M_{L\_LREA} = -117.9 \cdot kip \cdot ft$	$M_{L2\_LREA} = 64.07 \cdot kip \cdot ft$

$$OTM_{cwUREA} := M_{D\_UREA} + M_{L2\_UREA} = 136.56 \cdot kip \cdot ft$$

$$OTM_{cwLREA} := M_{D\_LREA} + M_{L2\_LREA} = 85.57 \cdot kip \cdot ft$$

Clock-Wise Overturning Moments

$$OTM_{ccwUREA} := \left| M_{D\_UREA} + M_{L\_UREA} \right| = 154.48 \cdot kip \cdot ft$$

$$OTM_{ccwLREA} := \left| M_{D\_LREA} + M_{L\_LREA} \right| = 96.4 \cdot kip \cdot ft$$

Counter Clock-Wise Overturning Moments

8.1 Wind Load: Consider Wall as a Risk (Occupancy) Category II structure. Use ASCE 7-10, Chapter 29

$A_s := H_{wall} \cdot L_{wall} = 128\,ft^2$ — Wind Area

$V_{3sec} := 110mph$ — Three-Second Gust Wind Velocity. ASCE 7-10, Figure 26.5-1A

$V := \dfrac{V_{3sec}}{mph}$

Exposure Category = "C"

$\alpha := 9.5 \quad z_g := 900ft \quad z_{min} := 15ft \quad z := H_{wall} = 16\,ft$ — ASCE 7-10, Table 26.9-1 for Exposure C

$$K_z := \begin{cases} 2.01\left(\dfrac{z}{z_g}\right)^{\frac{2}{\alpha}} & \text{if } 15ft \le z \le z_g \\ 2.01 \cdot \left(\dfrac{15ft}{z_g}\right)^{\frac{2}{\alpha}} & \text{otherwise} \end{cases} = 0.8605$$

Velocity Exposure Coefficients, ASCE 7-10 Table 29.3-1 for Exposure C

$K_{zt} := 1.0$ — Topographic Factor, ASCE 7-10 Section 26.8.2 Wind speed up is not considered for given terrain

$K_d := 0.85$ — Wind Directionality Factor, ASCE 7-10 Table 26.6-1

$q_h := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot psf = 22.66 \cdot psf$ — Velocity Pressure, ASCE 7-10 Eqn. (29.4-1)

$G := 0.85$ — ASCE 7-10 Section 26.9.4

$C_f := 1.55$ — Force Coefficient, ASCE 7-10 Figure 29.4-1. For this wall, s/h = 1.0 and B/s = 0.5

$P_{wind} := q_h \cdot G \cdot C_f = 29.85 \cdot psf$ — Design Wind for "Other" Structures, ASCE 7-10 Eqn. (29.4-1)

$F := P_{wind} \cdot A_s = 3821\,lbf$

$OT_{wind} := F \cdot \dfrac{H_{wall}}{2} = 31 \cdot kip \cdot ft$ — Overturning due to wind

8.2 BEARING CAPACITY:

TheProof of Principle wall is to be located at the Kurion facility on Horn Rapids Rd. in Richland, WA.

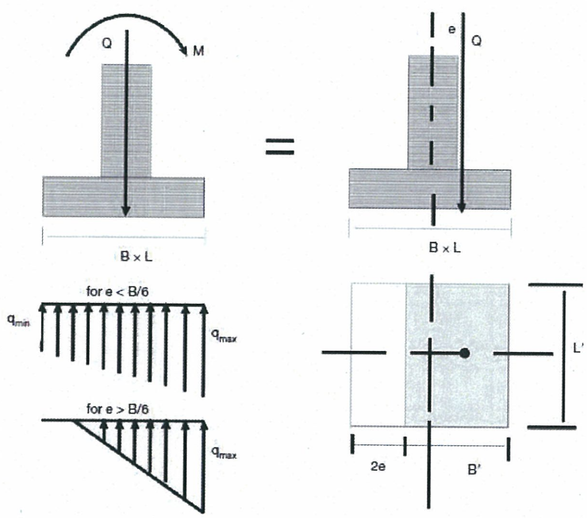
The soil on-site is most similar to Material 4 in IBC

IBC 2012 Table 1806.2 is used for presumptive load-bearing values for the foundation.

TABLE 1806.2
PRESUMPTIVE LOAD-BEARING VALUES

CLASS OF MATERIALS	VERTICAL FOUNDATION PRESSURE (psf)	LATERAL BEARING PRESSURE (psf/ft below natural grade)	LATERAL SLIDING RESISTANCE	
			Coefficient of friction[a]	Cohesion (psf)[a]
1. Crystalline bedrock	12,000	1,200	0.70	—
2. Sedimentary and foliated rock	4,000	400	0.35	—
3. Sandy gravel and/or gravel (GW and GP)	3,000	200	0.35	—
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	150	0.25	—
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500	100	—	130

$q_u := 2000\text{psf}$



$$q_{max} = \frac{Q}{BL} + \frac{6M}{B^2L}$$

$$q_{min} = \frac{Q}{BL} - \frac{6M}{B^2L}$$

Inital bearing pressure of

$$Wall_p := \frac{w_{wall}}{h \cdot L_{wall}} = 2400 \cdot psf$$

Bearing based on wall dead load alone

Add Footing $t_{add} := 2ft$

Right hand side Left hand side

$B_{addR} := 20in$ * $B_{addL} := 60in$

Additional Footing Dimensions

*The left side of the wall footing is sized larger than what is required to accomodate future additions of weight to resist overturning in the event over-excavation is required for REA testing.

Also, consider placing addtional footing around the entire perimeter to reduce bearing.

$Add_L := 3ft$

Width of each additional footing in the direction of the wall length

$L_{add} := 2 \cdot Add_L$

AdditionalWeights:

$w_{addR} := \gamma_{concrete} \cdot t_{add} \cdot B_{addR} \cdot (L_{wall} + L_{add}) = 7 \cdot kip$ — weight of right-hand footing

$w_{addL} := \gamma_{concrete} \cdot t_{add} \cdot B_{addL} \cdot (L_{wall} + L_{add}) = 21 \cdot kip$ — weight of left-hand footing

$w_{addC} := \gamma_{concrete} \cdot t_{add} \cdot L_{add} \cdot h = 9.6 \cdot kip$ — weight of footing at wall center

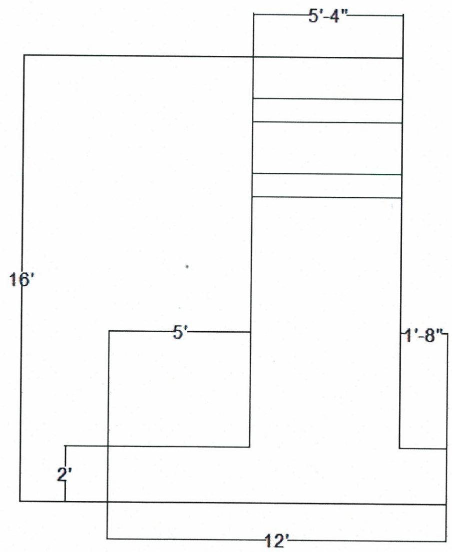


Figure 6 Wall Dimensions

$B := h + B_{addR} + B_{addL} = 12\,ft$ $\qquad A_{footing} := B \cdot (L_{wall} + L_{add}) = 168\,ft^2$

$$Q_p := \frac{w_{wall} + w_{addL} + w_{addR} + w_{addC}}{A_{footing}} = 833 \cdot psf$$

wall and footing only — Bearing on based on foundation dead load

$OTM_{cwUREA} = 137 \cdot kip \cdot ft$ $\qquad OTM_{ccwUREA} = 154 \cdot kip \cdot ft$

Clockwise Overturning:

$Q_{cw} := (w_{wall} + w_{addL} + w_{addR} + w_{addC}) + P_{D\_UREA} + P_{L2\_UREA} = 147 \cdot kip$ — Vertical load based on foundation and REA dead and live loads

$M_{cw} := OTM_{cwUREA} + OT_{wind} = 167 \cdot kip \cdot ft$ — Moment from REA

$e_{cw} := \dfrac{M_{cw}}{Q_{cw}} = 1.13\,ft$ $\qquad \dfrac{B}{6} = 2\,ft$ — eccentricity comparison

$q_{max\_cw} := \dfrac{Q_{cw}}{A_{footing}} + \dfrac{6 \cdot M_{cw}}{B^2 \cdot (L_{wall} + L_{add})} = 1375 \cdot psf$ $\qquad \dfrac{q_{max\_cw}}{q_u} = 0.69$ — Maximum Bearing Pressure on right-hand footing

Counter Clockwise Overturning:

$Q_{ccw} := (w_{wall} + w_{addR} + w_{addL} + w_{addC}) + P_{D\_UREA} + P_{L\_UREA} = 134 \cdot kip$ — Vertical load based on foundation and REA dead and live loads

$M_{ccw} := OTM_{ccwUREA} + OT_{wind} = 185 \cdot kip \cdot ft$ — Moment from REA

$e_{ccw} := \dfrac{M_{ccw}}{Q_{ccw}} = 1.38\,ft$ $\qquad \dfrac{B}{6} = 2\,ft$ — eccentricity comparison

$q_{max\_ccw} := \dfrac{Q_{ccw}}{A_{footing}} + \dfrac{6 \cdot M_{ccw}}{B^2 \cdot (L_{wall} + L_{add})} = 1347 \cdot psf$ — Maximum Bearing Pressure on left-hand footing

8.3 OVERTURNING:

Restoring Moment for concrete wall to resist counter-clock-wise overturning:

$w_{wall} = 102.4 \cdot kip$ $CG_{wallccw} := B_{addL} + \frac{h}{2} = 7.6667\,ft$ $RM_{wallccw} := w_{wall} \cdot CG_{wallccw} = 785 \cdot kip \cdot ft$

$w_{addC} = 9.6 \cdot kip$ $CG_{addCccw} := CG_{wallccw} = 7.6667\,ft$ $RM_{addCccw} := w_{addC} \cdot CG_{addCccw} = 74 \cdot kip \cdot ft$

$w_{addR} = 7 \cdot kip$ $CG_{addRccw} := B_{addL} + h + \frac{B_{addR}}{2} = 11.1667\,ft$ $RM_{addRccw} := w_{addR} \cdot CG_{addRccw} = 78 \cdot kip \cdot ft$

$w_{addL} = 21 \cdot kip$ $CG_{addLccw} := \frac{B_{addL}}{2} = 2.5\,ft$ $RM_{addLccw} := w_{addL} \cdot CG_{addLccw} = 53 \cdot kip \cdot ft$

$$RM_{ccw} := 0.9\left(RM_{wallccw} + RM_{addCccw} + RM_{addRccw} + RM_{addLccw}\right) = 890 \cdot kip \cdot ft$$

$$SF_{OTccw} := \min\left(\frac{RM_{ccw}}{OTM_{ccwLREA}}, \frac{RM_{ccw}}{OTM_{ccwUREA}}\right) = 5.76$$

Restoring Moment for concrete wall to resist clock-wise overturning:

$w_{wall} = 102.4 \cdot kip$ $CG_{wallcw} := B_{addR} + \frac{h}{2} = 4.3333\,ft$ $RM_{wallcw} := w_{wall} \cdot CG_{wallcw} = 444 \cdot kip \cdot ft$

$w_{addC} = 9.6 \cdot kip$ $CG_{addCcw} := CG_{wallcw} = 4.3333\,ft$ $RM_{addCcw} := w_{addC} \cdot CG_{addCcw} = 42 \cdot kip \cdot ft$

$w_{addR} = 7 \cdot kip$ $CG_{addRcw} := \frac{B_{addR}}{2} = 10 \cdot in$ $RM_{addRcw} := w_{addR} \cdot CG_{addRcw} = 6 \cdot kip \cdot ft$

$w_{addL} = 21 \cdot kip$ $CG_{addLcw} := B_{addR} + h + \frac{B_{addL}}{2} = 9.5\,ft$ $RM_{addLcw} := w_{addL} \cdot CG_{addLcw} = 200 \cdot kip \cdot ft$

$$RM_{cw} := 0.9\left(RM_{wallcw} + RM_{addCcw} + RM_{addRcw} + RM_{addLcw}\right) = 622 \cdot kip \cdot ft$$

$$SF_{OTcw} := \min\left(\frac{RM_{cw}}{OTM_{cwLREA}}, \frac{RM_{cw}}{OTM_{cwUREA}}\right) = 4.55$$

$$Check_{Overturn} := \begin{cases} \text{"Unstable"} & \text{if } SF_{OTccw} < 1.5 \vee SF_{OTcw} < 1.5 \\ \text{"OK"} & \text{otherwise} \end{cases} = \text{"OK"}$$

9. WALL FOUNDATION DESIGN

Recall: $t_{add} = 2\,ft$ $B_{addL} = 5\,ft$

Rebar: $d_{bar} := 0.625in$ $A_{bar} := 0.31in^2$

$cover = 3 \cdot in$ Concrete Protection for Cast in Place Concrete (ACI 7.7.1(a))

ASTM STANDARD REINFORCING BARS

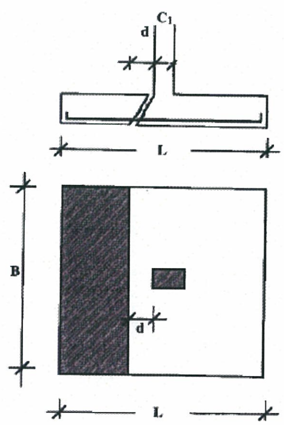
Bar size, no.	Nominal diameter, in.	Nominal area, in.^{2}	Nominal weight, lb/ft
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.650
18	2.257	4.00	13.600

Reinforcing Steel Data ACI Appendix E

$$d := t_{add} - cover - \frac{d_{bar}}{2} = 20.6875 \cdot in$$ Depth to tension

$$q_{max} := \max(q_{max\_ccw}, q_{max\_cw}) = 1375 \cdot psf$$ Maximum design bearing pressure

Check Shear:



Define:

$L_f := B = 12\,ft$

$B_f := L_{wall} + L_{add} = 14\,ft$

$b_{oneway} := B_{addL} - d = 39.31 \cdot in$

$$A_{onewayshear} := b \cdot b_{oneway} = 3.276\,ft^2$$

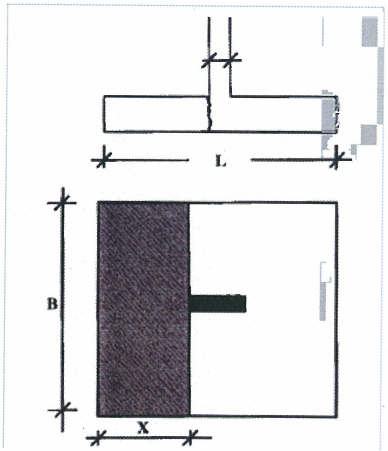
$$Vu_{oneway} := q_{max} \cdot A_{onewayshear} = 5 \cdot kip$$ per foot of wall — Ultimate one-way Shear

$$V_c := 2 \cdot \lambda \cdot psi \cdot \sqrt{\frac{f_c}{psi}} \cdot b \cdot d = 31 \cdot kip$$ per foot of wall — Nominal Shear strength per ACI (11-3)

$$V_{A\_oneway} := \phi_{shear} \cdot V_c = 24 \cdot kip$$ Allowable Concrete Shear Strength based on Beam Action

$$DC_{onewayshear} := \frac{Vu_{oneway}}{V_{A\_oneway}} = 0.19$$ Demand to Capacity Ratio for One-Way Shear

Check Flexure:



Define:

$X := B_{addL} = 5\,ft$

$M_u := q_{max} \cdot B_f \cdot \frac{X^2}{2} = 241 \cdot kip \cdot ft$ Ultimate bending moment

$count := 14$ Number of bars evenly spaced

$A_s := count \cdot A_{bar} = 4.34 \cdot in^2$

$a := \frac{A_s \cdot f_y}{0.85 f_c \cdot B_f} = 0.4559 \cdot in$ depth of rectangular compressive stress block

$M_n := A_s \cdot f_y \cdot \left(d - \frac{a}{2}\right) = 5328 \cdot kip \cdot in$ Nominal Moment Capacity

$M_A := \phi_{flexure} \cdot M_n = 4795 \cdot kip \cdot in$ Allowable Moment Capacity

$DC_{bending} := \frac{M_u}{M_A} = 0.6022$ Demand to Capacity Ratio for Foundation Bending

$47 \cdot d_{bar} = 29.375 \cdot in$ wall footing bar development length

10. USE OF COMPUTER SOFTWARE

This calculation utilizes:

MathCad
Version 15
MathCad is a registered trademark of Parametric Technology Corporation.
All calculations are routine and checked using a handheld calculator.

11. RESULTS AND CONCLUSIONS

The REA Support Structure has sufficient design capacity for the anticipated loading. The foundation supporting wall structure design meets ACI requirements. The wall structure stability is sufficient.

12. RECOMMENDATIONS

The following are recommendations from this calculation:

- Do not dig under the designed foundation.
- The excavated slope from soil removal shall not exceed a 1.5H:1.0V slope.

13. REFERENCES

A-300-296-00113, Rev. 0. *Mockup Design Basis Requirements 300-296 Soil Remediation Project Phase I and II.* 2014. AREVA Federal Services, LLC. Richland, WA

American Concrete Institute (ACI) 2011 AISC 318-11. *Building Code Requirements for Structural Concrete and Commentary.* Farmington Hills, MI

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American Society of Civil Engineers (ASCE) 2010. ASCE 7-10. *Minimum Design Loads for Buildings and Other Structures*, Reston, VA

American Society for Testing and Materials (ASTM) 2012. ASTM A615 -12. *Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement*, West Conshohocken, PA

K-1782F-RPT-003, Rev. B. *300-296 Soil Remediation Project Phase I and II Conceptual Design Report.* 2014. Kurion. Richland, WA

International Code Council 2012. *International Building Code 2012.* Country Club Hills, IL

15. List of Attachments

See the following Sheets:

Attachment 1. John Deere 35G Technical Data Sheet

Attachment 2. John Deere 50 G Technical Data Sheet

Attachment 3. John Deere 35G and 50G Boom/Arm/Bucket Assembly Weights

Attachment 4. REC B-Cell Wall Dimensions

ATTACHMENT 1

35G Excavator

17.4 kW (23.3 net hp)

JOHN DEERE

FEATURES

Meets EPA Final Tier 4 (FT4)/EU Stage IV engine standards without an after-treatment device. 24-percent increase in fuel efficiency in power mode.

Larger front windshield provides even better visibility; wider entryway eases entrance to/exit from the more spacious operator station.

Multifunction monitor displays vital machine operating info, tracks engine and hydraulic oil maintenance intervals, and provides access to auto shutdown and economy/power modes.

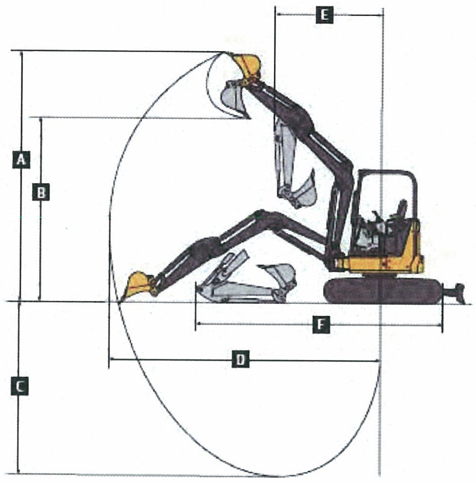
Standard joystick pattern changer and auxiliary hydraulics.

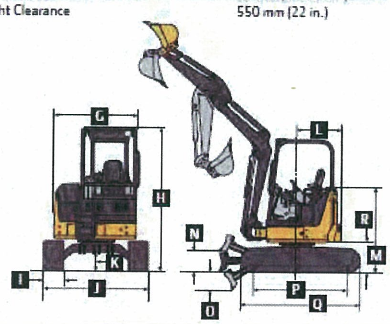
Additional service door provides easy access to side-by-side cooler cores, fuel filter/water separator, coolant overflow reservoir, battery, and Service ADVISOR™ connection.

Engine	**35G**			
Manufacturer and Model	Yanmar 3TNV88F-EPHB			
Non-Road Emission Standard	EPA Final Tier 4/EU Stage IV			
Displacement	1.642 L (100.2 cu. in.)			
Net Power (ISO 9249)	17.4 kW (23.3 hp) at 2,400 rpm			
Powertrain				
Maximum Travel Speed				
Low	2.8 km/h (1.7 mph)			
High	4.3 km/h (2.7 mph)			
Hydraulics				
Pump Flow				
Piston (P1+P2)	2 x 38.4 L/m (2 x 10.1 gpm)			
Gear (P3)	22.8 L/m (6.0 gpm)			
Auxiliary Flow	61.2 L/m (16.2 gpm)			
Upperstructure				
Swing Speed	9.0 rpm			
Independent Swing Boom	*Canopy*	*Cab*		
Left	72 deg.	62 deg.		
Right	62 deg.	62 deg.		
Counterweight				
Standard	540 kg (1,190 lb.)			
Additional	240 kg (529 lb.)			
Operating Weights				
	1315-mm (4 ft. 4 in.) Standard Arm, Canopy, and Standard Counterweight	*1315-mm (4 ft. 4 in.) Standard Arm, Cab, and Standard Counterweight*	*1715-mm (5 ft. 8 in.) Long Arm, Canopy, and Extra Counterweight*	*1715-mm (5 ft. 8 in.) Long Arm, Cab, and Extra Counterweight*
With Full Fuel Tank and 79-kg (175 lb.) Operator	3520 kg (7,760 lb.)	3690 kg (8,135 lb.)	3783 kg (8,340 lb.)	3953 kg (8,715 lb.)
Optional Angle Blade	296 kg (653 lb.)			

Operating Dimensions	35G			
	1315-mm (4 ft. 4 in.) Standard Arm and Canopy	*1715-mm (5 ft. 8 in.) Long Arm and Canopy*	*1315-mm (4 ft. 4 in.) Standard Arm and Cab*	*1715-mm (5 ft. 8 in.) Long Arm and Cab*
A Maximum Cutting Height	4.87 m (16 ft. 0 in.)	4.95 m (16 ft. 3 in.)	4.70 m (15 ft. 5 in.)	4.74 m (15 ft. 7 in.)
B Maximum Dumping Height	3.46 m (11 ft. 4 in.)	3.57 m (11 ft. 9 in.)	3.31 m (10 ft. 10 in.)	3.39 m (11 ft. 1 in.)
C Maximum Digging Depth	3.06 m (10 ft. 0 in.)	3.46 m (11 ft. 4 in.)	3.06 m (10 ft. 0 in.)	3.46 m (11 ft. 4 in.)
D Maximum Digging Reach	5.21 m (17 ft. 1 in.)	5.52 m (18 ft. 1 in.)	5.21 m (17 ft. 1 in.)	5.52 m (18 ft. 1 in.)
E Minimum Front Swing Radius	2.08 m (6 ft. 10 in.)	2.19 m (7 ft. 2 in.)	2.24 m (7 ft. 4 in.)	2.30 m (7 ft. 7 in.)
F Transport Length	4.64 m (15 ft. 3 in.)	4.75 m (15 ft. 7 in.)	4.64 m (15 ft. 3 in.)	4.75 m (15 ft. 7 in.)
Breakout Force (ISO 6015)				
Bucket	27.1 kN (6,085 lb.)	27.1 kN (6,085 lb.)	27.1 kN (6,085 lb.)	27.1 kN (6,085 lb.)
Arm	19.0 kN (4,277 lb.)	16.9 kN (3,792 lb.)	19.0 kN (4,277 lb.)	16.9 kN (3,792 lb.)

Machine Dimensions	
Blade	
Width	1.74 m (5 ft. 9 in.)
Height	373 mm (14.7 in.)
G Upperstructure Width	1.55 m (5 ft. 1 in.)
H Overall Height	
Canopy	2.48 m (8 ft. 2 in.)
Cab	2.48 m (8 ft. 2 in.)
I Track Width	300 mm (12 in.)
J Undercarriage Width	1.55 m (5 ft. 1 in.)
K Ground Clearance	280 mm (11 in.)
L Tail-Swing Radius	
With Standard Arm	870 mm (34 in.)
With Long Arm and Extra Counterweight	980 mm (39 in.)
M Engine Cover Height	1.53 m (5 ft. 0 in.)
N Maximum Blade Lift Above Ground	360 mm (14.2 in.)
O Maximum Blade Drop Below Ground	400 mm (15.7 in.)
P Sprocket Center to Idler Center	1.66 m (5 ft. 5 in.)
Q Undercarriage Length	2.11 m (6 ft. 11 in.)
R Counterweight Clearance	550 mm (22 in.)





Lift Capacities								
Ground Level at 3.05-m (10 ft.) Radius	*Canopy and Standard Counterweight*		*Canopy and Extra Counterweight*		*Cab and Standard Counterweight*		*Cab and Extra Counterweight*	
Arm	*Over Front**	*Over Side*	*Over Front**	*Over Side*	*Over Front**	*Over Side*	*Over Front**	*Over Side*
1315-mm (4 ft. 4 in.) Standard	1568 kg (3,453 lb.)	641 kg (1,412 lb.)	1568 kg (3,453 lb.)	765 kg (1,686 lb.)	1568 kg (3,453 lb.)	684 kg (1,506 lb.)	1568 kg (3,453 lb.)	808 kg (1,780 lb.)
1715-mm (5 ft. 8 in.) Long	1501 kg (3,307 lb.)	630 kg (1,388 lb.)	1501 kg (3,307 lb.)	755 kg (1,662 lb.)	1501 kg (3,307 lb.)	672 kg (1,481 lb.)	1501 kg (3,307 lb.)	797 kg (1,756 lb.)

*Blade down (limited by hydraulics).

www.JohnDeere.com

01-10-13

John Deere 35G Excavator Data Data:
http://www.deere.com/en_US/docs/html/brochures/publication.html?id=70ec5162#14

ATTACHMENT 2

50G Excavator

26.8 kW (35.9 net hp)

JOHN DEERE

FEATURES

Meets EPA Final Tier 4 (FT4)/EU Stage IV engine standards. Delivers a seamless operator experience with no machine performance interruptions during the regeneration process. 10-percent increase in fuel efficiency in economy mode.

Larger front windshield provides even better visibility; wider entryway eases entrance to/exit from the more spacious operator station.

Multifunction monitor displays vital machine operating info, tracks engine and hydraulic oil maintenance intervals, and provides access to auto shutdown and economy/power modes.

Standard joystick pattern changer and auxiliary hydraulics.

Additional service door provides easy access to side-by-side cooler cores, fuel filter/water separator, coolant overflow reservoir, battery, and Service ADVISOR™ connection.

Engine	**50G**			
Manufacturer and Model	Yanmar 4TNV88C-PHB			
Non-Road Emission Standard	EPA Final Tier 4/EU Stage IV			
Displacement	2.19 L (134 cu. in.)			
Net Power (ISO 9249)	26.8 kW (35.9 hp) at 2,400 rpm			
Powertrain				
Maximum Travel Speed				
Low	2.5 km/h (1.6 mph)			
High	4.2 km/h (2.6 mph)			
Hydraulics				
Pump Flow	120 L/m (31.7 gpm)			
Auxiliary Flow	87.4 L/m (23.1 gpm)			
Upperstructure				
Swing Speed	9.0 rpm			
Independent Swing Boom	*Canopy*	*Cab*		
Left	80 deg.	80 deg.		
Right	60 deg.	60 deg.		
Counterweight				
Standard	700 kg (1,543 lb.)			
Additional	200 kg (441 lb.)			
Operating Weights				
	1380-mm (4 ft. 6 in.) Standard Arm, Canopy, and Standard Counterweight	*1380-mm (4 ft. 6 in.) Standard Arm, Cab, and Standard Counterweight*	*1690-mm (5 ft. 7 in.) Long Arm, Canopy, and Extra Counterweight*	*1690-mm (5 ft. 7 in.) Long Arm, Cab, and Extra Counterweight*
With 400-mm (16 in.) Rubber Track, Straight Blade, Full Fuel Tank, and 79-kg (175 lb.) Operator	4790 kg (10,560 lb.)	4920 kg (10,847 lb.)	5018 kg (11,063 lb.)	5148 kg (11,349 lb.)
Optional Angle Blade	409 kg (902 lb.)			

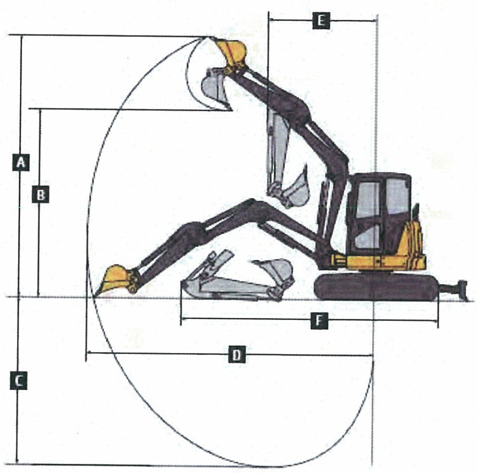
KURION
Isolating Waste from the Environment

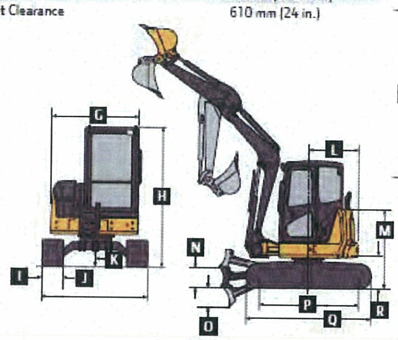
Calc. # KUR-1782P-CALC-C001
Revision: 0

Calculation Title: Support Structure Design for REA Proof Testing
Originator: R.S. Rast Date: 21 May 2014
Checker: R. Rasmussen Date: 21 May 2014

Operating Dimensions	50G			
	1380-mm (4 ft. 6 in.) Standard Arm and Canopy	*1690-mm (5 ft. 7 in.) Long Arm and Canopy*	*1380-mm (4 ft. 6 in.) Standard Arm and Cab*	*1690-mm (5 ft. 7 in.) Long Arm and Cab*
A Maximum Cutting Height	5.75 m (18 ft. 10 in.)	6.00 m (19 ft. 8 in.)	5.75 m (18 ft. 10 in.)	6.00 m (19 ft. 8 in.)
B Maximum Dumping Height	4.07 m (13 ft. 4 in.)	4.31 m (14 ft. 2 in.)	4.07 m (13 ft. 4 in.)	4.31 m (14 ft. 2 in.)
C Maximum Digging Depth	3.53 m (11 ft. 7 in.)	3.83 m (12 ft. 7 in.)	3.53 m (11 ft. 7 in.)	3.83 m (12 ft. 7 in.)
D Maximum Digging Reach	5.96 m (19 ft. 7 in.)	6.26 m (20 ft. 6 in.)	5.96 m (19 ft. 7 in.)	6.26 m (20 ft. 6 in.)
E Minimum Front Swing Radius	2.21 m (7 ft. 3 in.)	2.30 m (7 ft. 7 in.)	2.21 m (7 ft. 3 in.)	2.30 m (7 ft. 7 in.)
F Transport Length	5.47 m (17 ft. 11 in.)	5.52 m (18 ft. 1 in.)	5.47 m (17 ft. 11 in.)	5.52 m (18 ft. 1 in.)
Breakout Force (ISO 6015)				
Bucket	36.8 kN (8,267 lb.)	36.8 kN (8,267 lb.)	36.8 kN (8,267 lb.)	36.8 kN (8,267 lb.)
Arm	24.0 kN (5,401 lb.)	21.0 kN (4,718 lb.)	24.0 kN (5,401 lb.)	21.0 kN (4,718 lb.)

Machine Dimensions	
Blade	
Width	2.00 m (6 ft. 7 in.)
Height	375 mm (15 in.)
G Upperstructure Width	1.85 m (6 ft. 1 in.)
H Overall Height	
Canopy	2.53 m (8 ft. 4 in.)
Cab	2.53 m (8 ft. 4 in.)
I Track Width	400 mm (16 in.)
J Undercarriage Width	2.00 m (6 ft. 7 in.)
K Ground Clearance	340 mm (13 in.)
L Tail-Swing Radius	
With Standard Arm	1.00 m (39 in.)
With Long Arm and Extra Counterweight	1.10 m (43 in.)
M Engine Cover Height	1.59 m (5 ft. 3 in.)
N Maximum Blade Lift Above Ground	460 mm (18 in.)
O Maximum Blade Drop Below Ground	360 mm (14 in.)
P Sprocket Center to Idler Center	2.00 m (6 ft. 7 in.)
Q Track Length	2.50 m (8 ft. 2 in.)
R Counterweight Clearance	610 mm (24 in.)





Lift Capacities								
Ground Level at 3.05-m (10 ft.) Radius	*Canopy and Standard Counterweight*		*Canopy and Extra Counterweight*		*Cab and Standard Counterweight*		*Cab and Extra Counterweight*	
Arm	*Over Front**	*Over Side*	*Over Front**	*Over Side*	*Over Front**	*Over Side*	*Over Front**	*Over Side*
1380-mm (4 ft. 6 in.) Standard	2511 kg (5,531 lb.)	1110 kg (2,444 lb.)	2511 kg (5,531 lb.)	1232 kg (2,714 lb.)	2511 kg (5,531 lb.)	1150 kg (2,534 lb.)	2511 kg (5,531 lb.)	1273 kg (2,803 lb.)
1690-mm (5 ft. 7 in.) Long	2477 kg (5,456 lb.)	1088 kg (2,396 lb.)	2477 kg (5,456 lb.)	1210 kg (2,666 lb.)	2477 kg (5,456 lb.)	1129 kg (2,486 lb.)	2477 kg (5,456 lb.)	1251 kg (2,755 lb.)

*Blade down (limited by hydraulics).

www.JohnDeere.com

02-15-13

John Deere 50G Excavator Data Data:
http://www.deere.com/en_US/docs/html/brochures/publication.html?id=70ec5162#16

KURION
Isolating Waste from the Environment

Calc. # KUR-1782P-CALC-C001
Revision: 0

Calculation Title: Support Structure Design for REA Proof Testing
Originator: R.S. Rast Date: 21 May 2014
Checker: R. Rasmussen Date: 21 May 2014

ATTACHMENT 3

Rick Rast

From: CEDSFHQ <CEDSFHQ@JohnDeere.com>
Sent: Tuesday, May 06, 2014 12:06 PM
To: Rick Rast
Subject: RE: JohnDeere.com General Feedback

Your request for both long arm and standard arm for both but the matrix had the request for the long arm for the 35G and standard arm for the 50G. if additional information is needed, please let me know. I do not have the weight for the hoses, pins, brackets, etc. I would guess those items combined may increase the weight of the boom and arm assembly by 50 – 75 lb.

From: Rick Rast [mailto:rrast@KURION.COM]
Sent: Tuesday, May 06, 2014 1:12 PM
To: CEDSFHQ
Cc: Rick Rast
Subject: RE: JohnDeere.com General Feedback

Thank you for the quick response. To answer your question, I need the weights of the boom, arm(long and std.) , and 18" and 24"buckets for both 50G and 35G models.

	Weight			
Model	boom	long arm	18" bucket	24" bucket
35G	123 kg (271 lb.)	89 kg (196 lb.)	67.5 kg (149 lb.)	80.5 kg (177 lb.)
Model	boom	std. arm	18" bucket	24" bucket
50G	201 kg (443 lb.)	84 kg (185 lb.)	91.6 kg (202 lb.)	111 kg (245 lb.)

Boom cylinder weight for the 35G is 41 kg or 90 lb.
Arm cylinder weight for the 35G is 34 kg or 75 lb.
Bucket cylinder weight for the 35G is 23 kg or 51 lb.

Boom cylinder weight for the 50G is 60 kg or 132 lb.
Arm cylinder weight for the 50G is 43 kg or 95 lb.
Bucket cylinder weight for the 50G is 32 kg or 71 lb.

Thank you
Patrick Doyle

As far as arm and boom weight, please account for weights of all components (hydraulic pistons, hoses, etc.) The information will help in determining the weight of the excavator boom/arm/bucket assembly as if I were to remove it from the tractor body.

Thanks,

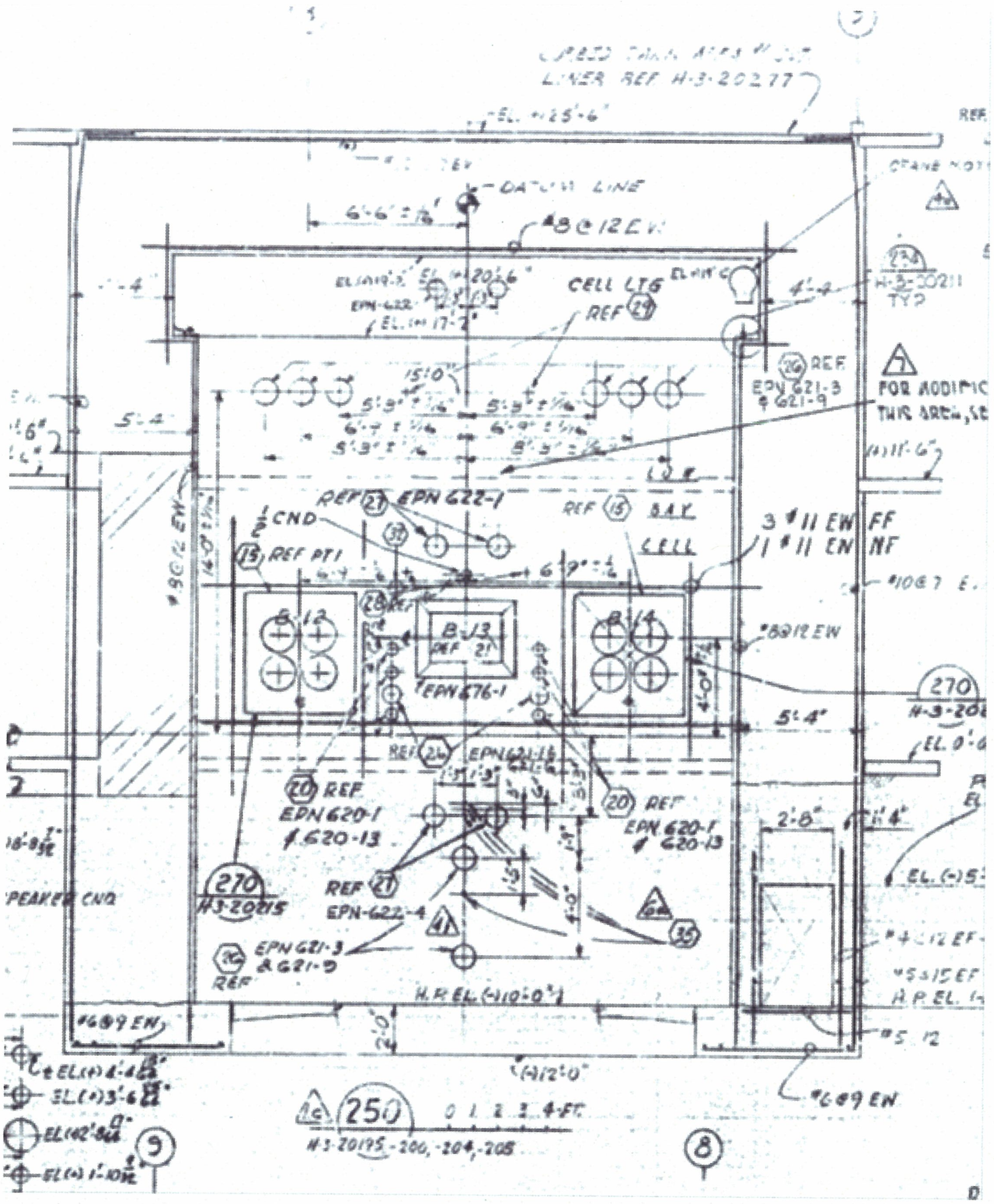
Rick Rast, P.E.
Civil/Structural Engineer

KURION
Isolating Waste from the Environment

Calc. # KUR-1782P-CALC-C001
Revision: 0

Calculation Title: Support Structure Design for REA Proof Testing
Originator: R.S. Rast Date: 21 May 2014
Checker: R. Rasmussen Date: 21 May 2014

Attachment 4



Section 250 from H-3-20213

Attachment C

Proof of Principle Testing

KURION
Isolating Waste from the Environment

Report #: KUR-1782P-TPL-001

Revision: 0

Report Title: Soil/Chemical Binder and Waste Bag Test Plan

Project Title: 300-296 Soil Remediation Project

Status: ☐ **In-Process** ☒ **Final**

Contains assumptions and/or inputs which require verification: ☐ **Yes** ☒ **No**

Report History

Revision #	Reason for Revision	Approvals/Date
0	Initial Issue	Originator:C.W. Singleton 4/15/2014 Checker:M. Cole FOR PER EMAIL 4/15/2014 PM:K. Quigley 4/15/14 Other:B. Carpenter 4/15/14
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:

1. Purpose and Scope

The purpose of this testing is to determine chemical binder formulation and to provide proof of principle validation of the conceptual design for remediation of the soil beneath the 324 building B-Cell. Testing shall be accomplished through all phases of design to ensure the final process design will allow successful remediation of the soil under the B-Cell.

The scope of the testing related to this plan includes the development/determination of specific chemical binder mixes to support the efficient remediation of the soil beneath building 324 B-cell. The testing scope also evaluates the waste bag and stand design and handling operations as it relates to the proposed remediation operations process. The large scale mixing test will utilize a standard excavator as opposed to the Remote Excavator Arm (REA). Demonstration mixing testing using the REA will be performed under the REA Test Plan.

2. Test and Objectives

The specified tests and test objectives for the test scope are defined in Table 1 - Tests and Objectives below. Testing shall be accomplished under the direction of a test engineer and in accordance with an approved test procedure. The test engineer shall have the latitude to change the test procedure as needed to adequately address the test objectives.

Table 1 - Tests and Objectives

Test Number	Test Description	Test Objective	Test Type
1	Soil/Binder mix formulation	1. Develop at least two variations of chemical binder mix formulas for sand to: 1) promote flow of the soil/binder mix to efficiently utilize disposal cell volume; and 2) minimize the soil/binder mixed volume. 2. Determine binder mix formulation for cobble. 3. Determine proper cobble/binder mix method.	Bench and Large Scale
2	Binder formulation	1. Determine binder formulation to provide adequate soil/binder mix set time to support waste bag handling and potential soil/binder mix flow in the disposal cell. 2. Determine equipment cleaning requirements. 3. Determine if binder color agent is required to determine proper mixing	Bench and Large Scale
3	Waste Bag handling	1. Validate the bag design 2. Validate the bag stand design 3. Validate remote bag handling operations 4. Demonstrate mixture flow from bags	Large Scale
4	Soil and Grout Mixing	1. Determine/demonstrate binder application. 2. Demonstrate soil/binder mixing with excavation equipment 3. Determine soil/binder buildup on equipment. 4. Develop method for cleaning soil/binder buildup from equipment 5. Evaluate the effects of residual/overflow binder in the excavation area.	Large Scale

3. Roles and Responsibilities

The roles and responsibilities related to the test scope specified in this plan include:

Project Manager	–	Assign Test Engineer(s) and technicians. Approve test procedures. Evaluate test results.
Test engineer	–	Define test scope, methodology, and acceptance criteria. Develop test procedures. Oversee/direct testing operations in accordance with the test procedure. Authorized to make changes to as needed the test procedure during testing to adequately address test objectives. Prepare test report.
Test Technicians/ Equipment Operators	–	Perform testing under direction of the test engineer.

4. Test Site

Multiple test sites may be used at the discretion of the Test Engineer and consistent with the scale of the tests. The test site shall provide the necessary facilities and utilities to support the test scope. The specific test site shall be recorded within the test procedure results.

5. Precautions, Limitations and Prerequisites

Precautions, limitations, and prerequisites related to the testing shall be identified within the test procedure and as a minimum consider:

- Any special requirements from the hazards identification and mitigation that may be required for testing.
- System interfaces that require isolation prior to initiation of testing for protection against energized systems, improper valve line-up, or connection to contaminated systems
- Actions to be taken should an abnormal event occur, such as system or equipment failure
- Events requiring shutdown or evacuation.
- Selection and identification of measuring and test equipment, to include calibration requirements based on the type, range, accuracy, and tolerance needed to accomplish the required measurements for determining conformance to specified requirements.
- Identification of personnel and their qualification, education, training, or experience for performing the test.
- Identification of equipment or electrical circuits that may need to be isolated or locked and tagged out prior to or during the test
- Permits, approvals, and notifications required before testing can be initiated.
- Fire loading or combustion in cell.

6. Test Requirements

The following general requirements apply to the test scope:

1. The soil for binder mixing test shall have physical properties similar to each of the remediation zones beneath the B-cell.

2. The testing shall evaluate material/binder mixtures for soil/binder and for cobble/binder combinations.

3. The soil/binder mixtures shall be evaluated for flow characteristics.

4. The testing shall evaluate various grout dilution ratios at various temperatures and the related mix set times.

5. Waste bag handling tests shall evaluate the bag design and demonstrate remote engagement, bag closing, and handling of empty and loaded waste bags.

6. Test shall evaluate the ability of the soil/binder mix to flow from the waste bag to support efficient utilization of disposal cell volume.

7. Test shall demonstrate mixing soil with binder and evaluate the buildup and cleaning of soil/binder mixture on the excavation equipment.

Detail test scope requirements/criteria applicable to specific tests shall be specified in the test procedure as needed to adequately address the applicable test objectives.

7. Data Collection, Analysis, and Interpretation

Applicable data collection requirements shall be specified within the test procedure specific to the test being performed and shall consider data required to specifically address the applicable test objective.

Data analysis and interpretation requirements shall also be specified within the test procedure and shall consider the applicable test acceptance criteria and limits, including minimum and maximum values, as applicable, and required levels of precision/accuracy

8. Documentation

Completed test procedures shall be signed and dated to document completion with in test plan parameters. All exceptions and deviations will be discussed in detail to identify problems and resulting dispositions.

Test results shall be documented and evaluated by a responsible authority to ensure that test requirements have been satisfied.

A Test report will be issued to contain, as a minimum, the following:

1. The results obtained, and their range of application and validation.

2. The relationship of the results to previous data, if any.
3. A description of equipment used.
4. A description of significant problems, if any, that occurred during the course of testing.
5. A description of data analysis issues, if any.
6. A summary of the work performed, including conclusions, recommendations, and a description of any possible impacts on safety and quality objectives.
7. Management and peer review approval requirements.

9. Quality Assurance

The following Quality Assurance controls apply to the testing:

1. Testing shall be in accordance with KURION Test Control procedure, KUR-QA-PRO-11-01.
2. Personnel involved with the testing shall be qualified in accordance with KURION Training and Qualification of Inspection and Test Personnel, KUR-QA-PRO-02-03.
3. The test procedure will be peer reviewed by an independent person knowledgeable in the scope area and documented. The peer review shall consider:
   - Appropriate test safety
   - Appropriate test objectives
   - Appropriate test approach
   - Sufficient procedure detail to adequately perform the testing
   - Sufficient data collection requirements to allow data analysis in support of test objectives
4. Completed test procedure shall be controlled as a Quality Record.
5. Calibration methods shall be documented in the test procedure and paperwork retained in Project file.
6. Calibrated equipment shall be used for all measurements.

10. Deliverables and Schedule

Table 2 - Test Deliverables and Schedule identifies the test deliverables and associated schedule related to the test scope.

Table 2 - Test Deliverables and Schedule

Deliverable	Due Date
Develop and Issue Test Procedure	4/18/14
Procure/Receive equipment and supplies	6/16/14
Conduct Test Per the Issued Test Procedure	7/31/14
Develop and Issue Test Report	8/22/14

KURION
Isolating Waste from the Environment

Report #: KUR-1782P-TPL-002
Revision: 0

Report Title: Floor Saw Cutting Test Plan
Project Title: 300-296 Soil Remediation Project
Status: ☐ In-Process ☒ Final

Contains assumptions and/or inputs which require verification: ☐ Yes ☒ No

Report History

Revision #	Reason for Revision	Approvals/Date
0	Initial Issue	Originator:C.W. Singleton CWSingleton 4/15/2014 Checker:M. Cole CW Singleton FOR PER EMAIL 4/15/2014 PM:K. Quigley Kent Quigley 4/15/14 Other:B. Carpenter Brent Carpenter 4/16/14
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:

1. Purpose and Scope

The purpose of the testing specified herein is to provide proof of principle validation of the conceptual design for remediation of the soil beneath the 324 building B-Cell. Testing shall be accomplished through all phases of design to ensure the final process design will allow successful remediation of the soil under the B-Cell.

The scope of the testing related to this plan includes determining and validating the saw design for cutting the liner/concrete of the B cell. The testing scope also evaluates the handling and positioning of the saw within the cell.

2. Test and Objectives

The specified tests and test objectives for the test scope are defined in Table 1 - Tests and Objectives below. Testing shall be accomplished under the direction of a test engineer and in accordance with an approved test procedure. The test engineer shall have the latitude to change the test procedure as needed to adequately address the test objectives. The test configuration will initially begin with small scale testing to determine equipment type and then transition to large scale testing of selected equipment.

Table 1 - Tests and Objectives

Test Number	Test Description	Test Objective	Test Type
1	Saw cut through combination of stainless steel liner and concrete floor	1. Determine proper combination blade for stainless steel and concrete 2. Determine saw stability during operation (i.e. is saw weight sufficient for gravity operation) 3. Determine minimum depth of cut required to allow floor to be demolished if complete cuts are not achievable. 4. Verify proper saw cutting with no coolant and determine saw wear rate 5. Determine spark potential as it relates to fire hazard 6. Determine dust generation and migration characteristics as it relates to ventilation and filters as well as visibility.	Bench and Large Scale
2	Saw handling, placement, and replacement	1. Demonstrate remote handling and placement at cut locations.	Large Scale

3. Roles and Responsibilities

The roles and responsibilities related to the test scope specified in this plan include:

Project Manager	–	Assign Test Engineer(s) and technicians. Approve test procedures. Evaluate test results.
Test engineer	–	Define test scope, methodology, and acceptance criteria. Develop test procedures. Oversee/direct testing operations in accordance with the test procedure. Authorized to make changes to as needed the test procedure during testing to adequately address test objectives. Prepare test report.
Test Technicians	–	Perform testing under direction of the test engineer.

4. Test Site

Multiple test sites may be used at the discretion of the Test Engineer and consistent with the scale of the tests. The test site shall provide the necessary facilities and utilities to support the test scope. The specific test site shall be specified within the test procedure.

5. Precautions, Limitations and Prerequisites

Precautions, limitations, and prerequisites related to the testing shall be identified within the test procedure and as a minimum consider:

- Any special requirements from the hazards identification and mitigation that may be required for testing.
- System interfaces that require isolation prior to initiation of testing for protection against energized systems, improper valve line-up, or connection to contaminated systems
- Actions to be taken should an abnormal event occur, such as system or equipment failure
- Events requiring shutdown or evacuation.
- Selection and identification of measuring and test equipment, to include calibration requirements based on the type, range, accuracy, and tolerance needed to accomplish the required measurements for determining conformance to specified requirements.
- Identification of personnel and their qualification, education, training, or experience for performing the test.
- Identification of equipment or electrical circuits that may need to be isolated or locked and tagged out prior to or during the test
- Permits, approvals, and notifications required before testing can be initiated.

6. Test Requirements

The following general requirements apply to the test scope:

1. The liner/concrete for cutting testing shall be configured similar to the B-cell liner and floor configuration (i.e. same thickness, reinforcement, etc.).

2. The testing shall evaluate various blades for combination stainless steel and concrete cutting.

3. Cutting tests shall evaluated for spark and dust generation.

4. Saw handling and placement test shall demonstrate saw placement within +/- 2 inches of target location.

5. Saw shall have sufficient stability and weight for saw frame to remain in contact with floor.

6. Test floor shall include "small" debris consistant with debris typically left after cell is cleared of equipment and stabilizer grout.

Detail test scope requirements/criteria applicable to specific tests shall be specified in the test procedure as needed to adequately address the applicable test objectives.

7. Data Collection, Analysis, and Interpretation

Applicable data collection requirements shall be specified within the test procedure specific to the test being performed and shall consider data required to specifically address the applicable test objective.

Data analysis and interpretation requirements shall also be specified within the test procedure and shall consider the applicable test acceptance criteria and limits, including minimum and maximum values, as applicable, and required levels of precision/accuracy

8. Documentation

Completed test procedures shall be signed and dated to document completion with in test plan parameters. All exceptions and deviations will be discussed in detail to identify problems and resulting dispositions.

Test results shall be documented and evaluated by a responsible authority to ensure that test requirements have been satisfied.

A Test report will be issued to contain, as a minimum, the following:

1. The results obtained, and their range of application and validation.

2. The relationship of the results to previous data, if any.

3. A description of equipment used.

4. A description of significant problems, if any, that occurred during the course of testing.

5. A description of data analysis issues, if any.

6. A summary of the work performed, including conclusions, recommendations, and a description of any possible impacts on safety and quality objectives.

7. Management and peer review approval requirements.

9. Quality Assurance

The following Quality Assurance controls apply to the testing:

1. Testing shall be in accordance with KURION Test Control procedure, KUR-QA-PRO-11-01.

2. Personnel involved with the testing shall be qualified in accordance with KURION Training and Qualification of Inspection and Test Personnel, KUR-QA-PRO-02-03.

3. The test procedure will be peer reviewed by an independent person knowledgeable in the scope area and documented. The peer review shall consider:
   - Appropriate test safety
   - Appropriate test objectives
   - Appropriate test approach
   - Sufficient procedure detail to adequately perform the testing
   - Sufficient data collection requirements to allow data analysis in support of test objectives

4. Completed test procedure shall be controlled as a Quality Record.

5. Calibration methods shall be documented in the test procedure and paperwork retained in Project file.

6. Calibrated equipment shall be used for all measurements.

10. Deliverables and Schedule

Table 2 - Test Deliverables and Schedule identifies the test deliverables and associated schedule related to the test scope and applies to the small scale testing and selection of equipment. Full scale testing shall be a follow on task and is based on the results of the initial testing effort.

Table 2 - Test Deliverables and Schedule

Deliverable	Due Date
Develop and Issue Test Procedure	4/18/14
Procure/Receive equipment and supplies	8/01/14
Conduct Test Per the Issued Test Procedure	9/05/14
Develop and Issue Test Report	9/30/14

KURION
Isolating Waste from the Environment

Report #: KUR-1782P-TPL-003
Revision: 0

Report Title:	Remote Excavator Arm (REA) Test Plan
Project Title:	300-296 Soil Remediation Project
Status:	☐ **In-Process** ☒ **Final**

Contains assumptions and/or inputs which require verification: ☐ **Yes** ☒ **No**

Report History

Revision #	Reason for Revision	Approvals/Date
0	Initial Issue	Originator:C.W. Singleton *CW Singleton 4/15/2014* Checker:M. Cole *CW Singleton for per email 4/15/2014* PM:K. Quigley *[signature] 4/15/14* Other:B. Carpenter *B A Carpenter 4/16/14*
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:

1. Purpose and Scope

The purpose of this testing is to provide proof of principle and operational validation of the design for remediation of the soil beneath the 324 building B-Cell. Testing shall be accomplished through all phases of design to ensure the final process design will allow successful remediation of the soil under the B-Cell.

The scope of the testing related to this plan includes demonstration of the Remote Excavator Arm (REA) mounting and basic operations. In addition, this plan also includes demonstration of REA integrated operations with other remediation components to support the efficient remediation of the soil beneath building 324 B-cell.

The testing will be performed in two phases: I) proof of principle to demonstrate REA installation and basic operations, II) integrated operations to demonstrate interface with other remediation components.

2. Test and Objectives

The specified tests and test objectives for the test scope are defined in Table 1 - Tests and Objectives below. Testing shall be accomplished under the direction of a test engineer and in accordance with an approved test procedure. The test engineer shall have the latitude to change the test procedure as needed to adequately address the test objectives.

Table 1 - Tests and Objectives

Test Number	Test Description	Test Objective	Test Type	Test Phase
1	REA Mounting and Operations	1. Demonstrate remote REA mounting to post. 2. Demonstrate structural attachment to thru-wall supports. 3. Demonstrate remote attachment of controls, monitoring, and hydraulic lines. 4. Demonstrate post load monitoring/sensing. 5. Demonstrate capability to accommodate typical digging, hammering, and shearing loads.	Large Scale	I
2	REA Integrated Operations	1. Demonstrate REA operations within the required envelop. 2. Demonstrate chemical binder application to the soil and mixing with REA. 3. Determine soil/binder buildup on equipment. 4. Develop method for cleaning soil/binder buildup from REA. 5. Evaluate the effects of residual/overflow binder in the excavation area on REA operations.	Large Scale	II
3	REA waste bag handling	1. Demonstrate bulk waste bag design. 2. Demonstrate remote bag handling operations with REA. 3. Demonstrate bag install and removal from stand.	Large Scale	II

3. Roles and Responsibilities

The roles and responsibilities related to the test scope specified in this plan include:

Project Manager	–	Assign Test Engineer(s) and technicians. Approve test procedures. Evaluate test results.
Test engineer	–	Define test scope, methodology, and acceptance criteria. Develop test procedures. Oversee/direct testing operations in accordance with the test procedure. Authorized to make changes as needed to the test procedure to adequately address test objectives. Prepare test report.
Test Technicians	–	Perform testing under direction of the test engineer.

4. Test Site

Multiple test sites may be used at the discretion of the Test Engineer and consistent with the scale of the tests. The test site shall provide the necessary facilities and utilities to support the test scope. The specific test site shall be identified within the test procedure results.

5. Precautions, Limitations and Prerequisites

Precautions, limitations, and prerequisites related to the testing shall be identified within the test procedure and as a minimum consider:

- Any special requirements from the hazards identification and mitigation that may be required for testing.
- System interfaces that require isolation prior to initiation of testing for protection against energized systems, improper valve line-up, or connection to contaminated systems.
- Actions to be taken should an abnormal event occur, such as system or equipment failure.
- Events requiring shutdown or evacuation.
- Selection and identification of measuring and test equipment, to include calibration requirements based on the type, range, accuracy, and tolerance needed to accomplish the required measurements for determining conformance to specified requirements.
- Identification personnel and their qualification, education, training, or experience for performing the test.
- Identification of equipment or electrical circuits that may need to be isolated or locked and tagged out prior to or during the test.
- Permits, approvals, and notifications required before testing can be initiated.

6. Test Requirements

The following general requirements apply to the test scope:

1. The REA mounting mockup wall shall have the same configuration as the existing B-cell related to mounting interface (i.e. same thickness, anchor location, etc.)
2. The excavation mockup envelop shall be dimensionally the same as the B-cell.
3. The soil/binder mix shall be the same formulation developed during chemical binder testing.
4. REA bag handling tests shall evaluate the bag design and demonstrate remote engagement and handling of empty and loaded waste bags.
5. Test shall demonstrate mixing soil with binder and evaluate the buildup and cleaning of grout mixture on the excavation equipment.

Detail test scope requirements/criteria applicable to specific tests shall be specified in the test procedure as needed to adequately address the applicable test objectives.

7. Data Collection, Analysis, and Interpretation

Applicable data collection requirements shall be specified within the test procedure specific to the test being performed and shall consider data required to specifically address the applicable test objective.

Data analysis and interpretation requirements shall also be specified within the test procedure and shall consider the applicable test acceptance criteria and limits, including minimum and maximum values, as applicable, and required levels of precision/accuracy

8. Documentation

Completed test procedures shall be signed and dated to document completion with in test plan parameters. All exceptions and deviations will be discussed in detail to identify problems and resulting dispositions.

Test results shall be documented and evaluated by a responsible authority to ensure that test requirements have been satisfied.

A Test report will be issued to contain, as a minimum, the following:

1. The results obtained, and their range of application and validation.
2. The relationship of the results to previous data, if any.
3. A description of equipment used.
4. A description of significant problems, if any, that occurred during the course of testing.
5. A description of data analysis issues, if any.

6. A summary of the work performed, including conclusions, recommendations, and a description of any possible impacts on safety and quality objectives.

7. Management and peer review approval requirements.

9. Quality Assurance

The following Quality Assurance controls apply to the testing:

1. Testing shall be in accordance with KURION Test Control procedure, KUR-QA-PRO-11-01.

2. Personnel involved with the testing shall be qualified in accordance with KURION Training and Qualification of Inspection and Test Personnel, KUR-QA-PRO-02-03.

3. The test procedure will be peer reviewed by an independent person knowledgeable in the scope area and documented. The peer review shall consider:

   - Appropriate test safety
   - Appropriate test objectives
   - Appropriate test approach
   - Sufficient procedure detail to adequately perform the testing
   - Sufficient data collection requirements to allow data analysis in support of test objectives

4. Completed test procedure shall be controlled as a Quality Record.

5. Calibration methods shall be documented in the test procedure and paperwork retained in Project file.

6. Calibrated equipment shall be used for all measurements.

10. Deliverables and Schedule

Table 2 - Test Deliverables and Schedule identifies the test deliverables and associated schedule related to the test scope as applicable to Phase I testing.

Table 2 - Test Deliverables and Schedule

Deliverable	Due Date
Develop and Issue Test Procedure	4/18/14
Procure/Receive equipment and supplies	5/01/14
Conduct Test Per the Issued Test Procedure	8/21/14
Develop and Issue Test Report	9/25/14

KURION
Isolating Waste from the Environment

Report #: KUR-1782P-TPL-004
Revision: 0

Report Title: Chemical Grout Curtain Test Plan
Project Title: 300-296 Soil Remediation Project
Status: ☐ **In-Process** ☒ **Final**

Contains assumptions and/or inputs which require verification: ☐ **Yes** ☒ **No**

Report History

Revision #	Reason for Revision	Approvals/Date
0	Initial Draft	Originator:C.W. Singleton CW Singleton 4/15/2014 Checker:M. Cole CW Singleton for Mel Bharel 4/15/2014 PM:K. Quigley Buck Quigley 4/15/14 Other:B. Carpenter B R Carpenter 4/15/14
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:
		Originator: Checker: PM: Other:

1. Purpose and Scope

The purpose of this plan is to determine general chemical grout formulations, placement methodology, and provide a proof of principal for a grout curtain to be constructed below grade at the 324 facility B-Cell structure. Testing of materials will be conducted throughout this and following phases of initial and demonstration (mock-up) activities.

Determination of chemical grout curtain formulation and placement will include evaluation of materials, equipment, and methods for both vertical and horizontal drilling and chemical grout injection. This is with the intent of resultant negligible or no radiological dose concerns for associated project personnel and others. This phase of grout curtain test work will be conducted under non radiological conditions.

2. Test and Objectives

Test(s) for grout curtain materials and methods will be conducted per the table below. Test activities will be conducted under the direction of a test engineer per general project procedures. Testing may be modified during test activities in order to optimize test procedures and test results benefiting actual grout curtain placement objectives.

Table 1 - Tests and Objectives

Test Number	Test Description	Test Objective	Test Type
1	Percussion Drill Operations	1. Determine drilling rate in sand and sand/gravel, vertical and horizontal 2. Determine injection rate in sand and sand/gravel, vertical and horizontal. 3. Determine optimum bit configuration 4. Evaluate angle and depth operations of drill head within limited access head space 5. Evaluate electrical/hydraulic drill for non-conductive drill operations through concrete 6. Determine directional control under horizontal conditions below concrete structure	Large Scale
2	Grout Mixing/Pumping Operations	1. Determine bounding capabilities of mixing and pumping equipment. 2. Evaluate pump tubing/piping and required system pressure and volume per unit time requirements for optimal grout injection rates in sand and sand/gravel media. 3. Evaluate grout liquid swivel operations with simultaneous soil nail placement.	Large Scale
3	Chemical Grout Performance	1. Develop multiple grout set times under drill operations. 2. Develop multiple grout set times under set-in conditions. 3. Determine grouted soil physical characteristics after placement, e.g., compressive strength, shear, elevated temperature, etc.	Large Scale
4	Grout Column Morphology	1. Determine morphology of vertical and horizontal columns with coaxial soil nails or directional drill steel. 2. Determine drilling spacing for optimum grouted column placement.	Large Scale

3. Roles and Responsibilities

The roles and responsibilities related to the test scope specified in this plan include:

Project Manager – This participant assigns engineers, drillers, technicians, and others for general and specific tests and support activities. The project manager also approves testing methods and protocols as well as testing reports.

Test engineer – The plan test engineer has the technical responsibility for carrying out specific work scope management and operations. This person will direct all test operations as well as modification of testing, etc., as approved by the project manager and others as appropriate. Additionally, the test engineer will compile and otherwise prepare the test report.

Drillers – Drillers consisting of exempt and/or non-exempt participants will conduct vertical and horizontal core drilling and grout injection drilling with limited access drilling and directional drilling equipment. They will conduct operations under the direction of the test engineer.

Safety/Quality – Safety and quality engineers, respectively, will provide oversight and inspection on all applicable work scope both before and during field operations.

4. Test Site

Testing of grout curtain placement will be conducted as a large scale activity, hence a test site consisting of materials, for the most part, equivalent with those of actual B-cell structures and materials are anticipated. These shall be delineated in size and location by the project manager and test engineer.

5. Precautions, Limitations and Prerequisites

Testing of grout curtain placement requires full scale test facilities and industrial equipment. As a result significant emphasis will be given to safety, quality, and project overview. Test operations will as a minimum consider:

- Environmental operations and discharge permits will be ascertained from appropriate local/state/federal agencies as appropriate.
- Personnel qualifications relative to grout curtain placement testing will be evaluated and approved by the project engineer.
- Equipment operations will be evaluated/approved for operations by manufactures for electrical, mechanical, hydraulic, etc., systems and also approved by the engineering and project management. Equipment will also be surveyed radiologically and released for use by the client where appropriate. Electrical systems and electrical system grounding and ground fault components will be specifically evaluated.

- Hydraulic systems components will be evaluated for component thermal and pressure compatibility and maximum operational limits. Mechanical guarding and related operations will also be specifically evaluated.
- All appropriate personnel protective equipment should be required during all test field operations.
- Operational or equipment failure may require corrective actions which need to be indentified as a precursor to field operations.
- Test instrumentation and associated measuring devices are required to be calibrated as appropriate based on safety considerations.

6. Test Requirements

The following general requirements apply to the test scope:

1. Test equipment must be full scale.
2. Soil and soil/gravel geologic media should be similar in properties and configuration to that of those proximal to B-cell.
3. Temperature and soil moisture (if any) should be similar to that proximal to B-cell.
4. Bounding and mean conditions of grout formulations should be evaluated.
5. Scaling and similitude should not be used.
6. Samples of injected and set materials will be taken in situ (subsequent to excavation) for further testing.
7. Testing shall include simultaneous evaluation of operations of all interfaced pumping drilling and injection systems, including subsystems, components, etc.

Test results should provide direct information relative to requirements, methods, and materials needed to construct a curtain wall around and below B-cell (324 facility).

Detail test scope requirements/criteria applicable to specific tests shall be specified in the test procedure as needed to adequately address the applicable test objectives.

7. Data Collection, Analysis, and Interpretation

A test procedure will be written subsequent to approval of this general test plan. Within the procedure, specific data collection methods, analysis methods, and interpretation of data will be documented.

This information collected is significantly important for other work scope tasks that will require summary grout curtain results to support design completion of equipment and placement of auxiliary structures within and around B-cell.

8. Documentation

A test document will be compiled by the test engineer throughout all phases of large scale task activities. Baseline, operations, quality, etc,. data will be recorded and where applicable, photographs of all operations and resultant placement results will be photographed. A test report will be prepared including:

1. A description of all drilling, coring, pumping, tubing/piping, test equipment/instrumentation, soil nails, etc. will be required. Equipment technical and operational specifications for each will also be required as part of the test plan.
2. Photographs of all equipment utilized during operations and post operations test evaluations.
3. Record(s) of all operational data, i.e., soil temperature, equipment hydraulic pressure, grout pump pressure/volume, grout formulations, drilling rate, grouted soil column morphology, etc..
4. The test record and associated documentation will be controlled as a quality record.
5. Calibration records will be included in task documentation.
6. A summary of test plan work performed including objectives, workscope, approvals, results, conclusions, recommendations, and references.

9. Quality Assurance

The following Quality Assurance controls apply to the testing:

1. Test Engineer and associated staff involved with task data collection, interpretation, etc., will be qualified in accordance with KURION Training and Qualification of Inspection and Test Personnel, KUR-QA-PRO-02-03.
2. Testing actions will be completed in accordance with KURION Test Control Procedure KUR-QA-PRO-11-01.
3. A qualified quality engineer will provide oversight of all applicable task work scope.
4. Completed test procedure shall be controlled as a Quality Record.

5. Calibration methods shall be documented in the test procedure and paperwork retained in Project file.

6. Calibrated equipment shall be used for all measurements.

10. Deliverables and Schedule

Deliverables and schedule relative to this test plan are delineated in Table 2.

Table 2 - Test Deliverables and Schedule

Deliverable	Due Date
Develop and Issue Test Procedure	4/18/14
Procure equipment and supplies to support tests.	TBD
Conduct Test Per the Issued Test Procedure	TBD
Develop and Issue Test Report	TBD

Attachment D

Testing & Mockup Plan

KURION
Isolating Waste from the Environment

REMOTE SYSTEMS ENGINEERING INC.

Report #: KUR-1782M-PLN-001

Revision: A

Report Title: **Mock Up and Testing Plan**

Project Title: **Waste Site 300-296 Soil Contamination Under 324 Building B-Cell Remediation**

Status: ☒ In-Process ☐ Final

Contains assumptions and/or inputs which require verification: ☒ Yes ☐ No

Report History

Revision #	Reason for Revision	Approvals/Date
A (4/14/14)	Initial draft	Originator: Paul Gee Checker: Wade Singleton PM: Other: email (4/13)

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ABBREVIATIONS AND ACRONYMS

AFS	AREVA Federal Services LLC
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
CAR	Corrective Action Record
HEPA	High Efficiency Particulate Air
HVAC	Heating, Ventilation & Air Conditioning
IBC	International Building Code
MSM	Master Slave Manipulator
NCR	Non-Conformance Report
REA	Remote Excavator Arm
REC	Radiochemical Engineering Complex
RHPG	Remote Handling Project Goals
RoM	Range of Motion
SSC	Systems, Structures and Components
TAP	Technical Approach Priorities
WCH	Washington Closure Hanford

Waste Site 300-296 Soil Contamination Under 324 Building B-Cell Remediation: Mock Up Testing Plan

1.0 MOCK-UP FACILITY DESCRIPTION

The mock-up facility for the "Waste Site 300-296 Soil Contamination Under 324 Building B-Cell Remediation" project is a multifunction facility. In addition to mock-up testing to validate/prove the remediation process design, the facility will also act as process development facility to aid in process/procedure development, as a training facility to support personnel training to safely complete the work, and as a troubleshooting facility to aid in developing solutions to problems that develop during remediation operations.

Although the remediation approach was conceptually presented in the proposal phase of the project, the successful completion of the process design phase requires significant development and testing activities to ensure project success. Process development includes determining and selecting the most efficient equipment for the process as well as developing the process operations techniques, and subsequently, the procedures that efficiently and safely support project execution. This includes the ability to troubleshoot process and equipment issues as they arise during actual remediation operations in the 324 facility. In the event that an upset condition occurs during remediation operations, the mock-up facility will be used to develop recovery actions and procedures for equipment and processes to minimize down time.

In addition to equipment and process/procedure development, another key factor in successful project execution is properly trained personnel. The project the facility will support is a complex combination of tasks, and therefore, operations personnel assigned to the project require significant training to safely and efficiently perform the required remediation tasks. The required training must simulate as closely as possible the actual project conditions in order to be effective and ensure project success.

The three functions described above (mock-up process validation, process/procedure development, training) form the overall functional basis of the facility. The following paragraphs provide a more detailed facility description with these three basic functions in mind.

Facility Floor Plan/Envelope/Structure

The basic mock-up area floor plan is shown in Figure 1 below. The floor plan provides the basic mock-up layout and identifies the various key mock-up areas. The mock-up area layout reflects the REC cell configuration of the 324 facility. The mock-up area is covered by a weather enclosure which is a tensioned fabric structure. The overall weather enclosure foot print dimensions are 120' long x 120' wide. The weather enclosure is a clear span structure (i.e. no support columns within the enclosure interior foot print). The weather enclosure and the mock-up area structural design and construction is in accordance with the adopted version of the IBC and per the authority having jurisdiction.

As previously noted, the mock-up layout was developed based on the three basic facility functions described above and as a result provides the ability to closely mimic the expected remediation operations. This basic replication of the key areas of the 324 facility ensures a high level of confidence that the remediation process will work as designed. The layout presented also ensures personnel assigned to the remediation efforts are well trained for the tasks required in the process. Each of the various mock-up areas are described in more detail below.

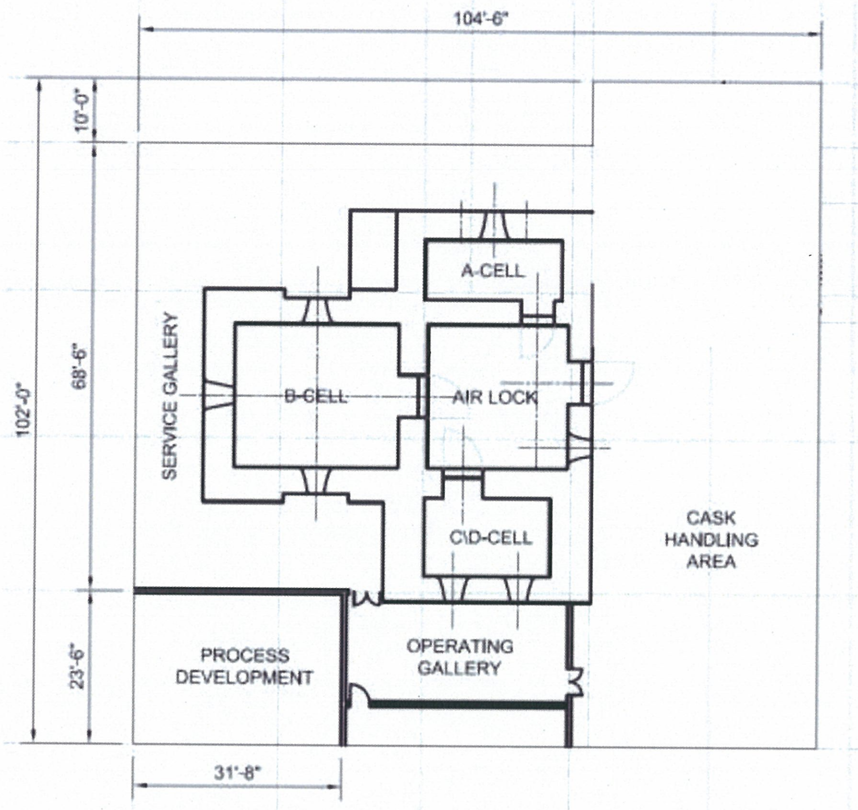


Figure 1: Mockup Facility Basic Floor Plan

Mock-up Cell Areas

To support the required facility functions, the facility must have mock-up cell areas that reflect the actual facility configuration for the REC cells, and the common air lock, and configuration for the B and D-cell galleries. The mock-up cell areas include:

- B-cell
- Air lock
- C-cell/D-cell complex
- A-cell
- Galleries

B-cell area is the primary process area for the project and is a high/low bay (i.e. 2 stories with no floor in between). As such, the mock-up facility includes a dimensionally accurate representation of the B-cell interior foot print and volume. The cell finished floor elevation is 10 feet below grade and the gallery finished floor elevation is at grade. The below grade portion of the cell walls are cast in place concrete. This mock-up area includes a partial wall constructed of concrete to simulate the shield wall between the gallery and the cell interior. This partial wall is used to demonstrate core drilling and REA mounting capabilities. The remaining walls of the B-cell mock-up above grade are either wall simulations of material hung to replicate a wall, framed walls or a combination of the two. The determination of the wall construction is based on whether the wall has to serve a mockup function or if it is purely to simulate a wall to enclose an area.

As previously noted, the shield wall mock-up is configured to demonstrate core drilling as well as accepting the installation of REA(s) and supporting the REA and the associated operational loads the REA must accommodate. The shield wall includes key features that accurately represent the actual shield wall and include:

- Shield window cut-out that simulates the field of view of the actual facility
- All master slave manipulator ports
- All currently non-utilized shield wall plug penetrations in the B and D cell galleries

These features are dimensionally accurate for size. The feature locations are also dimensionally accurate and reflect the existing B-cell geometry relative to cell interior surfaces (e.g. the centerline of the window cut out is 15' – 1" above the mockup B-cell interior floor, reference drawing H-3-20214).

The mockup B-cell also includes a stainless steel liner on the floor that extends up 2 feet on the walls. This liner is attached to the floor and wall in accordance with the 324 facility B-cell drawings. The B-cell mockup also includes racks and scrap equipment to represent existing equipment and scrap in the B-cell. Equipment racks are attached to the west wall and scrap items, both loose and fixed, are included in the B-cell mock-up. The fixed items are various scrap items fixed in position via a layer of grout. The scrap items and the grout thickness represent items currently in B-cell.

The Air lock area in the 324 building is a shielded common service area and provides direct access to cells A, B, and D through shield doors. In order to properly simulate the remediation process as well as support the preparatory operations, the mock-up facility includes a clearly defined, dimensionally accurate airlock interior volume footprint bounded by walls. The air lock mock-up floor is slab on grade with an elevation of 0'-0". The mock-up includes representations of cell doors to ensure any space consumed by open doors is identified to determine the process paths available.

The C and D cell area of the 324 building is a stacked configuration cell area with the D-cell directly above the C-cell. The process flow for the loaded waste soil bags will be from the B-cell, through the air lock, into the D-cell, through the port in the D-cell floor into the C-cell. To accurately simulate the process flow, the mock-up replicates the C/D cell interior configuration. The C/D cell mock-up includes a clearly defined and dimensionally accurate D-cell interior foot print bounded by hard walls. In addition, a dimensionally accurate representation of the C-cell interior is located beneath the D-cell foot print. The C-cell finished floor is slab on grade with an elevation of 0'-0". The C and D-cell mock-ups are also bounded by walls. The C/D cell mock-up includes a dimensionally accurate interface port between the C and D cells. The location of the interface port in the mock-up facility also reflects the port location found in the 324 building.

The 324 building A-cell, like the B-cell, is also high bay type cell. The remediation approach includes the use of A-cell as a repository for equipment currently located in the B, C, and D cells. To accurately simulate the process flow, the mock-up facility replicates the A-cell configuration. The A-cell mock-up includes a clearly defined and dimensionally accurate A-cell interior volume foot print bounded by walls with the A-cell finished floor being slab on grade at an elevation of 0'-0".

In addition to the various cells and the air lock, an integral and important part of the hot cells, is the gallery area. The gallery area provides cell interior observation via the shielded windows. The gallery also provides an area to operate the MSMs for manipulation of in-cell equipment and processes. Since the remediation process will be utilizing all of the cells, the mock-up facility includes an area that simulates the gallery area around the B and D cells. The simulated gallery area is configured the same, and is dimensionally the same as the actual gallery area. Any permanent equipment in the gallery is defined as needed to show the equipment foot prints within the gallery. Maintaining the gallery space envelope and representing equipment space in the gallery the same as the existing facility will aid in proving that the operations to drill and install the REA equipment is achievable within the existing gallery envelope.

In addition, to items within the gallery to aid in simulations, at least one MSM port is occupied by an operational MSM. MSM ports not occupied by an MSM, include a representation of the in cell portion of the MSM to represent the space occupied by the MSM.

Process Development Area

The mock-up facility also includes an area for development of the remediation process operations and equipment as well as training that does not require the full cell mock-up. This area includes an area for cell floor cutting as well as a general area for miscellaneous operations development, testing, and training. The overall process development footprint is 31'-8" long X 23'-6" wide.

Equipment Staging Area

The mock-up facility also includes a staging area for equipment. This area is representative of the cask handling area in the 324 building and provides a smooth approach to the air lock area. This area floor is concrete slab on grade at an elevation of 0'-0" and does not have exterior walls. The area does include framed interior walls to appropriately reflect the existing facility area.

Crane Support

The 324 building REC area has various cranes previously used to support cell and air lock operations. The remediation process will use these cranes to the extent practical to perform remediation operations. Based on this, the mock-up facility includes a crane to transfer materials and equipment to and from the B-cell. This crane has an operational envelope that reflects the actual 324 building B-cell to air lock crane operational envelope.

The facility also includes a crane that simulates the combined operating envelope of the A and A/D crane. This crane is used to replicate crane moves into and out of A and D cells. All of the crane capacities for the mock facility also replicate the capacities of the existing facility cranes to ensure accurate mock-up operations.

Other Facility Support Areas

Facility support areas such as break areas and restroom facilities are not included in the mock-up facility but are provided via the temporary installation of mobile trailers provided by others.

Facility Utilities and Services

The 324 build has a variety of utilities and services. The mockup facility requires various utilities and services to support operations of the facility. The facility site includes the following available services:

- Electrical service as needed to support the facility operations.

The mock-up facility includes various rooms and closets located as needed to support utilities and services (i.e. mechanical room, communications closet, electrical room, etc.).

Paint and Coatings

Paint and coating color for the cell, air lock, and gallery areas is similar to the respective areas of the 324 building. The intent is to ensure the mockup will provide similar visual effects as the actual facility for training purposes.

Lighting

Lighting for the cell, air lock, and gallery areas is also similar in type and intensity as compared to the respective areas of the 324 building. The intent is to ensure the mockup will provide similar visual effects as the actual facility for training purposes.

Internal lighting in other facility areas as well as exterior lighting around the building perimeter is in accordance with code requirements.

Remote Vision/monitoring Systems

The remediation process will use existing facility systems as much as possible to avoid the various costs associated with installation of new system(s). Based on this, the mock-up includes remote vision systems that replicate/simulate existing vision systems installed in the existing facility. Any new or upgraded vision systems that are required will be installed as needed as part of the mock-up testing. The vision systems output is transmitted to the operations trailer located outside of the mock-up weather enclosure.

Mock-up Cell Ventilation and Facility HVAC

The 324 facility includes a HEPA filtered ventilation system that supported the REC cell operations and ensured a negative pressure in the REC cells. The mock-up facility does not include a full operational HEPA filtered ventilation system for the mock-up cell area. The mock-up does, however, include pre-filter mounting frames and the associated pre-filters that reflect the existing facility filter configuration. Filter and frame location within the mock-up also reflect the existing facility filter location within the cells. While the filters in the mock-up are not functional, they are provided to support training operations for personnel.

Since occupancy within the mock-up is minimal (all process observation, once REAs are installed, occurs at the control trailer), the facility does not include an HVAC system to provide facility heating and cooling. In the event that personnel are required to occupy the mock-up gallery areas, during hot weather, portable units are used for cooling the gallery area.

Facility Access

Access to the mock-up through the weather enclosure is provided by various man doors as well as equipment doors. Equipment access to the air lock mock-up is provided by a door with a clear opening envelope consistent with the existing 324 facility airlock access from the cask handling area. This door will simulate the door between the air lock and the cask handling area.

In addition, personnel facility access and egress is through man doors at various locations as determined by life safety requirements. The man doors are standard steel doors and selection is based on a 36" X 84" rough opening.

2.0 TESTING SCOPE

This MOCK-UP TESTING PLAN intent is to demonstrate BLDG 324, B-Cell Soil Remediation Remote Operated Equipment and Processes to be employed during the project's operational working lifecycle. This will be accomplished by duplicating the intended project remote operated process steps from the start of operation through to final completion. All process steps and operations are intended to be conducted within the pre-determined Mock-Up structure and facility in a manner which is as close as is feasibly possible to the real operational conditions thereby allowing the intended operators and equipment to interact and allow any necessary additional learning while in a safe and controlled environment.

This Mock Up and Testing Plan is aligned with the 6 basic Remote Handling Project Goals and the overriding 6 Technical Approach Priorities.

Remote Handling Project Goals:
(Project Scope Narrative pg. 43, G.1.2.2 Technical Data and Conceptual Plan, Remote Operated Equipment)

1. Install needed equipment (e.g., crane, MSMs, roughing HEPA filters, lighting, etc.)
2. Size reduce and rearrange legacy in-cell debris
3. Remove grouted debris, liner, and floor slab from B-Cell
4. Excavate soil from under B-Cell
5. Transport excavated soil into A, C, or D cell for final disposal
6. Support final back fill and monolith creation

Technical Approach Priorities:
(Project Scope Narrative pg. 37, G.1.1 Project Scope Narrative, Project Overview)

A. Safety
B. Contamination Control
C. Waste Compliance
D. Simplicity/Robustness
E. Reliable Operations
F. Operational Flexibility/Backup

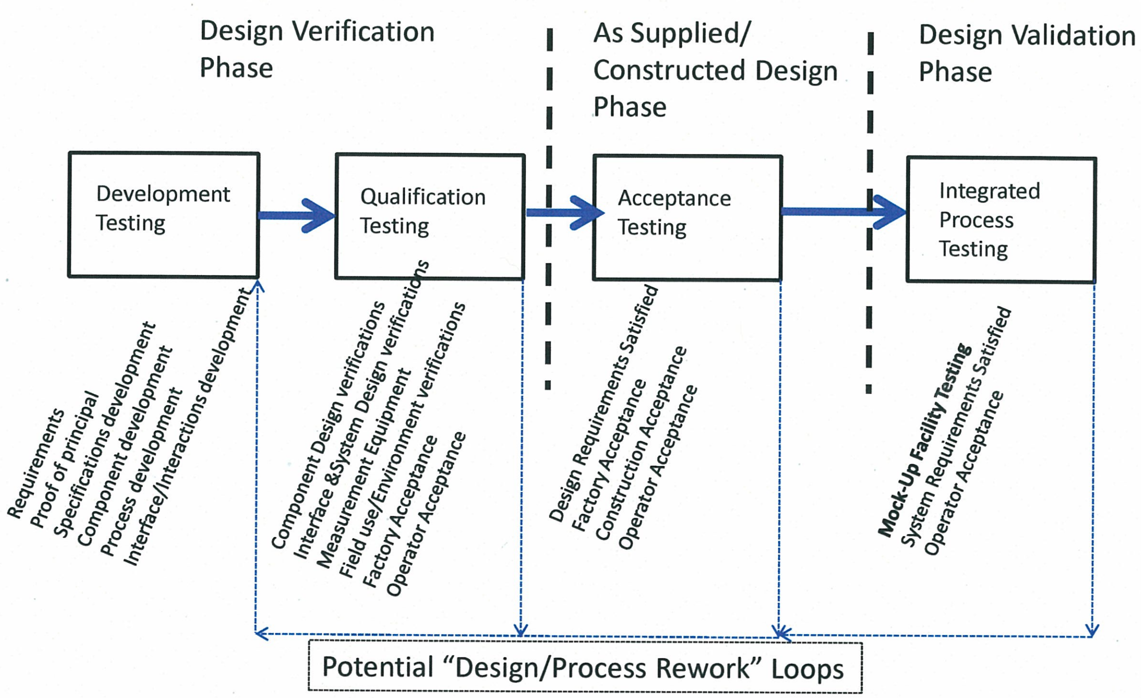
The plan is considered to be a "living document" until 100% system design completion and approval sign-off. It is anticipated that this plan will change based on the evolution of the individual SSC (systems, structures and components) through the Development, Qualification, Acceptance and Process testing phases. Any and all impacts to this plan will be tracked and controlled through the document revision change controls as captured earlier in this document. The following testing plan in Section 6.0 encompasses the final systems and processes as intended to be used within the Bldg. 324 cell facility during the actual project operational work scope (Process Testing Phase) but does not comprehend any of the underlying testing (Development, Qualification and Acceptance). These underlying testing phases can be referenced as applicable for each of the Process Testing steps with the associated Development, Qualification and Acceptance Testing document numbers in order to provide compliance with the State of Work (SOW) expectation.

The project Statement of Work, section 2.4.2.4 states: “Remote equipment shall be tested and qualified. The test and qualification procedures shall be developed and documented. CONTRACTOR shall witness and accept testing and qualification activities.” It is anticipated that the customer (WCH) will also expect to take part in these “witness and approval events” for at least the key project deliverables during the various stages of the project lifecycle.

3.0 TESTING OVERVIEW

The testing, results and corresponding documentation will follow the attached table of process steps/operations as detailed in section 6.0 (this step sequence as listed should be viewed as "living" and may change until the 100% Design completion gate). The table should be utilized with an overriding *WHAT, HOW and WHY* questioning approach. During the completion of each of the Remote Handling Processes and Steps, (*THE WHAT*), the effectiveness of each test will be assessed and successful completion determined using documented test methods and acceptance metric sets (*HOW THE WHAT IS ACCOMPLISHED*). These results will then be formally documented and reported for each under an assigned report/document number enabling ease of traceability and referencing (*WHY THE HOW ACCOMPLISHES THE WHAT*). It is intended that the methods and applicable metrics employed for each assessment will be determined during the design development, qualification and acceptance phases in preparation for the Mock-Up facility testing. As initiated in section 6.0, the test plan is a sequential outline of the anticipated remote handling process steps involved and includes a mechanism to link the PROCESS testing back to the earlier design Development, Qualification, Acceptance and Operational Acceptance criteria utilized (an additional column showing the respective D, Q, A, O and associated report number).

Figure 2: Remote Systems Testing Method Chronology



The types of testing/phases involved will be categorized into these 5 (five) testing groups as outlined below and shown in Figure 2 (above):

Development Test. A test performed to provide or develop design information, concepts, or criteria. Development test may also be performed to:
· Calculate and verify design, safety, or reliability concepts or criteria.
· Develop performance characteristics through the use of mock-ups or test facilities.
· Develop engineering specification requirements and specific design objectives.
· Resolve engineering or technological issues.

Qualification Test. Conducting laboratory or field tests on prototype, pilot, preproduction, or production hardware to verify design adequacy and thus qualify the item for use in the field. Qualification tests define:
· The differences between the test and final field configuration;
· Clearly identify which items are included in the scope of the test;
· Any limitations such as only certain design features are to be tested;
· Modification documentation and retest requirements; and
· When tests are performed on models or mockups, scaling laws are established and verified, and error analysis utilized before use in the final design.

Acceptance Test. A test that is performed to demonstrate that fabrication, assembly, installation, and construction requirements have been met as required in design documents.

Operational Acceptance Test. An acceptance test that is performed by the operator with items in their final in-service configuration to verify that functional, operational, and design requirements have been met.

Process Test. A test that consists of making a controlled change in a production or processing operation to evaluate potential improvements, develop optimum process parameters, or establish new criteria.

The plan will be updated accordingly as the project testing phase gates are passed and any evolution occurs. When finalized, this "list" will ultimately serve as the Mock-Up Test roadmap allowing duplication and documentation of complete system level validation of the final intended project process sequence.

4.0 TESTING ISSUES/ABNORMALITIES

In the event of any instances of test issues or irregularities/adnormalities during the Mock-Up evaluations the specific situations shall be documented. Potential NCR verification or NCR/CAR initiation shall be addressed within the specific test procedures.

5.0 TRAINING AND OPERATIONAL/PROCEDURAL DEVELOPMENT

The Mock-Up facility in conjunction with this test plan is also intended to serve as a safety, procedural and operational training sequence as well as the final platform for specific process and procedure development for use in the work packages to be employed within building 324. The process step by step approach was deemed the most effective in ensuring that the proper level of attention to detail is employed and can then facilitate the most learning and experience prior to actual operation. Training opportunities as detailed in the respective columns of the table within section 6.0 show both the actual training opportunities involved with each step and also the anticipated needs for additional training beyond the scope of the Mock-Up facility and test.

It is expected that the operational/procedural work package development will be inclusive of but not limited to:

Equipment Testing	Contamination generation/dust monitoring
Process Testing	Grout demolition and debris removal
Personnel Training	Floor cutting equipment install, replacement and removal
Lighting and Vision Systems Usage and Function	Floor cutting operations,debris removal
Crane(s) Usage and Function	Waste Bag equipment installation
Crane(s) Upgrade/Replacement	Binder application
-Manipulator (MSM) Usage and Function	Soil and Binder mixing process and tool utilization
Manipulator (MSM) Upgrade/Replacement	Soil mixture transfer to transport bags/containers
REA Usage and Function	Top Coat application
REA Upgrade/Replacement	Soil Bag transport to desired final location
BROKK Usage and Function	Soil Bag spike penetration and material flow
Ventilation Filtration Removal & Replacement	Crane failure recovery
Core Drill and REA Installation(s)	Misc. equipment failure recovery
Legacy Waste/Debris resize and removal	Crane/Misc Equip. in cell repairs
Waste Debris Transport to final locations	Grout fill of cell and excavated volumes
Rad/Environmental Sampling Measurements	Disconnect utilities and service ports

6.0 TESTING PROCESS FLOW

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
								D : DEVELOPMENT TEST Q: QUALIFICATION TEST A: ACCEPTANCE TEST O: OPERATIONAL ACCEPTANCE TEST
1.	DOC#: xxxxxxxxx	INSTALL CAMERAS AND LIGHTING PER INDIV. CELL REQUIREMENT	MOUNTING REQUIREMENTS: SPLIT PLUG INTERFACE, HOLE DRILLING, WIRING CONNECTIONS, etc			1/CELL	Y	D: assoc doc # Q: assoc doc # A: assoc doc #
			CONNECT/ RECONNECT			1/CELL	Y	D Q O
			RANGE OF MOTION/LIGHTING FUNCTIONALITY TESTS			1/CELL	Y	D Q A O
			VISION TESTS			1/CELL	Y	D Q A O
			AUDIO TESTS			1/CELL	Y	D Q A O
1a	xxxxxxxxx	REMOVE FLOOR PANEL BETWEEN D-CELL AND C-CELL	INSTALL JACK TOOL IN D-CELL, REMOVE BOLTS, JACK THE FLOOR PANEL UP IN D-CELL. LIFT WITH CRANE AND SET ASIDE.			1	Y	D Q O
2[1]	xxxxxxxxx	UPGRADE/REPLACE A-CELL CABLE MANAGEMENT EQUIPMENT	FUNCTIONALITY TESTS			1	Y	D Q A O
			IF REQUIRED WILL REQUIRE AIRLOCK ENTRY					

[1] Scope Creep

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
2a[2]	xxxxxxxxx	REMOVAL OLD B-CELL CRANE PARTS	CONFIRMATION OF NEED					D O
			IF REQUIRED WILL REQUIRE AIRLOCK ENTRY					D O
2b	xxxxxxxxx	INSTALL UPGRADE B-CELL CRANE/PARTS	FUNCTIONALITY TESTS			1	Y	D Q A O
3	xxxxxxxxx	INSTALL VENTILATION (ROUGHING) FILTERS IN ALL CELLS	PERFORM REQUIRED HVAC AND ELECTRICAL MODIFICATIONS			1/ROOM	Y	D Q A
			ATTACHMENT TO MOUNTING FRAME TESTS			1/ROOM	Y	D Q A
			MOUNTING FRAME ATTACHMENT TO DUCTWORK TESTS			1/ROOM	Y	D Q A
			AIRFLOW/SYS dP FUNCTIONAL TESTS			1/ROOM	Y	D Q A
			CONFIRM EDGE SEAL OF FILTER			1/ROOM	Y	D Q A
4	xxxxxxxxx	REINFORCE CELL FLOORS FOR STORAGE LOADING NEEDS AND FUTURE MONOLITHE TRANSPORT REQUIREMENTS	CONFIRMATION OF NEED					D Q A
5	xxxxxxxxx	BROKK OPERATIONAL TESTS PRIOR TO AIRLOCK ENTRY PER OPERATOR	FUNCTIONALITY TEST			1	Y	D A
			SPECIFIC TASK			1	Y	D A

[2] Scope Creep

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
			TESTS					
5a	xxxxxxxxx	INSTALL BROKK IN AIRLOCK	FUNCTIONALITY TEST			1	Y	D A
			SPECIFIC TASK TESTS			1	Y	D A
			CRANE LIFT BROKK OPERATIONAL TEST			1		D A
5B	xxxxxxxxx	AIR LOCK CHARACTERIZATION TESTS BY BROKK	3D POSITIONAL RADIALOGICAL MAPPING			1	Y	D A
6[3]	xxxxxxxxx	INSTALL 6 DEBRIS CONTAINERS (REELS) INTO AIRLOCK				6		D A
7[4]	xxxxxxxxx	REMOVE REELS FROM CELLS/SITE	OPERATIONAL TEST LIFT, MOVE AND POSITION WITH CRANE			6	Y	D A O
			PLACE IN SHIP CONTAINERS			6	Y	D O
			SEAL CONTAINERS			6	Y	D O
			DECONTAMINATE CONTAINERS			6	Y	D A O
			REMOVE FROM AIRLOCK			6	N	D O
			SHIP TO ERDF			1	N	O
8	xxxxxxxxx	INSTALL BROKK IN B-CELL TO REMOVE LOOSE LEGACY EQUIPMENT	FUNCTIONALITY TEST			1	N	A O

[3] Scope Creep
[4] Scope Creep

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
9	xxxxxxxxx	CLOSE B-CELL DOOR	REDUCE POTENTIAL FOR CONTAMINATION TO AIRLOCK DURING NEXT STEPS			1	N	O
10	xxxxxxxxx	USE BROKK TO RELOCATE AND RESIZE LOOSE CELL LEGACY EQUIPMENT WITHIN B-CELL	PICKUP/TRANSPORT LOOSE B-CELL LEGACY EQUIPMENT			1/PC DEBRIS	Y	D Q O
			SIZE REDUCE AND PLACE OUT OF WAY IN B-CELL (FOR BULK MOVEMENT OF ALL TOGETHER LATER)			1/PC DEBRIS	Y	D Q O
11[5]	xxxxxxxxx	BORE HOLES IN B-CELL WALLS FOR REA MOUNTING	HOLE LOCATION AND SIZE			2/REA FRAME	Y	D Q O
			HOLE TRUE POSITIONS TO EACH OTHER			2/REA	Y	D Q O
12	xxxxxxxxx	USE BROKK OR (alt) TO PREP FLOOR FOR REA AND TOOL HOLDERS	FRACTURE AND REMOVE GROUT BARRIER AT MOUNTING LOCATION			4	Y	D Q O
13	xxxxxxxxx	USE BROKK TO LOOSEN STUCK LEGACY EQUIPMENT AND PREP REA LOCATIONS	JACKHAMMER GROUTED LEGACY EQUIPMENT			1/PC DEBRIS	Y	D Q O
			LIFT AND POSITION FOR CRANE			1/PC DEBRIS	Y	O
13a		(Alt) USE	JACKHAMMER			1/PC DEBRIS	Y	D

[5] Scope Creep

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
	(THIS WAS LISTED AS POTENTIAL BACKUP AFTER DISCUSSION DURING CRANE WALK THROUGH) XXXXXXXXX	EXISTING SUSPENDED JACK HAMMER TO LOOSEN STUCK LEGACY EQUIPMENT AND PREP REA LOCATIONS	GROUTED LEGACY EQUIPMENT					Q O
			LIFT AND POSITION FOR CRANE			1/PC DEBRIS	Y	O
14	XXXXXXXXX	REMOVE AND RESIZE ALL LEGACY B-CELL EQUIPMENT TO FREE SPACE IN CELL-A	SIZE REDUCE NECESSARY PCS PRIOR TO TRANSPORT OUT OF B-CELL			1/PC DEBRIS	Y	D Q O
			B-CELL CRANE TRANSPORT				Y	O
			CRANE SWAP TO A-D CRANE				Y	D Q O
			TRANSPORT INTO A-CELL				Y	O
15a	XXXXXXXXX	RELOCATE DEBRIS W/IN B-CELL FROM MOUNTING TOOL HOLDER AND REA LOCATIONS FOR LATER BULK REMOVAL FROM CELL				1	N	D Q O
15b	XXXXXXXXX	INSTALL TOOL HOLDERS-REA/BROKK-B-CELL	POSITION AND PLACE WITH CRANE/BROKK			2/HOLDER	Y	D Q O
			INSTALL REA AND BROKK EXTRA TOOLS TO HOLDERS			1/TOOL	Y	D Q O
16	XXXXXXXXX	INSTALL NEW EQUIPMENT FOR REA MOUNTING THROUGH	POSITION EACH POST/FRAME WITH CRANES ALIGNED WITH			4	Y	D Q A O

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
		AIRLOCK	WALL HOLES					
			INSTALL FASTENERS/PLUGS			8	Y	D Q A O
			LIFT AND ATTACH POST/FRAME TO WALL			4	Y	D Q A O
			MOUNT REA TO POST			4	Y	D Q A O
			CONNECT POWER, HYDRAULICS, COMMUNICATION			4	Y	D Q A O
			INSTALL CAMERA AND LIGHTING TO EACH REA LOCATION			4	Y	D Q A O
			HYDRAULIC LINE R&R PRACTICE TESTS			TBD	Y	D Q A O
			FUNCTIONAL AND CONTROLLER REA TESTING			4	Y	D Q A O
			FUNCTIONAL AND CONTROLLER VIDEO/AUDIO TESTING			4	Y	D Q A O
			REA TOOL CHANGE TESTS			12	Y	D Q O
17	XXXXXXXXX	PRACTICE RUN REA SWAP/CHANGEOUT FOR LATER CELL OPERATIONS (USING REA TO LIFT SOIL SACKS TO TRANSPORT BARRIER SLED)	REA REMOVAL AND LOCATIONAL SWAP TEST			1	Y	D Q A O
			VERIFY FUNCTION			1	Y	A O
			RECONNECTION (RESWAP) TESTS			1	Y	A O
18		DECONTAMINATE AND REMOVE BROKK FROM B-	DECONTAMINATION			1	Y	O

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
	xxxxxxxxx	CELL TO AIRLOCK						
			CRANE LIFT				N	O
18a	xxxxxxxxx	PARK BROKK IN OUT OF WAY LOCATION (AL OR AVAILABLE CELL SPACE)	LOCATION TRANSPORT TESTS (ease of access)			tbd	Y	D O
19	xxxxxxxxx	INSTALL TRANSFER PORT	INSTALLATION AND CONNECTIONS TEST			1	Y	D Q A O
			EXERCISE TRANSFER PORT SLED			tbd	Y	D Q A O
			EXERCISE/TEST TOP COAT SPRAYER			tbd	Y	D Q A O
			EXERCISE/TEST ROOM TO ROOM dP CONTROLS USING CRANE DOOR AND HVAC CONTROLS (FOR CONTAMINATION CONTROL AND TOP COAT PROCESSING)			1	Y	D Q A O
20	xxxxxxxxx	INSTALL TRANSFER BUCKET/CONTAINER	CRANE AND LIFT AND PLACEMENT TESTS			tbd	Y	D Q A O
			BUCKET ON TRANSFER SLED OPERATIONAL TEST			tbd	Y	D Q A O
21	xxxxxxxxx	INSTALL AND REMOVE SOIL/DEBRIS BAG AND FRAME	OPERATIONAL TESTS			tbd	Y	D Q A O
22	xxxxxxxxx	REMOVE ALL GROUT DEBRIS FROM B-CELL USING	OPERATIONAL TESTS			tbd	Y	D Q O

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
		COMPLETE SYSTEM OF TOOLS						
23	xxxxxxxxx	REMOVE TRANSFER PORT TO AIRLOCK	OPERATIONAL TESTS			1	Y	D O
24	xxxxxxxxx	CLOSE B-CELL DOOR	CONTAMINATION CONTROL			1	N	O
25	xxxxxxxxx	RESIZE IF NECESSARY & REPOSITION ALL REMAINING LEGACY EQUIPMENT IN C, D AND AIRLOCK TO NEW LOCATIONS WITHIN A-CELL	OPERATIONAL TESTS			per item	Y	D Q A O
25a	xxxxxxxxx	(alt) RESIZE IF NECESSARY & REPOSITION ALL LEGACY EQUIPMENT IN C, D AND AIRLOCK FOR CONTAINER TRANSPORT OFFSITE	OPERATIONAL TESTS			per item	Y	D Q A O
			(alt) -ERDF CONTAINER(S) SET-UP AND POSITIONING			1/CONTAINER	Y	D Q A O
			(alt) -DEBRIS SIZE CONSTRAINTS FOR ERDF CONTAINER(S)				N	D Q A
			(alt) -CONFIRM CLOSURE OF ERDF CONTAINER(S)			1/CONTAINER	Y	D Q O
			(alt) DECONTAMINATE CONTAINERS WITH DEBRIS			1/CONTAINER	Y	O
			(alt) SHIP DEBRIS CONTAINERS TO ERDF			1/CONTAINER	N	O

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
26	xxxxxxxxx	B-CELL GROUTED FLOOR FRACTURE AND REMOVAL USING REAS	GROUT REMOVAL TESTS			1	Y	D Q O
			MONITOR/CONTROL DUST AIRBORNE DEBRIS					
27	xxxxxxxxx	INSTALL SAWS AND STEEL LINER REMOVAL TOOLS INTO B-CELL				1/PC	Y	D Q A O
28	xxxxxxxxx	CUT LINER AND SLAB PER PREDETEMINED CUT PATHS TO ALLOW TRANSPORT OUT OF B-CELL FOR DISPOSAL	CUT PATTERN TESTS			1	Y	D Q A O
29	xxxxxxxxx	SAW REPLACEMENT IN EVENT OF FAILURE	SAW REPLACEMENT			1	Y	D Q O
30	xxxxxxxxx	OPEN B-CELL DOOR AND REMOVE LARGER DEBRIS TO ALTERNATE CELL LOCATIONS WITH CRANES	TRANSPORT AND TRANSFER TEST			TBD	Y	O
31	xxxxxxxxx	CLOSE B-CELL DOOR	CONTAMINATION CONTROL				N	O
32		ASSESS REMAINING FLOOR AND				1	Y	D O

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
	xxxxxxxxx	CELL SPACE WITHIN A, C & D CELLS						
33	xxxxxxxxx	INSTALL PUNCTURE DEVICE AT APPROPRIATE C, D CELL LOCATION	OPERATIONAL TESTS			MULTIPLE	Y	D Q A O
34	xxxxxxxxx	INSTALL AIR HANDLING SNORKELS IN C, D CELLS	OPERATIONAL TESTS			2	Y	D Q A O
			CELL AIRFLOW/VENTILATION/dP CONFIRMATIONS				Y	D Q
35	xxxxxxxxx	REINSTALL TRANSFER PORT, TRANSFER BUCKET/CONTAINER, DEBRIS BAG AND FRAME, CONNECT TOP COAT SPRAY SYSTEM				1	N	D Q A O
36	xxxxxxxxx	INSTALL BINDER SOLUTION DISPENSING HOSE/MECHANISM	INSTALL THROUGH WALL PORT TESTS			1	Y	D Q A O
			CONFIRMATION SOLUTION FEED AND FLOW				Y	D Q A O
			CONFIRMATION OF LINE PURGE AFTER DISPENSE				Y	D Q A O
37	xxxxxxxxx	POSITION TRANSPORT EMPTY BAG	OPERATIONAL TESTS			Multiple	Y	D Q A

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
		WITH CRANE OVER HOLE						O
38	xxxxxxxxx	SPRAY SOIL SURFACE WITH BINDER SOLUTION	PREDETERMINED AREA, SPRAY PATTERN AND ONTIME			Multiple	Y	D Q O
39	xxxxxxxxx	MIX BINDER/SOIL WITH REA ARMS	PREDETERMINED MIX CONSISTENCY			MULTIPLE	Y	D Q O
40	xxxxxxxxx	EXCAVATE SOIL MIXTURE AND DEPOSIT INTO TRANSPORT BAG	FILL TO PREDETERMINED VOLUME			MULTIPLE	Y	D Q O
			CONFIRMATION TESTS OF NO CONTAMINANT SPILLAGE ONTO TRANSPORT FRAME			MULTIPLE	Y	A O
41	xxxxxxxxx	CRANE LIFT FULL BAG TO SLED TRANSPORT RECEPTACLE	OPERATIONAL TESTS			MULTIPLE	Y	D Q O
42	xxxxxxxxx	POSITION SLED UNDER TOP COAT SPRAY NOZZLE	AFTER SPRAY TOP COAT COVERAGE CONFIRMATION TEST			MULTIPLE	Y	D Q A O
43	xxxxxxxxx	POSITION SLED TO FINAL POSITION FOR BAG EXTRACTION	OPERATIONAL TESTS	SLED POSITION LOCK/DETENT		MULTIPLE	Y	D Q O
43a	xxxxxxxxx	RADIOLOGOICAL SAMPLE FROM BAG	MEASUREMENT SYSTEMS TESTS AND DATA COMMUNICATION S TESTS			MULTIPLE	Y	D Q A O
			OPERATIONAL TESTS			MULTIPLE	Y	D Q

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
								A O
44	xxxxxxxxx	CRANE LIFT TOP COATED SOIL BAG AND TRANSPORT TO NECESSARY CELL LOCATION (C 1st, D THEN A)	OPERATIONAL TESTS			MULTIPLE	Y	D Q O
44a	xxxxxxxxx	(alt) CRANE TRANSFER SOIL BAG TO JIB CRANE FOR DEPOSIT INTO C-CELL	OPERATIONAL TESTS			MULTIPLE	Y	D Q O
45	xxxxxxxxx	POSITION OVER PUNCTURE MECHANISM AND LOWER UNTIL RUPTURE	POSITIONAL/ALIGNMENT ORIENTATION TEST/FIXTURE GUIDE TEST			MULTIPLE	Y	D Q O
			MIXTURE FLOW/SPREAD CONFIRMATION			MULTIPLE	Y	D Q A O
46	xxxxxxxxx	RELEASE EMPTY BAG IN CELL FOR DISPOSAL				MULTIPLE	Y	D Q O
46a	xxxxxxxxx	(alt) POSITION FULL BAG IN OPEN LOCATION WITHIN CELL	POSITIONAL LOCATION DISTANCE TO NEXT BAG OR WALL			MULTIPLE	Y	D Q A O
47	xxxxxxxxx	INSTALL NEW DEBRIS BAG INTO SLED RECEPTACLE AND RETURN TO B-CELL	OPERATIONAL TESTS			MULTIPLE	Y	D Q A O
48	xxxxxxxxx	LIFT BAG AND FRAME WITH CRANE AND RETURN TO	OPERATIONAL TESTS			MULTIPLE	Y	D O

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
		LOADING POSITION IN B-CELL						
49	xxxxxxxxx	REPEAT SOIL EXCAVATION, TRANSPORT AND RELEASE STEPS UNTIL NECESSARY HOLE DEPTH ACHIEVED	RAD TESTS AT SPECIFIED DEPTHS			MULTIPLE	Y	D Q A O
50	xxxxxxxxx	SCABBLE FOOTERS, EXCAVATE WITH REA's AND TRANSPORT DEBRIS MIXED WITH SOIL TO AVAILABLE SOIL DISPOSAL CELL SPACE	REA TEST TO SCABBLE FOOTER SURFACES			1	Y	D O
51	xxxxxxxxx	REMOVE ALL USED TOOLS TO APPROPRIATE B-CELL LOCATION FOR DISPOSAL	CRANE/LIFT AND POSITION			1	N	D O
52	xxxxxxxxx	REMOVE TRANSPORT SLED AND BARRIER TO B-CELL FOR DISPOSAL	CRANE OPERATIONAL TEST			1	N	D O
53	xxxxxxxxx	RETURN B-CELL CRANE INTO B-CELL	VISUAL CONFIRMATION			1	N	O
54	xxxxxxxxx	CLOSE B-CELL DOORS	VISUAL CONFIRMATION			1	N	O
55	xxxxxxxxx	DRILL CEILING PORTS INTO INDIVIDUAL CELLS FOR	PORT POSITIONING			PER ROOM	Y	D Q A O

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
		GROUT FILL						
			PORT SIZE			PER CELL	Y	D Q A O
			SEALABILITY			PER CELL	Y	D Q A O
			FIT TO GROUT EQUIPMENT			PER CELL	Y	D Q A O
56	XXXXXXXXX	SEAL B-CELL HVAC VENTILATION DUCTS	SEAL INTEGRITY			1	Y	D Q A O
57	XXXXXXXXX	INSTALL BACKFILL SUPPLY TUBE/HOSE TO B-CELL	FIT			1	Y	D Q A O
			PROPER GROUT FLOW			1	Y	D Q A O
58	XXXXXXXXX	FILL B-CELL HOLE WITH APPROPRIATE BACKFILL/GROUT TO DEPTH	VOLUME FILL			1	Y	D O
59	XXXXXXXXX	SIZE REDUCE ANY REMAINING EQUIPMENT AND SUPPLIES IN AIRLOCK	IF REQUIRED RESIZE			PER ITEM	Y	D O
60	XXXXXXXXX	TRANSPORT TO APPROPRIATE OPEN CELL AND LOCATION FOR DISPOSAL	IF REQUIRED TRANSPORT WITH CRANE			PER ITEM		D O
61	XXXXXXXXX	CLOSE ALL CELL DOORS AND SEAL ACCESS PORTALS	OPERATION			PER PORTAL	Y	D O

KURION REMOTE

No.	PROCESS TEST DOCUMENT #	STEP (WHAT IS BEING DONE)	TEST (HOW IS THE WHAT BEING ACCOMPLISHED)	METHOD (HOW IS THE WHAT BEING EVALUATED)	ACCEPT/ REJECT METRIC (HOW IS THE WHAT BEING CONFIRMED)	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDIT. TRAINING NEEDED (prior to Mock Up)	ASSOCIATED UNDERLYING TESTING & DOCUMENTS (WHY THE HOWS ACCOMPLISH THE WHATS)
		BETWEEN CELLS						
62	xxxxxxxxx	SEAL REMAINING HVAC VENTILATION DUCTS	SEAL INTEGRITY			PER CELL	Y	D Q O
63	xxxxxxxxx	DISCONNECT ALL ELECTRICAL SUPPLIES	CONFIRM DISCONNECT			PER CELL	Y	D O
64	xxxxxxxxx	PUMP CELLS FULL WITH GROUT	CONFIRM FLOW AND VOLUME FILL			PER CELL	Y	D Q O
65	xxxxxxxxx	CONFIRM FILL LEVELS AND	VISUAL CONFIRMATION			PER CELL	Y	D Q O

7.0 POTENTIAL FAILURE MODE REACTION PLANS

This section is included in the event that any reaction plans need to be documented either preventatively or reactionally for each of the sequence steps of the Mock Up Facility test.

No.	STEP	POTENTIAL FAILURE	REACTION PLAN	OPERATION TRAINING OPPORTUNITY (w/in Mock Up)	ADDITIONAL TRAINING NEEDED
	EXAMPLE:	EXAMPLE:			
44	CRANE LIFT TOP COATED SOIL BAG AND TRANSPORT TO NECESSARY CELL LOCATION (C 1st, D THEN A)	SOIL TRANSPORT CONTAINER SPILLS IN AIRLOCK DURING LIFT EVENT			
		CRANE GETS STUCK DURING TRANSPORT WITH SOIL TRANSPORT CONTAINER SUSPENDED ABOVE GROUND			

8.0 REFERENCES (IF REQUIRED)

Attachment E

Debris Tracking Within REC

AREVA	AREVA Federal Services LLC
	ENGINEERING INFORMATION RECORD

Page: 1 of 20

Date: August 21, 2014

Document Number: A-300-296-00131 Rev B

Document Title: Debris Tracking Within REC

AFS Project No. and Title: 300-296 Soil Remediation Project

Client Contract No.: C036502A00

Safety: ☐ Yes ☒ No

The document contains assumptions that shall be verified prior to use: ☒ Yes ☐ No

	Printed Name	Signature	Date
Originator:	J. Beauchene	[signature]	8/21/14
Reviewed by:	B. Flanagan 300-296 Project Engineering Manager	[signature]	8/21/14
Approved by:	R. Watkins, P.E. 300-296 Project Manager	[signature]	8/21/14
Other:			

AFS-EN-FRM-012 Rev. 01 (Issued May 8, 2012)
Reference: AFS-EN-PRC-019 Engineering Information Record

RECORD OF REVISION

Revision	Date	Pages/Sections Changed	Brief Description
A			30% Design
B	8/21/2014	All	30% Design Comment Incorporation

Table of Contents

TABLE OF TABLES

ABBREVIATIONS AND ACRONYMS

AFS	AREVA Federal Services LLC
DOT	Department of Transportation
ERDF	Environmental Restoration Disposal Facility
REC	Radiochemical Engineering Complex
WCH	Washington Closure Hanford

1.0 INTRODUCTION

Over the years of operation, a number of radiological tasks have been completed within the REC cells which resulted in the accumulation of debris in the cells. This debris varies in size and shape as well as weight and radiological contamination. The majority of this debris is to be moved from its existing location and relocated into A-Cell or shipped to the Environmental Restoration Disposal Facility (ERDF) depending on various size, weight and radiological activity parameters. This relocation of debris is to occur prior to removal of soil underneath B-Cell to make space available in cells C and D. The purpose of this report is to document and plan the removal of debris from B, C, D cells, as well as the Airlock, and plan the relocation and loading of this debris into A-Cell. This plan will be based on parameters such as: the existing radioactivity level, total volume of debris, total weight in relation to the allowable inventory, A-Cell volume available, and floor loading capacity.

Following all remediation activities, the cells will be segmented into end state monoliths and transported to ERDF. Each monolith must comply with ERDF waste acceptance criteria (Ref. 5) and Hanford on-site transportation safety documents (Ref. 4). This document identifies the anticipated approach and feasibility of meeting end state monolith requirements.

2.0 ASSUMPTIONS

The following assumptions are made within this document. Although the assumptions are made to simplify the document, they are intended to be conservative.

2.1 UNVERIFIED ASSUMPTIONS

1. The radiological inventory from calculation 0300X-CA-N0115 is evenly distributed across the existing debris that are to be placed in A-Cell.
2. The average debris density is assumed to be 115 lb/ft^3 in order to be consistent with the conceptual design.
3. The anticipated maximum debris height for A-Cell is 14.5 ft. above the floor based on an estimated monolith cut line at 16.5 ft. above the floor with a 2 foot thick layer of grout on both sides of the cut line.
4. Dimensions and volumes of debris were estimated conservatively using typical equipment and debris dimensions.
5. The radiological inventory calculation (0300X-CA-N0115) was performed prior to the discovery of the leak beneath B-Cell the findings are assumed to be incorrect but are the best estimate provided.

3.0 REC CELL INFORMATION

3.1 A-CELL

3.1.1 Existing Activity Level

The radioactive material inventory documented as of 5/26/2010 from calculation 0300X-CA-N0115 (Ref. 1) was an effort to estimate the radioactivity within each of the REC Cells (A, B, C, D, and Airlock). Each item in A-Cell (High Bay Cell) was measured and scaled appropriately as well as any residual contamination on the floor, walls, ceiling, and cranes. The radiological inventory is documented in Table 1, with the total inventory for A-Cell being 1,690 Ci.

3.1.2 Floor Loading

The A-Cell floor is a structural slab approximately 18 in. thick with interior dimensions of 21 ft. long by 9 ft. 3 in. wide or roughly 194 sq. ft. The existing load limit for the A-Cell floor is 1,000 lbf/ft^2, or a 30 ton concentrated load on an area 4 ft. by 4 ft. There is a large quantity of existing debris located on the A-Cell floor which includes eight containers with grouted material and a number of B-Cell filters and frames along with various other items. The complete inventory is listed in Table 1. All of these items come to an approximate total weight of 20,130 lbs. with an approximate volume of 1144 ft^3. Structural modification to accommodate the greater amount of weight on the floor may be required prior to relocating debris into A-Cell.

As part of the project design activities the A-Cell floor will be evaluated to determine the maximum floor loading for the end state monolith condition. A maximum debris height of 14.5 ft. is determined based on an approximate monolith cut line at the midpoint, 16.5 ft., and 2 ft. thick layer of grout. The total debris weight identified in Table 6 is 124,665 lbs., not including any final grout added, which is less than the live load limit of 194,000 lbs. Therefore, the floor loading is not expected to be exceeded for the bottom monolith. Reinforcement for the top monolith is still being evaluated.

3.2 B-CELL

3.2.1 Existing Activity Level

The B-Cell radioactive material inventory as of 5/26/2010 was determined from calculation 0300X-CA-N0115 (Ref. 1). This calculation was performed prior to the discovery of the leak and therefore the results are not accurate but are the best information that we have available. The floor, sump, trench, walls (below 9' and above 9'), HEPA's, crane, and ceiling were estimated to have a total inventory of 11,227 Ci. The floor, sump, and trench (the items going into A-Cell) were estimated to have an inventory of 8,480 Ci. These values are now considered to be conservative due to the activity in the soil that was discovered after the calculation was made.

3.2.2 Floor Loading

Floor loading evaluation for B-Cell is unnecessary because the debris sitting on top of the grout, the debris encapsulated in grout, and the floor will be size reduced and moved out of the cell in order to access the contaminated soil below.

3.3 C-CELL

3.3.1 Existing Activity Level

The C-Cell radioactive material inventory as of 5/26/2010 was determined from calculation 0300X-CA-N0115 (Ref. 1). This calculation does not assess each item in C-Cell individually but instead assesses C-Cell as a whole. To model the C-Cell radioactivity, each of the cell walls was divided into 4 equal sections through their respective vertical and horizontal centerlines with the floor and ceiling divided into 4 sections through their east-west and north-south centerlines. Through this process it was found that the C-Cell total inventory was 2.39 Ci.

3.3.2 Floor Loading

The C-Cell floor is a structural slab with an approximate thickness of 12 in., a length of 19 ft.-4 in. by 12 ft. wide, or roughly 232 sq. ft., with a height of 15 ft. The existing load limit for C-Cell is 400 lbf/ft^2 or a 5 ton concentrated load on an area of 4 ft.-0 in. by 4 ft.-0 in. which gives a total capacity of 92,800 lbs. Debris located on the C-Cell floor vary in size and shape and some of the debris such as the manipulator boot, Cybernetics power cable, and Cybernetics hydraulic cable may be eligible for packaging or size reduction. The approximate weight of this debris is 3,985 lbs. with an approximate volume of 440 ft^3.

As part of the project design activities the C-Cell floor will be evaluated to determine the maximum floor loading for the end state monolith condition. With the assumed average soil density to be 115 lbf/ft^3, this equates to an allowable soil loading depth of 3.5 ft. [Conceptual Design Report]. The maximum height of the crane hook is 12 ft. above the floor.

3.4 D-CELL

3.4.1 Existing Activity Level

The D-Cell radioactive material inventory as of 5/26/2010 was determined from calculation 0300X-CA-N0115 (Ref. 1), this calculation does not assess each item in D-Cell individually but instead assesses D-Cell as a whole. D-Cell radioactivity was modelled the same way that C-Cell was, by dividing the cell walls into 4 equal sections and by dividing the floor and ceiling into 4 equal sections. These sections were then measured using a medium range probe. Through this process it was found that the total D-Cell inventory was 135 Ci.

3.4.2 Floor Loading

The D-Cell floor is a structural slab approximately 24 in. thick with a length of 21 ft., a width of 13 ft., or roughly 273 sq. ft., and a height of 12 ft. The existing load limit for the D-Cell floor is 400 lbf/ft^2, or a 5 ton concentrated load on an area 4 ft.-0 in. by 4 ft.-0 in. D-Cell contains two duct sprayer spools which are of unknown size and weight, as well as a steel box which will require removal with a crane, and other smaller items. The approximate weight of the remaining debris is 1818 lbs. with an approximate volume of 455 ft^3.

As part of the project design activities the D-Cell floor will be evaluated to determine the maximum floor loading for the end state monolith condition. With an average soil density of 115 lbf/ft^3 this translates to an allowable debris depth of 3.5 ft. [Conceptual Design Report]. The maximum height of the crane hook is 12 ft. above the D-Cell floor.

3.5 AIRLOCK

3.5.1 Existing Activity Level

The Airlock radioactive material inventory as of 5/26/2010 was determined from calculation 0300X-CA-N0115 (Ref. 1), this calculation does not assess each item in the Airlock individually but instead assesses it as a whole. The REC airlock was modeled using exposure profile measurements using a medium range probe. This was done using a grid pattern every 5 ft. by 5 ft. and at 7 measurement elevations. The cell walls, floors, and ceiling were divided into 4 equal sections through their centerlines, resulting in 24 sections total. Through this measurement process the airlock inventory was found to be 10.3 Ci.

3.5.2 Floor Loading

The Airlock floor is a structural slab that is approximately 26 in. thick with a length of 22 ft., a width of 16 ft. 2 in., or roughly 356 sq. ft., and a height of 33 ft. The remainder of the floor consists of removable cover blocks. A 9in. wide trench runs North/South and is located along the pipe trench cover blocks, approximately 5 ft. 9 in. east of the West wall. In the Airlock, the minimum floor thickness along the trench is approximately 24 in. The trench is 6 in. deep, but is located above a thicker portion of the floor at the transition to the pipe trench wall. The existing load limit for the Airlock floor is 1,000 lbf/ft^2, or a 30 ton concentrated load on an area of 4 ft. by 4 ft. The Airlock contains a large Televator which will require either size reduction or shipment to a disposal facility (or both). The approximate weight of the identified debris located in the Airlock is 4,145 lbs. with an approximate volume of 751 ft^3.

3.6 TOTAL REC INVENTORY

3.6.1 Existing Activity Level

The total REC radioactive material inventory level is the sum of all of the individual area inventories. This includes the pipe trench in the WCH calculation, but the pipe trench value has been subtracted from the total for this report. The total inventory is 13,028 Ci (w/o pipe trench value). This value does not include the soil inventory beneath B-Cell.

4.0 CURRENT DEBRIS CONFIGURATIONS

The “Movement Method” column of the following tables identifies what the preferred approach is for moving the debris from cell to cell or cell to ERDF. The anticipated methods are briefly described below:

Container: Article of debris that is irregular in shape will be placed in a soil sack container in order to create a more uniform stacking arrangement for final placement.

Package: A package is an ERDF approved container that will be used for any debris items that will be shipped to ERDF for final disposition.

Direct: Debris that can be easily hoisted with a crane and moved to A-Cell without a package with be moved directly with a crane capable of lift.

Size Reduce: Debris items that are large and able to be size reduced will be with Brock or other device and then transfer with either a container or directly.

4.1 A-CELL

The internal height of A-Cell is 33 ft., with a maximum hook height of 28 ft. The max available volume of A-Cell is 5,439 ft^3 based on the hook height. The following table lists the items in A-Cell, with an estimated value of the items weight and approximate size provided by WCH. The following radioactivity information is from WCH Calculation 0300X-CA-N0115 (Ref. 1). All items within A-Cell are expected to remain within the cell.

A Refractory Brick with dose rate of 780 Ci was placed in a container and move to A-Cell, it is unknown which container below contains the refractory brick.

Certain volumes used in the table incorporate inefficiencies expected during stacking. Such as, cylinders modelled as rectangles to account for voids between them, as well as loose debris (B-Cell grout and floor) include a 15% volume stacking factor. This stacking factor is applied to the grout and floor pieces that will be removed from B-Cell to account for any void spaces that may result when the cut floor pieces are placed in A-Cell.

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Table 1 - A-Cell Inventory

Item	Approx. Weight (lbs)	Dimensions (LxWxH in.)	Approx Volume (ft^3)	Proposed Final Location	Activity Level (Ci)
B-Cell Non-Testable High Efficiency Particle Air (HEPA) Filters	150	30x30x14	7.29	A-Cell	0
Light Bar	20	36x6x6	0.75	A-Cell	Unknown
Grout Container GC-166	2000	48 Dia. x 52 H[1]	69.33	A-Cell	43
Grout Container GC-167	2000	48 Dia. x 52 H[1]	69.33	A-Cell	75.2
Grout Container GC-168	2000	48 Dia. x 52 H[1]	69.33	A-Cell	573
Grout Container GC-169	2000	48 Dia. x 52 H[1]	69.33	A-Cell	28.3
Grout Container GC-170	2000	48 Dia. x 52 H[1]	69.33	A-Cell	23.7
Grout Container GC-171	2000	48 Dia. x 52 H[1]	69.33	A-Cell	20.4
Grout Container GC-172	2000	48 Dia. x 52 H[1]	69.33	A-Cell	43
Grout Container GC-173	2000	48 Dia. x 52 H[1]	69.33	A-Cell	43
Power Hawk Tray	100	30x30x8	4.17	A-Cell	8.42
Box #1	500	36x36x14	10.50	A-Cell	8.28
Box #2	10	30x14x14	3.40	A-Cell	1.19
30 Gal Drum	30	18 Dia. x 28 H[1]	5.25	A-Cell	3.25
B-Cell ESP Filter Frame	250	25x13x102	19.18	A-Cell	6.07
B-Cell ESP Filter 1	150	30x30x14	7.29	A-Cell	0.631
B-Cell ESP Filter 2	150	30x30x14	7.29	A-Cell	0.631
B-Cell ESP Filter 3	150	30x30x14	7.29	A-Cell	0.631
B-Cell ESP Filter 4	150	30x30x14	7.29	A-Cell	0.631
Shop Vac	10	18 Dia. x 30 H[1]	5.63	A-Cell	1.59
24-Pin Fuel Storage Container	500	180x12x12	15.00	A-Cell	9.68
Work Tray #1	500	60x30x24	25.00	A-Cell	4.42
Work Tray #2	20	60x24x12	10.00	A-Cell	2.5
10 Gal. Drum	10	18 Dia. x 24 H[1]	4.50	A-Cell	2.79
Crawler	150	24x48x24	16.00	A-Cell	6.24
Clamshell	50	6x14x18	0.88	A-Cell	0.642
D-Cell Dust Stop #1 and #2	30	24x24x1	0.33	A-Cell	2.86
Duct Sprayer (Spool)	600*	72x72x72*	216.00	ERDF	Unknown
Duct Sprayer (Spool)	600*	72x72x72*	216.00	ERDF	Unknown
Totals	**20,130**		**1,144**		**1,690**

1) Cylinders are modeled as rectangles.
2) *Values are estimates that need confirmation.

4.2 B-CELL

The B-Cell inventory list provided in the table below includes items that were grouted in place at the bottom of the cell and also items that were added after grouting.

Table 2 - B-Cell Inventory

Item	Approx. Weight (lbs.)	Dimensions (LxWxH in.)	Approx. Volume (ft^3)	Movement Method	Proposed Final Location	Estimated Activity Level
Grout	41250	264x300x6*	316.25[1]	Container	A-Cell	
Stainless Steel Liner	2800	264x300x.125*	5.73	Container	A-Cell	
Concrete Floor	39522	224x260x6*	303[1]	Container	A-Cell	
Items Grouted in Place						
Carbon Steel Spreader Bar	250	12x72x1*	0.50	Container	A-Cell	
Block of Steel	4000	36x36x12*	9.00	Direct	A-Cell	
Grout Container Lids (8 total)	1200 (total)	48 Dia. x 3/16 H[2]	2	Container	A-Cell	
SST Screen and Frame	200*	24x96x2	2.67	Container	A-Cell	
2'x2'x1/4" MS Plate and Angle	200	24x24x.25 Thickx72	0.50	Container	A-Cell	
10" Sch 40 SST Pipe, Ends Capped	150	10.75 Dia. x 36 H[2]	2.41	Container	A-Cell	
Camera Unit on Frame	200*	3 Dia. x 24 H[2]*	0.13	Container	A-Cell	
SA Robotics Skid	4000	72x96x24	96.00	Container	A-Cell	
Zirmul Refractory Bricks, clam shell	215	2x24x18 (Brick)	0.50	Container	A-Cell	
Bigalow Scraper	200	72x24x12	12.00	Direct	A-Cell	
R07 Probe Shielded Container	100	8 Dia. X 12 H[2] Steel	0.44	Container	A-Cell	
Items Placed in B-Cell After Grout						
4 Sections of Airlock Tracks	1800	48x48x12	16.00	Direct	A-Cell	
Duct Sprayer (Spool)	600*	72x72x72*	216.00	Package	ERDF	
Turntable	1000	48x60x96	160.00	Direct	A-Cell	
3T Crane Winch Motor Stand	500	36x48x48	48.00	Direct	A-Cell	
3 Way Spreader Bar for Grout Container	290	36x30x.125 Thick*	0.08	Direct	A-Cell	
Cybenetix Robot/Stand	500*	48x84x72	168.00	Direct	A-Cell	
Step Ladder	10*	18x36x36	13.50	Direct	A-Cell	
Camera Counter Balance Bar	100	72x36x4	6.00	Direct	A-Cell	
HEPA Vacuum	100	12 Dia. x 24 H[2]	2.00	Container	A-Cell	
Totals	**99,187**		**1,381**			**8,480**

*Values are estimates that need confirmation.
1. 15% packing factor applied to volume.
2. Cylinders are modeled as rectangles for stacking purposes.

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4.3 C-CELL

Table 3 – C-Cell Inventory

Item	Approx. Weight (lbs)	Dimensions (LxWxH in.)	Approx. Volume (ft^3)	Movement Method	Proposed Final Location	Estimated Activity Level
Dust Stop Filters in Frame	75	30x30x24*	12.50	Container	A-Cell	
Dust Stop Filters in Frame	75	30x30x24*	12.50	Container	A-Cell	
Aluminum 10 Ft. Ladder	20	120x18x4*	5.00	Direct	A-Cell	
Platform Ladder	70	84x24x121	141.17	Direct	A-Cell	
Aluminum 4 Ft. Ladder	10	48x18x4*	2.00	Direct	A-Cell	
Aluminum 6 Ft. Step Ladder	15	72x18x4*	3.00	Direct	A-Cell	
Engineered Container (EC)	120	10" Sch. 40 SST Pipe ~ 36[1]	2.08	Container	A-Cell	
Duct Sprayer (Spool)	600*	72x72x72*	216.00	Package	ERDF	
Grout Container (GC) 3-Way Spreader Bar	290	36x36x6*	4.50	Direct	A-Cell	
50 Ft. Cybernetics Power Cable	400	36x36x6*	4.50	Container	A-Cell	
50 Ft. Cybernetics Hydraulic Cable	400	36x36x6*	4.50	Container	A-Cell	
5 Ft. Grab Tool, Aluminum	5	1x1x60*	0.03	Container	A-Cell	
KSI Arm	700	36x24x12* (Contains Lead)	6.00	Container	A-Cell	
Cover Block Lifting Fixtures	140	12x12x6*	0.50	Container	A-Cell	
Camera Unit on Frame	50	36x12x10	2.50	Container	A-Cell	
Winch Motor	50	10 Dia. x 12 H[1]*	0.69	Container	A-Cell	
Rock Stop Filters (2 each)	240	24x48x6	4.00	Container	A-Cell	
A-Cell Counter Balance Spreader Bar	500*	96x3x6*	1.00	Direct	A-Cell	
SST Spent Fuel Cask Alignment Basket	200	30 Dia. x 24 H[1]	12.50	Container	A-Cell	
Manipulator Boot	5	2x2x2*	0.01	Container	A-Cell	
10 Ft. Aluminum Extension Ladder	20	120x18x4*	5.00	Direct	A-Cell	
Totals	**3,985**		**440**			**2.39**

*Values are estimates that need confirmation.

1. Cylinders are modeled as rectangles for stacking purposes.

4.4 D-CELL

Table 4 – D-Cell Inventory

Item	Approx. Weight (lbs)	Dimensions (LxWxH in.)	Approx. Volume (ft^3)	Movement Method	Proposed Final Location	Activity Level
Duct Sprayer (Spool)	600*	72x72x72*	216.00	Package	ERDF	
Duct Sprayer (Spool)	600*	72x72x72*	216.00	Package	ERDF	
Steel Box	400	24x30x24	10.00	Container	A-Cell	
Steel/Lead Lid	143*	30x12x1	0.21	Container	A-Cell	
Dust Stop Filter and Frame	75*	30x30x24*	12.50	Container	A-Cell	
Totals	**1818**	-	**455**	-	-	**135**

*Values are estimates that need confirmation.

4.5 AIRLOCK

Table 5 – Airlock Inventory

Item	Approx. Weight (lbs.)	Dimensions (LxWxH in.)	Approx. Volume (ft^3)	Movement Method	Proposed Final Location	Activity Level
Duct Sprayer	600*	72x72x72*	216.00	Package	ERDF	
Counter Balance	2000*	30x30x30*	15.63	Direct	A-Cell	
Televator	400	48x96x120	320.00	Size Reduce	ERDF	
Dust Stop Filters and Frames	75*	30x30x24*	12.50	Container	A-Cell	
Dust Stop Filters and Frames	75*	30x30x24*	12.50	Container	A-Cell	
Dust Stop Filters and Frames	75*	30x30x24*	12.50	Container	A-Cell	
Dust Stop Filters and Frames	75*	30x30x24*	12.50	Container	A-Cell	
Misc. Rigging on Walls and Floor	100	16x16x15	2.22	Container	A-Cell	
Working Camera (crane rail camera)	50	24x24x15	5.00	Direct	A-Cell	
Pan/Tilt Camera	50	24x24x15	5.00	Direct	A-Cell	
Pan/Tilt Camera (not working)	50	24x24x15	5.00	Direct	A-Cell	
Remote Camera/Medium Pressure Decon Sprayer	100	24x24x12	5.00	Direct	A-Cell	
4 Ft. Ladder	5	48x18x4*	2.00	Direct	A-Cell	
Small Clamshell	15	12x18x12	1.50	Container	A-Cell	
Port-A-Band Saw	10	20x15x10*	1.74	Container	A-Cell	
Plastic on Floor	50	36x36x36*	27.00	Container	A-Cell	
Misc. Tools, Hooks, Paint Cans on Work Tray	100	16x16x23	3.41	Container	A-Cell	
100 Ft. of Air Hose	30	36x36x6*	4.50	Container	A-Cell	
Long Reach Tools (several)	5	2x2x72	0.17	Container	A-Cell	
55 Gallon Drum	50	23.5 Dia x 34.75 H 16 Gauge[1]*	11.11	Direct	A-Cell	
25 ft. Garden Hose	10	24x24x6*	1.67	Container	A-Cell	
Misc. Pipes, Conduit, Power Cords, Buckets	50	48x48x48*	64.00	Container	A-Cell	
Aluminum Saw Horse (2 ea)	100	18.5x38x25*	10.17	Direct	A-Cell	
Lead Blanket	70	18x60x.25	0.16	Container	A-Cell	
Totals	**4,145**	**-**	**751**	-	-	**10.3 Ci**

*Values are estimates that need confirmation.

1. Cylinders are modeled as rectangles for stacking purposes.

5.0 PROPOSED DEBRIS CONFIGURATION

The proposed plan is to relocate all of the existing debris from the REC into A-Cell or package and ship to the ERDF Facility for final disposal. This will be executed in a way to meet the end state requirements.

5.1 A-CELL

In order to keep with the final end state demolition plan and the original monolith cut plan, A-Cell will be cut approximately halfway through the cell. For the purpose of this report it is assumed that the cut height is 16.5 ft. from the floor with approximately 2 ft. of grout on either side of the cut line. This results in approximately 2,816 ft^3 of space available for debris.

As shown in Table 6, the final stacked volume of debris within A-Cell is approximately 2,338 ft^3. This results in approximately 18% additional space available as margin.

Table 6 – Final A-Cell Inventory

Item	Previous Location	Approximate Weight (lbs.)	Volume (ft^3)	Activity Level (Ci)
B-Cell Non-Testable HEPA Filters	A Cell	150	7.29	0
Light Bar	A Cell	20	0.75	Unknown
Grout Container GC-166	A Cell	2000	69.33	43
Grout Container GC-167	A Cell	2000	69.33	75.2
Grout Container GC-168	A Cell	2000	69.33	573
Grout Container GC-169	A Cell	2000	69.33	28.3
Grout Container GC-170	A Cell	2000	69.33	23.7
Grout Container GC-171	A Cell	2000	69.33	20.4
Grout Container GC-172	A Cell	2000	69.33	43
Grout Container GC-173	A Cell	2000	69.33	43
Power Hawk Tray	A Cell	100	4.17	8.42
Box #1	A Cell	500	10.50	8.28
Box #2	A Cell	10	3.40	1.19
30 Gal Drum	A Cell	30	5.25	3.25
B-Cell ESP Filter Frame	A Cell	250	19.18	6.07
B-Cell ESP Filter 1	A Cell	150	7.29	0.631
B-Cell ESP Filter 2	A Cell	150	7.29	0.631
B-Cell ESP Filter 3	A Cell	150	7.29	0.631
B-Cell ESP Filter 4	A Cell	150	7.29	0.631
Shop Vac	A Cell	10	5.63	1.59
24-Pin Fuel Storage Container	A Cell	500	15.00	9.68
Work Tray #1	A Cell	500	25.00	4.42
Work Tray #2	A Cell	20	10.00	2.5
10 Gal. Drum	A Cell	10	4.50	2.79
Crawler	A Cell	150	16.00	6.24
Clamshell	A Cell	50	0.88	.642
D-Cell Dust Stop #1 and #2	A Cell	30	0.33	2.86
Grout	B-Cell	41250	316.25	
Stainless Steel Liner	B-Cell	2800	5.73	

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Item	Previous Location	Approximate Weight (lbs.)	Volume (ft^3)	Activity Level (Ci)
Concrete Floor	B-Cell	39522	303	
Carbon Steel Spreader Bar	B-Cell	250	0.50	
Block of Steel	B-Cell	4000	9.00	
Grout Container Lids (8 total)	B-Cell	1200 (total)	2.00	
SST Screen and Frame	B-Cell	200*	2.67	
2'x2'x1/4" MS Plate and Angle	B-Cell	200	0.50	
10" Sch 40 SST Pipe, Ends Capped	B-Cell	150	2.41	
Camera Unit on Frame	B-Cell	200*	0.13	
SA Robotics Skid	B-Cell	4000	96.00	
Zirmul Refractory Bricks, clam shell	B-Cell	215	0.50	
Bigalow Scraper	B-Cell	200	12.00	
R07 Probe Shielded Container	B-Cell	100	0.44	
4 Sections of Airlock Tracks	B-Cell	1800	16.00	
Turntable	B-Cell	1000	160.00	
3T Crane Winch Motor Stand	B-Cell	500	48.00	
3 Way Spreader Bar for Grout Container	B-Cell	290	0.08	
Cybenetix Robot/Stand	B-Cell	500*	168.00	
Step Ladder	B-Cell	10*	13.50	
Camera Counter Balance Bar	B-Cell	100	6.00	
HEPA Vacuum	B-Cell	100	2.00	
Dust Stop Filters in Frame	C-Cell	75	12.50	
Dust Stop Filters in Frame	C-Cell	75	12.50	
Aluminum 10 Ft. Ladder	C-Cell	20	5.00	
Platform Ladder	C-Cell	70	141.17	
Aluminum 4 Ft. Ladder	C-Cell	10	2.00	
Aluminum 6 Ft. Step Ladder	C-Cell	15	3.00	
Engineered Container (EC)	C-Cell	120	2.08	
Grout Container (GC) 3-Way Spreader Bar	C-Cell	290	4.50	
50 Ft. Cybernetics Power Cable	C-Cell	400	4.50	
50 Ft. Cybernetics Hydraulic Cable	C-Cell	400	4.50	
5 Ft. Grab Tool, Aluminum	C-Cell	5	0.03	
KSI Arm	C-Cell	700	6.00	
Cover Block Lifting Fixtures	C-Cell	140	0.50	
Camera Unit on Frame	C-Cell	50	2.50	
Winch Motor	C-Cell	50	0.69	
Rock Stop Filters (2 each)	C-Cell	240	4.00	
A-Cell Counter Balance Spreader Bar	C-Cell	500*	1.00	
SST Spent Fuel Cask Alignment Basket	C-Cell	200	12.50	
Manipulator Boot	C-Cell	5	0.00	
10 Ft. Aluminum Extension Ladder	C-Cell	20	5.00	
Steel Box	D-Cell	400	10.00	

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Item	Previous Location	Approximate Weight (lbs.)	Volume (ft^3)	Activity Level (Ci)
Steel/Lead Lid	D-Cell	143*	0.21	
Dust Stop Filter and Frame	D-Cell	75*	12.50	
Counter Balance	Airlock	2000*	15.63	
Dust Stop Filters and Frames	Airlock	75*	12.50	
Dust Stop Filters and Frames	Airlock	75*	12.50	
Dust Stop Filters and Frames	Airlock	75*	12.50	
Dust Stop Filters and Frames	Airlock	75*	12.50	
Misc. Rigging on Walls and Floor	Airlock	100	2.22	
Working Camera (crane rail camera)	Airlock	50	5.00	
Pan/Tilt Camera	Airlock	50	5.00	
Pan/Tilt Camera (not working)	Airlock	50	5.00	
Remote Camera/Medium Pressure Decon Sprayer	Airlock	100	5.00	
4 Ft. Ladder	Airlock	5	2.00	
Small Clamshell	Airlock	15	1.50	
Port-A-Band Saw	Airlock	10	1.74	
Plastic on Floor	Airlock	50	27.00	
Misc. Tools, Hooks, Paint Cans on Work Tray	Airlock	100	3.41	
100 Ft. of Air Hose	Airlock	30	4.50	
Long Reach Tools (several)	Airlock	5	0.172	
55 Gallon Drum	Airlock	50	11.11	
25 ft. Garden Hose	Airlock	10	1.67	
Misc. Pipes, Conduit, Power Cords, Buckets	Airlock	50*	64.00	
Aluminum Saw Horse (2 ea)	Airlock	100*	10.17	
Lead Blanket	Airlock	70	0.16	
Totals		**124,665**	**2,338**	**TBD**

*Values are estimates that need confirmation.

5.2 ITEMS TO BE SHIPPED TO ERDF

The items identified in Table 7 are anticipated to be packaged and shipped to ERDF. These items will be packaged and shipped in accordance with DOE/RL-2001-36, Hanford Sitewide Transportation Safety Document (Ref. 4). The anticipated packaging is Department of Transportation (DOT) 7A Type A carbon steel boxes.

Table 7 – ERDF Items

Item	Previous Location	Approximate Weight (lbs)	Approx. Volume (ft^3)	Movement Method	Activity Level (Ci)
Duct Sprayer (Spool)	A Cell	600*	216.00	Package	
Duct Sprayer (Spool)	A Cell	600*	216.00	Package	
Duct Sprayer (Spool)	B Cell	600*	216.00	Package	
Duct Sprayer (Spool)	C Cell	600*	216.00	Package	
Duct Sprayer (Spool)	D Cell	600*	216.00	Package	
Duct Sprayer (Spool)	D Cell	600*	216.00	Package	
Duct Sprayer	Airlock	600*	216.00	Package	
Televator	Airlock	400	320.00	Size Reduce	
Totals		**4,600**	**1,832**		**TBD**

*Values are estimates that need confirmation.

6.0 REFERENCES

1. WCH Calculation 0300X-CA-N0115 Rev. 0, *Revised Radiological Inventory for the 324 Building REC Cells, Airlock & Pipe Trench (Part 1 of 2)*, WCH, May 26, 2010

2. KUR-1782F-RPT-001 Rev 0, *300-296 Soil Remediation Project Phase I & II, Assessment Report,* Kurion, Used revision with comments from Steve Marske, May 22, 2014.

3. KUR-1782F-RPT-002, Rev 0, *300-296 Soil Remediation Project Phase I & II, Conceptual Design Report*, Kurion, Richland, WA

4. DOE/RL-2001-36, Rev. 1-E, 2011, *Hanford Sitewide Transportation Safety Document*, Department Of Energy, Richland Operations Office, Richland, WA.

5. WCH-191, Rev. 3, January 2014, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, Washington Closure Hanford, Richland, WA

Attachment 3

WASHINGTON CLOSURE HANFORD	**Job No. 14655**

SUPPLIER/SUBCONTRACTOR DOCUMENT STATUS STAMP

- [x] 1. Work may proceed
- [ ] 2. Revise and resubmit. Work may proceed prior to resubmission.
- [ ] 3. Revise and resubmit. Work may proceed prior to resubmission subject to resolution of indicated comments.
- [x] ~~4. Revise and resubmit. Work may not proceed.~~ mjp 07/22/10 per CCN 152215
- [ ] 5. Permission to proceed not required.

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the supplier/subcontractor and does not relieve supplier/subcontractor from full compliance with contractual obligations or release any "holds" placed on the contract.

	CIVIL/STRUCTURAL/ ARCHITECTURAL/ GEOTECHNICAL	ELECTRICAL	MECHANICAL	PROCESS/NUCLEAR	CADD	PROJECT REP.	ENVIRONMENTAL	WASTE MANAGEMENT	SAFETY	INDUSTRIAL HYGIENE	FIRE PROTECTION	QA	RADCON	FIELD ENGINEER	OTHER
CHECK REVIEW REQUIREMENT						✓	✓						✓		
REVIEWED BY						[signature]							[signature]		

JSP 7/15/10

[signature] Jeff Pierce — 7/15/10

Project Engineer/STR — Date

DOCUMENT ID NUMBER

C010171A00	05-009	001
SC/P.O. No.	SSRS ITEM	SUBMITTAL

WCH-DE-032 (01/15/2007)

comments compiled by: A. B. Cee, WCH
responses compiled by: X. Y. Zee, NWDE

WCH Washington Closure Hanford

WCH Document Comments Form

Title of Document: 30 % Design for 300 Area 324 Building Disposition
Document number or other identifier: Subcontract No.: C010171A00

Comment No.	By	Page/ Reference	Comments	Responses
			DRAWING COMMENTS	
1	RJR	BG-4-1	Show details on how water/slurry containment shroud will be connected and sealed to monolith during cutting	
2	RJR	BG-4-2	Add radiation shielding around water/slurry recovery system (amount to be determined)	
3	RJR	R4	Update the facility layout plan to current revision	
4	RJR	CR1	Is the position of the crane operator typical	
5	RJR	CR2	Can the crane be operated from the ground? If so, change position of worker to ground level	
6	RJR	G13	Change the prevailing wind direction to show coming from the SW going towards the NE	
7	RJR	SMF5	1) Show cutting equipment containment and water/slurry recovery system, 2) show details on how water/slurry containment shroud will be connected and sealed to monolith during cutting, 3) add radiation shielding around water/slurry recovery system (amount to be determined)	
8	pfe	R1 Col1 Para0	Please number paragraphs for ease of reference for example col 2 par 2 and col 2 Par 22 state different grout strengths	
9	pfe	R1 Col1 P1	Confirm DOE is the Authority Having Jurisdiction	
10	pfe	R1 Col1 P3	Confirm NWDE is the Architect/Engineer	
11	pfe	R1 Col1 P7	Contractor should be Subcontractor in all instances	
12	pfe	R1 Col1 P15	What facilities require building permits?	
13	pfe	R1 Col2 P14	Add "available on the jobsite" to "FIELD REFERENCE"	RECEIVED
14	pfe	R1 Col2 P18	Define "fc" and "f c" and use consistently in paragraph	
15	pfe	R1 Col2 P24	Do you mean "TEST AND ACCEPTANCE"?	JUN 16 2010
16	pfe	R1 Col3 P1&2	Testing para says 4 cylinders while Acceptance para seems to require 3 sets of 2 break cylinders to pass. Please clarify.	
17	pfe	R1 Col3 P13	Do you mean "TEST AND ACCEPTANCE"?	WCH - DOCUMENT CONTROL
18	pfe	R1 Col3 P19	SUBMITTALS should indicate to whom throughout	
19	pfe	R1 Col3 P19	Define SLRS	

 C010171A00-05-009-001

DATE
DATE

comments compiled by: A. B. Cee, WCH
responses compiled by: X. Y. Zee, NWDE

Comment No.	By	Page/ Reference	Comments	Responses
20	pfe	R2 Col1 P1	Correct "LDING:"	
21	pfe	R2 Col1 P1	Add period after "Fabrication/erection."	
22	pfe	R2 Col1 P9&10	Where are the referenced WELDING notes and SPECIAL INSPECTION sections located?	
23	pfe	R2 Col1 P12	Are we really going to paint all the steel on the crane and rail system?	
24	pfe	R4	Revise to reflect current mix of trailers and their locations upwind (southwest and south due toprevailing SW wind).	
		R5, 6,	No comment.	
25	pfe	R7 & 8	Need to specify excavation elevations that piles will embed 20' below as some are rooms and others will be excavated to final depths	
26	pfe	R7 & 8	Specify casings for the unsupported pile lengths in rooms, tunnels and incompetent soils..	
27	pfe	R9	Lower Detail 1 to clear the Drawing number block (upper left).	
28	pfe	BG1 –BG4.4	Complete title blocks with amplified titles	
29	pfe	BG-1	Wire cutting note 12: Should this read: … observed continuously during cutting and inspected periodically for… instead of …inspected continuously… ?	
30	pfe	BG3-2	What is the design operating air temperature of the hydraulic Power Unit?	
31	pfe	BG4-1	Place HEPA Exhaust on side of containment opposite containment entrance and at maintenance height.	
32	pfe	All but BG-1	Adjust coloration of "purple" components to allow legible black & white copies. Similar to the transparent wall color in BG 2-2.	
33	pfe	BG 4-2 and 4-3	Supply cutting waste from location opposite entrance to allow hot solids to accumulate at greatest distance from entrance. Decant water away from entrance if possible.	
34	pfe	BG 4-3 and 4-4	Anticipate sludge removal and filter press cake removal being remote operation for B-Cell cutting. Supply additional details of handling and processing.	
35	pfe	BG 4-3 and 4-4	What are the sizes of these confinements?.	
36	pfe	BG 4-3 and 4-4	Where will the vacuum systems be located?	
			SPECIFICATIONS	

Comment No.	By	Page/ Reference	Comments	Responses
			APPENDIXES	
			WORK PLANS	
			GENERAL COMMENTS	
37	JSP		To allow the proper close-out of the design drawing submittals in the WCH System and to have clear & complete drawing set for each area a couple of things will need to be revised for the NWDE 60% Design Drawings submittal: 1) The NWDE drawing submittal from 60% - final will need to conform to the section/numbering requirements per Exhibit "I". For example all the drawings having to do with the Shielded Materials Facility (SMF) need to be assembled altogether in section 5-01 and numbered accordingly per Exhibit "I" as well as having the NWDE drawing number, all the drawings having to do with the REC need to be assembled altogether in section 5-02 and numbered accordingly per Exhibit "I" as well as having the NWDE drawing number, and so on. 2) There appears to be several drawings that apply to several sections/areas, like REC, HLV, LLV, & SMF. When this is the case this drawing will be submitted for each section/area individually to provide a complete set of drawings for each section as specified in Exhibit "I". 3) It will not be required to revise and re-submit these 30% drawings to incorporate this numbering.	
38	JSP		Note: the re-submittal of these drawings will be the 60% Design Drawing Set. It will not be required to re-submit this 30% Design Drawings Set to resolve these comments. All comments will be addressed / answered in the 60% Design Drawing Set.	
38	JSP		Make sure to adhere to Exhibit "E" and follow the WCH Drawing specification 0000X-SP-X0001	

Exhibit "I" (Attachment A)
Subcontractor Submittal Requirements Summary

Submittal Schedule
F Prior to Fabrication
S Prior to Shipment
B Prior to Balance of Payment
A Per S/C Schedule
M Prior to Mobilization
W Prior to Commencing Work
U Prior to Use
X Prior to Purchase
Y Prior to Progress Payment for Each Specific Task
Z As Required
14 Number Indicates Calendar Days After Award
AA ______

Submittal Type Required
O Original
P Prints/Photocopies
T Transparencies
M Microfilm
PH Photographs
CD Compact Disk
S Sample
(2) A number indicates quantity of copies
Q ______
E Electronic Mail

Distribution Designation
SC Submittal Coordinator
SA Subcontract Administrator
FM Field/Functional Manager
ES Engineering Services
ENV Environmental Monitoring & Management
STR Subcontract Technical Representative
SH Safety & Health
PR Procurement
EC Environmental Compliance
CSE Contract Specialist Engineer
SOMP Site Occupational Medical Provider
QA Quality Assurance
FP Fire Protection Engineer
WM Waste Management
RC Radiation Control
PC Project Control
SME Hoisting & Rigging, Electrical,

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Contract Submittals
Items to be Sent to Subcontract Administrator

Item No./ Submittal Title	Clause, * Specification, or Scope of Work Paragraph	Subcontractor Send Submittal to	Submittal Codes		FOR WCH USE ONLY	
					Send to/for	
			Schedule	(No.) and Type	Review	Info
4-18 Irrevocable Standby Letter of Credit	Exhibit "B" SC-3.1	SC	30, M	O, P (1) or E	STR SA	
5-00 ENGINEERING						
5-01 Shielded Materials Facility (SMF) Engineering/Planning						
5-01a SMF Segmentation/Size Reduction Plan	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-01b SMF Segmentation/Size Reduction Calculations	Exhibit "D" 2.1.2.1	SC	A,W	O, P (2) or E	ES, STR, SME	
5-01c SMF Segmentation/Size Reduction Drawings	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3)	ES, STR, RC, EC	
5-01d SMF Structural Stabilization/Shoring Plan	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2) or E	ES, STR, RC	
5-01e SMF Structural Stabilization/Shoring Calculations	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2) or E	ES, STR, SME	
5-01f SMF Structural Stabilization/Shoring Drawings	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2)	ES, STR, RC	
5-01g SMF Excavation/Earthwork Plan	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-01h SMF Excavation/Earthwork Calculations	Exhibit "D" Exhibit "E"	SC	A,W	O, P (2) or E	ES, STR, SME	
5-01i SMF Excavation/Earthwork Drawings	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3)	ES, STR, RC, EC	
5-01j SMF Hoisting & Rigging/Loadout Plan	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2) or E	ES, STR, SME	
5-01k SMF Hoisting & Rigging/Loadout Calculations	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2) or E	ES, STR, SME	
5-01l SMF Hoisting & Rigging/Loadout Drawings	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2)	ES, STR, SME	
5-01m SMF Packaging/Transportation Plan	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3) or E	ES, STR, RC, WM	

Exhibit "I" (Attachment A)
Subcontractor Submittal Requirements Summary

Submittal Schedule

F	Prior to Fabrication
S	Prior to Shipment
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A	Per S/C Schedule
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W	Prior to Commencing Work
U	Prior to Use
X	Prior to Purchase
Y	Prior to Progress Payment for Each Specific Task
Z	As Required
14	Number Indicates Calendar Days After Award
AA	______________

Submittal Type Required

O	Original
P	Prints/Photocopies
T	Transparencies
M	Microfilm
PH	Photographs
CD	Compact Disk
S	Sample
(2)	A number indicates quantity of copies
Q	______________
E	Electronic Mail

Distribution Designation

SC	Submittal Coordinator
SA	Subcontract Administrator
FM	Field/Functional Manager
ES	Engineering Services
ENV	Environmental Monitoring & Management
STR	Subcontract Technical Representative
SH	Safety & Health
PR	Procurement
EC	Environmental Compliance
CSE	Contract Specialist Engineer
SOMP	Site Occupational Medical Provider
QA	Quality Assurance
FP	Fire Protection Engineer
WM	Waste Management
RC	Radiation Control
PC	Project Control
SME	Hoisting & Rigging, Electrical,

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Item No./ Submittal Title	Clause, * Specification, or Scope of Work Paragraph	Subcontractor Send Submittal to	Submittal Codes		FOR WCH USE ONLY Send to/for	
			Schedule	(No.) and Type	Review	Info
5-01n SMF Packaging/Transportation Calculations	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-01o SMF Packaging/Transportation Drawings	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3)	ES, STR, RC, WM	
5-01p SMF ERDF Off-load Plan	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, SME	
5-01q SMF ERDF Off-load Calculations	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, SME	
5-01r SMF ERDF Off-load Drawings	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3)	ES, STR, RC, SME	
5-02 REC Engineering/Planning						
5-02a REC Segmentation/Size Reduction Plan	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-02b REC Segmentation/Size Reduction Calculations	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-02c REC Segmentation/Size Reduction Drawings	Exhibit "D" 2.1.2.1	SC	A,W	O, P (2)	ES, STR, SME	
5-02d REC Structural Stabilization/Shoring Plan	Exhibit "D" 2.1.2.3	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-02e REC Structural Stabilization/Shoring Calculations	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2) or E	ES, STR, RC	
5-02f REC Structural Stabilization/Shoring Drawings	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2)	ES, STR, SME	
5-02g REC Excavation/Earthwork Plan	Exhibit "D" Exhibit "E"	SC	A,W	O, P (2) or E	ES, STR, RC	
5-02h REC Excavation/Earthwork Calculations	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-02i REC Excavation/Earthwork Drawings	Exhibit "D" Exhibit "E"	SC	A,W	O, P (2)	ES, STR, SME	
5-02j REC Hoisting & Rigging/Loadout Plan	Exhibit "D" 2.1.2.2	SC	A,W	O, P (3) or E	ES, STR, RC, EC	

Exhibit "I" (Attachment A)
Subcontractor Submittal Requirements Summary

Submittal Schedule		Submittal Type Required		Distribution Designation	
F	Prior to Fabrication	O	Original	SC	Submittal Coordinator
S	Prior to Shipment	P	Prints/Photocopies	SA	Subcontract Administrator
B	Prior to Balance of Payment	T	Transparencies	FM	Field/Functional Manager
A	Per S/C Schedule	M	Microfilm	ES	Engineering Services
M	Prior to Mobilization	PH	Photographs	ENV	Environmental Monitoring & Management
W	Prior to Commencing Work	CD	Compact Disk	STR	Subcontract Technical Representative
U	Prior to Use	S	Sample	SH	Safety & Health
X	Prior to Purchase	(2)	A number indicates quantity of copies	PR	Procurement
Y	Prior to Progress Payment for Each Specific Task	Q	______	EC	Environmental Compliance
		E	Electronic Mail	CSE	Contract Specialist Engineer
Z	As Required			SOMP	Site Occupational Medical Provider
14	Number Indicates Calendar Days After Award			QA	Quality Assurance
				FP	Fire Protection Engineer
AA	______			WM	Waste Management
				RC	Radiation Control
				PC	Project Control
				SME	Hoisting & Rigging, Electrical,

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Contract Submittals
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Item No./ Submittal Title	Clause, * Specification, or Scope of Work Paragraph	Subcontractor Send Submittal to	Submittal Codes		FOR WCH USE ONLY Send to/for	
			Schedule	(No.) and Type	Review	Info
5-02k REC Hoisting & Rigging/Loadout Calculations	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2) or E	ES, STR, SME	
5-02l REC Hoisting & Rigging/Loadout Drawings	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2)	ES, STR, SME	
5-02mREC Packaging/Transportation Plan	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (2) or E	ES, STR, SME	
5-02n REC Packaging/Transportation Calculations	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-02o REC Packaging/Transportation Drawings	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3)	ES, STR, RC, WM	
5-02p REC ERDF Off-load Plan	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-02q REC ERDF Off-load Calculations	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, SME	
5-02r REC ERDF Off-load Drawings	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3)	ES, STR, RC, SME	
5-03 A-Frame Engineering/Planning						
5-03a A-Frame Segmentation/Size Reduction Plan	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-03b A-Frame Segmentation/Size Reduction Calculations	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-03c A-Frame Segmentation/Size Reduction Drawings	Exhibit "D" 2.1.2.1	SC	A,W	O, P (2)	ES, STR, SME	
5-03d A-Frame Structural Stabilization/Shoring Plan	Exhibit "D" 2.1.2.3	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-03e A-Frame Structural Stabilization/Shoring Calculations	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2) or E	ES, STR, RC	
5-03f A-Frame Structural Stabilization/Shoring Drawings	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2)	ES, STR, SME	
5-03g A-Frame Excavation/Earthwork Plan	Exhibit "D" Exhibit "E"	SC	A,W	O, P (2) or E	ES, STR, RC	

Exhibit "I" (Attachment A)
Subcontractor Submittal Requirements Summary

Submittal Schedule

F	Prior to Fabrication
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X	Prior to Purchase
Y	Prior to Progress Payment for Each Specific Task
Z	As Required
14	Number Indicates Calendar Days After Award
AA	______

Submittal Type Required

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T	Transparencies
M	Microfilm
PH	Photographs
CD	Compact Disk
S	Sample
(2)	A number indicates quantity of copies
Q	______
E	Electronic Mail

Distribution Designation

SC	Submittal Coordinator
SA	Subcontract Administrator
FM	Field/Functional Manager
ES	Engineering Services
ENV	Environmental Monitoring & Management
STR	Subcontract Technical Representative
SH	Safety & Health
PR	Procurement
EC	Environmental Compliance
CSE	Contract Specialist Engineer
SOMP	Site Occupational Medical Provider
QA	Quality Assurance
FP	Fire Protection Engineer
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Item No./ Submittal Title		Clause, * Specification, or Scope of Work Paragraph	Subcontractor Send Submittal to	Submittal Codes		FOR WCH USE ONLY Send to/for	
				Schedule	(No.) and Type	Review	Info
5-03h	*A-Frame Excavation/Earthwork Calculations*	Exhibit "D"	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-03i	*A-Frame Excavation/Earthwork Drawings*	Exhibit "D" Exhibit "E"	SC	A,W	O, P (2)	ES, STR, SME	
5-03j	*A-Frame Hoisting & Rigging/Loadout Plan*	Exhibit "D" 2.1.2.2	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-03k	*A-Frame Hoisting & Rigging/Loadout Calculations*	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2) or E	ES, STR, SME	
5-03l	*A-Frame Hoisting & Rigging/Loadout Drawings*	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2)	ES, STR, SME	
5-03m	*A-Frame Packaging/Transportation Plan*	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (2) or E	ES, STR, SME	
5-03n	*A-Frame Packaging/Transportation Calculations*	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-03o	*A-Frame Packaging/Transportation Drawings*	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3)	ES, STR, RC, WM	
5-03p	*A-Frame ERDF Off-load Plan*	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-03q	*A-Frame ERDF Off-load Calculations*	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, SME	
5-03r	*A-Frame ERDF Off-load Drawings*	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3)	ES, STR, RC, SME	
5-04 High-Level Vault (HLV) Engineering/Planning							
5-04a	*HLV Segmentation/Size Reduction Plan*	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-04b	*HLV Segmentation/Size Reduction Calculations*	Exhibit "D" 2.1.2.1	SC	A,W	O, P (2) or E	ES, STR, SME	
5-04c	*HLV Segmentation/Size Reduction Drawings*	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3)	ES, STR, RC, EC	
5-04d	*HLV Structural Stabilization/Shoring Plan*	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2) or E	ES, STR, RC	

Exhibit "I" (Attachment A)
Subcontractor Submittal Requirements Summary

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EC	Environmental Compliance
CSE	Contract Specialist Engineer
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FP	Fire Protection Engineer
WM	Waste Management
RC	Radiation Control
PC	Project Control
SME	Hoisting & Rigging, Electrical,

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Item No./ Submittal Title	Clause, * Specification, or Scope of Work Paragraph	Subcontractor Send Submittal to	Submittal Codes: Schedule	Submittal Codes: (No.) and Type	FOR WCH USE ONLY Send to/for: Review	FOR WCH USE ONLY Send to/for: Info
5-04e HLV Structural Stabilization/Shoring Calculations	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2) or E	ES, STR, SME	
5-04f HLV Structural Stabilization/Shoring Drawings	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2)	ES, STR, RC	
5-04g HLV Excavation/Earthwork Plan	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-04h HLV Excavation/Earthwork Calculations	Exhibit "D" Exhibit "E"	SC	A,W	O, P (2) or E	ES, STR, SME	
5-04i HLV Excavation/Earthwork Drawings	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3)	ES, STR, RC, EC	
5-04j HLV Hoisting & Rigging/Loadout Plan	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2) or E	ES, STR, SME	
5-04k HLV Hoisting & Rigging/Loadout Calculations	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2) or E	ES, STR, SME	
5-04l HLV Hoisting & Rigging/Loadout Drawings	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2)	ES, STR, SME	
5-04m HLV Packaging/Transportation Plan	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-04n HLV Packaging/Transportation Calculations	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-04o HLV Packaging/Transportation Drawings	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3)	ES, STR, RC, WM	
5-04p HLV ERDF Off-load Plan	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, SME	
5-04q HLV ERDF Off-load Calculations	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, SME	
5-04r HLV ERDF Off-load Drawings	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3)	ES, STR, RC, SME	
5-05 Low-Level Vault (LLV) Engineering/Planning						
5-05a LLV Segmentation/Size Reduction Plan	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3) or E	ES, STR, RC, EC	

Exhibit "I" (Attachment A)
Subcontractor Submittal Requirements Summary

Submittal Schedule

F	Prior to Fabrication
S	Prior to Shipment
B	Prior to Balance of Payment
A	Per S/C Schedule
M	Prior to Mobilization
W	Prior to Commencing Work
U	Prior to Use
X	Prior to Purchase
Y	Prior to Progress Payment for Each Specific Task
Z	As Required
14	Number Indicates Calendar Days After Award
AA	______

Submittal Type Required

O	Original
P	Prints/Photocopies
T	Transparencies
M	Microfilm
PH	Photographs
CD	Compact Disk
S	Sample
(2)	A number indicates quantity of copies
Q	______
E	Electronic Mail

Distribution Designation

SC	Submittal Coordinator
SA	Subcontract Administrator
FM	Field/Functional Manager
ES	Engineering Services
ENV	Environmental Monitoring & Management
STR	Subcontract Technical Representative
SH	Safety & Health
PR	Procurement
EC	Environmental Compliance
CSE	Contract Specialist Engineer
SOMP	Site Occupational Medical Provider
QA	Quality Assurance
FP	Fire Protection Engineer
WM	Waste Management
RC	Radiation Control
PC	Project Control
SME	Hoisting & Rigging, Electrical,

Notices

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Contract Submittals
Items to be Sent to Subcontract Administrator

Item No./ Submittal Title		Clause, * Specification, or Scope of Work Paragraph	Subcontractor Send Submittal to	Submittal Codes		FOR WCH USE ONLY Send to/for	
				Schedule	(No.) and Type	Review	Info
5-05b	*LLV Segmentation/Size Reduction Calculations*	Exhibit "D" 2.1.2.1	SC	A,W	O, P (2) or E	ES, STR, SME	
5-05c	*LLV Segmentation/Size Reduction Drawings*	Exhibit "D" 2.1.2.1	SC	A,W	O, P (3)	ES, STR, RC, EC	
5-05d	*LLV Structural Stabilization/Shoring Plan*	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2) or E	ES, STR, RC	
5-05e	*LLV Structural Stabilization/Shoring Calculations*	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2) or E	ES, STR, SME	
5-05f	*LLV Structural Stabilization/Shoring Drawings*	Exhibit "D" 2.1.2.3	SC	A,W	O, P (2)	ES, STR, RC	
5-05g	*LLV Excavation/Earthwork Plan*	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-05h	*LLV Excavation/Earthwork Calculations*	Exhibit "D" Exhibit "E"	SC	A,W	O, P (2) or E	ES, STR, SME	
5-05i	*LLV Excavation/Earthwork Drawings*	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3)	ES, STR, RC, EC	
5-05j	*LLV Hoisting & Rigging/Loadout Plan*	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2) or E	ES, STR, SME	
5-05k	*LLV Hoisting & Rigging/Loadout Calculations*	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2) or E	ES, STR, SME	
5-05l	*LLV Hoisting & Rigging/Loadout Drawings*	Exhibit "D" 2.1.2.2	SC	A,W	O, P (2) or E	ES, STR, SME	
5-05m	*LLV Packaging/Transportation Plan*	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-05n	*LLV Packaging/Transportation Calculations*	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-05o	*LLV Packaging/Transportation Drawings*	Exhibit "D" 2.1.2.4 Exhibit "D" 2.1.2.5	SC	A,W	O, P (3)	ES, STR, RC, WM	
5-05p	*LLV ERDF Off-load Plan*	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, SME	
5-05q	*LLV ERDF Off-load Calculations*	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3) or E	ES, STR, RC, SME	

For Internal Use Only:
Proforma Exhibit "I", WCH-DE-042
Proforma Issue Date: 07/01/2009

Exhibit "I" (Attachment A)
Subcontractor Submittal Requirements Summary

Submittal Schedule		Submittal Type Required		Distribution Designation	
F	Prior to Fabrication	O	Original	SC	Submittal Coordinator
S	Prior to Shipment	P	Prints/Photocopies	SA	Subcontract Administrator
B	Prior to Balance of Payment	T	Transparencies	FM	Field/Functional Manager
A	Per S/C Schedule	M	Microfilm	ES	Engineering Services
M	Prior to Mobilization	PH	Photographs	ENV	Environmental Monitoring & Management
W	Prior to Commencing Work	CD	Compact Disk	STR	Subcontract Technical Representative
U	Prior to Use	S	Sample	SH	Safety & Health
X	Prior to Purchase	(2)	A number indicates quantity of copies	PR	Procurement
Y	Prior to Progress Payment for Each Specific Task	Q		EC	Environmental Compliance
Z	As Required	E	Electronic Mail	CSE	Contract Specialist Engineer
14	Number Indicates Calendar Days After Award			SOMP	Site Occupational Medical Provider
AA				QA	Quality Assurance
				FP	Fire Protection Engineer
				WM	Waste Management
				RC	Radiation Control
				PC	Project Control
				SME	Hoisting & Rigging, Electrical,

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Contract Submittals
Items to be Sent to Subcontract Administrator

Item No./ Submittal Title	Clause, * Specification, or Scope of Work Paragraph	Subcontractor Send Submittal to	Submittal Codes		FOR WCH USE ONLY Send to/for	
			Schedule	(No.) and Type	Review	Info
5-05r LLV ERDF Off-load Drawings	Exhibit "D" 2.1.2.6	SC	A,W	O, P (3)	ES, STR, RC, SME	
5-06 Wet Storage Basin Engineering/Planning						
5-06a Excavation/Removal Plan	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-06b Excavation/Removal Calculations	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3) or E	ES, STR, RC, SME	
5-06c Excavation/Removal Drawings	Exhibit "D" Exhibit "E"	SC	A,W	O, P (3)	ES, STR, RC, SME	
5-07 General Engineering/Planning						
5-07a Project Execution Plan	Exhibit "D"	SC	A,W	O, P (4) or E	ES, STR, RC, EC	PC
5-07b Risk Plan	Exhibit "D"	SC	A,W	O, P (3) or E	ES, STR, RC	PC
5-07c Radiological Shielding/Contamination Control Plan	Exhibit "D" 2.2.2 Exhibit "D" 2.5.6.1	SC	A,W	O, P (2) or E	ES, STR, RC	
5-07d Macro-encapsulation Plan	Exhibit "D" 2.5.6.2	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-07e Subcontracting/Procurement Plan	Exhibit "D" 2.4	SC	A,W	O, P (2) or E	ES, STR, SA	
5-07f Water Collection/Disposition Plan	Exhibit "D"	SC	A,W	O, P (3) or E	ES, STR, RC, WM	
5-07g Cold Weather Protection Plan	Exhibit "D"	SC	A	O, P (1) or E	ES, STR	
5-07h Subcontract/Vendor Technical Spec Sheets	Exhibit "D"	SC	A	O, P (2) or E	ES, STR, SME	
5-07i Procedures	Exhibit "D"	SC	A	O, P (3) or E	ES, STR, RC, SME	
5-07j Equipment Inspection and PM Program	Exhibit "D"	SC	A	O, P (3) or E	ES, STR, RC, SME	

Exhibit "I" (Attachment A)
Subcontractor Submittal Requirements Summary

Submittal Schedule

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A	Per S/C Schedule
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U	Prior to Use
X	Prior to Purchase
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Submittal Type Required

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FP	Fire Protection Engineer
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RC	Radiation Control
PC	Project Control
SME	Hoisting & Rigging, Electrical,

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Contract Submittals
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			Schedule	(No.) and Type	Review	Info
5-07k Project Startup Review	Exhibit "D" 2.2.15	SC	A,W	O, P (2)	ES, STR, RC	
5-07l Other Calculations	Exhibit "D"	SC	A	O, P (2) or E	ES, STR, RC	
5-07m Other Drawings	Exhibit "D"	SC	A	O, P (3)	ES, STR, RC, SME	
5-07n Facility Layout Plan	Exhibit "D"	SC	A,W	O, P (3) or E	ES, STR, RC, EC	
5-07o Detailed Design/Layout of Loadout Area	Exhibit "D"	SC	A,W	O, P (3) or E	ES, STR, RC,WM	
5-07p Asbestos Abatement Plan	Exhibit "D"	SC	W	O, P (3) or E	ES, STR, RC, SH	
5-07q Asbestos Handling Plan	Exhibit "D"	SC	W	O, P (3) or E	ES, STR, SH, SME	
5-07r Lead Handling Plan	Exhibit "D"	SC	W	O, P (3) or E	ES, STR, SH, SME	
5-08 Other Engineering/Planning						
5-08a Electrical Design	Exhibit "G," 4.2.08	SC	A	O, P (2) or E	STR, ES, SME	
5-08b Welding Program	Exhibit "D" 3.2	SC	F,W	O, P (2) or E	ES, STR, QA	
5-08c Welding Procedures	Exhibit "D" 3.2	SC	F,W	O, P (2) or E	ES, STR, QA	
5-08d Welder Qualifications/Certifications	Exhibit "D" 3.2	SC	F,W	O, P (2) or E	ES, STR, QA	
5-08e Weld Inspector Qualifications/Certifications	Exhibit "D" 3.2	SC	F,W	O, P (2) or E	ES, STR, QA	
5-08f Weld Inspection/NDE Examination Documentation	Exhibit "D" 3.2	SC	F,W	O, P (2) or E	ES, STR, QA	
5-08g Welding Electrode/Filler Materials Documentation	Exhibit "D" 3.2	SC	F,W	O, P (2) or E	ES, STR, QA	
6-00 QUALITY ASSURANCE PROGRAM						

For Internal Use Only:
Proforma Exhibit "I", WCH-DE-042
Proforma Issue Date: 07/01/2009

NW Demolition and Environmental
A Joint Venture

SUBCONTRACTOR SUBMITTAL REQUIREMENTS

Subcontract # C010171A00

THE FOLLOWING ITEM OR ITEM'S ARE BEING SUBMITTED ON BEHALF OF NWDE:

ITEM NUMBER	SUBMITTAL TITLE
5-01	Shielding Materials Facility (SMF)
5-02	REC Engineering/Planning
5-03	A-Frame Engineering/Planning
5-04	High Level Vault (HLV)
5-05	Low Level Vault (LLV)
5-07	General Engineering/Planning

Please refer to document entitled 30% Design Submittal Master Sheet 2010-06-24 324 30-60-90 Design Drawings Submittal r2 for further clarification on all items being submitted and the Exhibit I Engineering Submittal Numbers document.

IF YOU HAVE ANY QUESTIONS OR COMMENTS PLEASE CONTACT CHAD HOFFART AT 503-638-6900 OR MY EMAIL chad@nwdemolition.com.

June 24, 2010

WCH Hanford Building 324 Hot Cell Demolition
30% Submittal Drawing List

	Summary	Number of Drawings
G	General	35
SH		0
EX	Site Excavation and Grading	7
R	Crane Rail and Foundation	12
BG	Cutting Equipment	9
CR	Gantry Crane for REC / HLV / LLV	19
HG	Hydraulic Gantry System for SMF	10
TE	Transport Equipment	6
TG	Transport General	10
REC	REC / HLV / LLV General Drawings	13
M	REC / HLV / LLV Monoliths	145
SMF	SMF General Drawings	8
M	SMF Monoliths	50
	Total	324

Made By	Number of Drawings
BIGGE	
DCI	
BIGGE/DCI	
DCI / MACTEC	
BLUEGRASS	

Weighted Percent of Total Drawing Effort		
29%	49%	23%

NOTE: Preliminary calculation that are available with the 60% design submittal will be submitted and final stamped calculations at 90% design submittal

Count		Preliminary Drawing Number	Exhibit I Submittal Number (s)	Calculations Yes or No For Each Drawing	Made By	Shts	Drawing Status at Submittal: 30% 24-Jun	60% 28-Aug	100% 30-Nov	NOTES:
	General Drawings									
1	Title Sheet	G1	5-07m	No	BIGGE	1	60%	90%	100%	
2	Drawing List	G2	5-07m	No	BIGGE	1	60%	90%	100%	
3	Project Key Plan	G3	5-07m	No	BIGGE	1	90%	90%	100%	
4	300 Area Map	G4	5-07n	No	BIGGE	1	60%	90%	100%	
5	324 Building Area	G5	5-07n	No	BIGGE	1	90%	90%	100%	
6	324 Building Work Area 3-D View	G6	5-07n	No	BIGGE	2	60%	75%	100%	
7	324 Existing Buildings to be Demolished Plan	G7	5-07m	No	BIGGE	1	90%	90%	100%	
8	324 Existing Buildings to be Demolished Sections 1	G8	5-07m	No	BIGGE	1	90%	90%	100%	
9	321 Existing Buildings to be Demolished Sections 2	G9	5-07m	No	BIGGE	1	90%	90%	100%	
10	General Notes	G10	5-07m	No	BIGGE/DCI	1	60%	90%	100%	
11	*General Specifications 1*	*G11*	5-07m	No	*BIGGE/DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
12	*General Specifications 2*	*G12*	5-07m	No	*BIGGE/DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
13	Facility Layout	G13	5-07n	No	BIGGE	1	90%	90%	100%	
14	*Site Lighting and Utilities*	*G14*	5-07n	No	*DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
15	*Site Radiation Protection Facilities*	*G15*	5-07n	No	*DCI/MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
16	REC/HLV/LLV Monolith Segmentation Plan	G16	5-02a, 5-03a,5-04a,5-05a	No	BIGGE	1	90%	90%	100%	
17	SMF Monolith Segmentation Plan	G17	5-01a	No	BIGGE	1	90%	90%	100%	
18	B-Cell Floor Stabilization	G18	5-07m	yes	DCI	1	60%	90%	100%	
18A	B-Cell Floor Stabilization *not used yet, may be needed based on markups*	G18A	5-07m	yes	DCI	1	*0%*	*60%*	*100%*	
19	REC Work Site Plan w 24 Goldhofers	G19	5-07o	No	BIGGE	1	60%	90%	100%	
20	Rec Work Site Section w 24 Goldhofers	G20	5-07o	No	BIGGE	1	60%	90%	100%	
21	REC Work Site Plan w 60 Goldhofers	G21	5-07o	No	BIGGE	1	60%	90%	100%	
22	REC Work Site Section w 60 Goldhofers	G22	5-07o	No	BIGGE	1	60%	90%	100%	
23	HLV/LLV Work Site Plan	G23	5-07o	No	BIGGE	1	60%	90%	100%	
24	HLV/LLV Work Site Section	G24	5-07o	No	BIGGE	1	60%	90%	100%	
25	*SMF Work Site Plan*	*G25*	5-07o	No	*BIGGE*	*1*	30%	60%	100%	
26	*SMF Work Site Section*	*G26*	5-07o	No	*BIGGE*	*1*	30%	60%	100%	
27	REC/HLV/LLV Gantry Crane General Arrangement	G27	5-02j,5-03j,5-04j,5-05j	Yes	BIGGE	1	60%	90%	100%	
28	SMF Hydraulic Gantry System	G28	5-02j,5-03j,5-04j,5-05j	Yes	BIGGE	1	30%	90%	100%	
29	Gantry Crane Design Criteria, Wheel Loads and Interfaces	G29	5-02j,5-03j,5-04j,5-05j	Yes	BIGGE	1	60%	90%	100%	
30	Sections Rail Foundations	G30	5-02j,5-03j,5-04j,5-05j	Yes	DCI	1	0%	60%	100%	
31	Elevations Rail Foundations	*G31*	5-02j,5-03j,5-04j,5-05j	Yes	*DCI*	*1*	*0%*	*90%*	*100%*	*defered to 60% submittal*
32	*Sections Grading 2*	*G32*	*5-03i,5-04i*	Yes	*DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
33	*Sections Grading 3*	*G33*	*5-05i*	Yes	*DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
	Site Handover									
34										
35										
36										
37										
	Site Excavation and Grading									
38	Site Excavation and Grading General Notes	EX1	5-07m	no	DCI	1	30%	60%	100%	
39	Site Excavation and Grading General Notes 2	EX2	5-07m	no	DCI	1	*0%*	*60%*	*100%*	*Title changed to "Site Excavation and Grading General Notes, Continued"*
40	Site Excavation and Grading General Notes 3	EX3	5-07m	no	DCI	1	*0%*	*60%*	*100%*	*Title changed to "Site Excavation and Grading General Notes, Continued"*
41	Site Foundation Excavation	EX4	5-07m	*yes*	DCI	1	*0%*	*60%*	*100%*	*defered to 60% submittal*

Count		Preliminary Drawing Number	Exhibit I Submittal Number (s)	Calculations Yes or No For Each Drawing	Made By	Shts	Drawing Status at Submittal: 30%	60%	100%	NOTES:
42	HLV & LLV Excavation Plan	EX5	5-04g,5-05g	Yes	DCI	1	30%	60%	100%	
43	HLV & LLV Excavation Sections	EX6	5-04i,5-05i	Yes	DCI	1	30%	60%	100%	
44	*Site Excavation and Grading Details 1*	*EX7*	*5-04i,5-05i*	*Yes*	*DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
	Crane Rail and Foundation									
45	Crane Rail Foundation General Notes	R1	5-02j,5-03j,5-04j,5-05j	no	DCI	1	30%	90%	100%	
46	Crane Rail Foundation General Notes 2	R2	5-02j,5-03j,5-04j,5-05j	no	DCI	1	30%	90%	100%	
47	Crane Rail Foundation General Notes 3	R3	5-02j,5-03j,5-04j,5-05j	no	DCI	1	0%	60%	100%	
48	Crane Rail Foundation Site Plan	R4	5-02j,5-03j,5-04j,5-05j	no	DCI	1	30%	90%	100%	*Title to be changed to "???"*
49	Crane Rail Foundation Partial Plan 1	R5	5-02j,5-03j,5-04j,5-05j	Yes	DCI	1	30%	90%	100%	*Title to be changed to "???"*
50	Crane Rail Foundation Partial Plan 2	R6	5-02j,5-03j,5-04j,5-05j	yes	DCI	1	30%	90%	100%	*Title to be changed to "???"*
51	Crane Rail Foundation Details 1 (ftg elevations)	R7	5-02j,5-03j,5-04j,5-05j	yes	DCI	1	30%	90%	100%	*Title to be changed to "???"*
52	Crane Rail Foundation Details 2 (ftg elevations)	R8	5-02j,5-03j,5-04j,5-05j	yes	DCI	1	30%	90%	100%	*Title to be changed to "???"*
53	Crane Rail Foundation Details 3 (details)	R9	5-02j,5-03j,5-04j,5-05j	yes	DCI	1	30%	90%	100%	*Title to be changed to "???"*
54	*Crane Rail Interfaces (End Stops, Pin Points, Hold Downs)*	*R10*	5-02j,5-03j,5-04j,5-05j	*yes*	*DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from Bigge to prepare*
55	*Rail Details 1*	*R11*	5-02j,5-03j,5-04j,5-05j	*yes*	*DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from Bigge to prepare*
56	*Rail Details 2*	*R12*	5-02j,5-03j,5-04j,5-05j	*yes*	*DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from Bigge to prepare*
	Cutting Equipment									
57	Cutting General Notes	BG1	5-07m	NO	BLUEGRASS	1	60%	90%	100%	
57A	Cutting Equipment and General Setup	BG2-1	5-07m	NO	BLUEGRASS	1	60%	90%	100%	
58	Cutting Equipment and General Setup	BG2-2	5-07m	NO	BLUEGRASS	1	60%	90%	100%	
58A	Equipment Details	BG3-1	5-07m	NO	BLUEGRASS	1	60%	90%	100%	
59	Equipment Details	BG3-2	5-07m	NO	BLUEGRASS	1	60%	90%	100%	
59A	Water Control Details	BG4-1	5-07m	NO	BLUEGRASS	1	60%	90%	100%	
59B	Water Control Details	BG4-2	5-07m	NO	BLUEGRASS	1	60%	90%	100%	
59C	Water Control Details	BG4-3	5-07m	NO	BLUEGRASS	1	60%	90%	100%	
60	Water Control Details	BG4-4	5-07m	NO	BLUEGRASS	1	60%	90%	100%	
	Gantry Crane for REC / HLV / LLV									
61	Gantry Crane General Arrangement	CR1	5-02j,5-03j,5-04j,5-05j	Yes	BIGGE	1	60%	90%	100%	
62	Gantry Crane Sections	CR2	5-02j,5-03j,5-04j,5-05j	Yes	BIGGE	1	60%	90%	100%	
63	Gantry Crane Plan View	CR3	5-02j,5-03j,5-04j,5-05j	Yes	BIGGE	1	60%	90%	100%	
64	Gantry Crane 3-D View	CR4	5-02j,5-03j,5-04j,5-05j	Yes	BIGGE	1	60%	90%	100%	
65	*Gantry Crane Trolley 3-D View*	*CR5*			*BIGGE*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
66	*Gantry Crane to Monoliths Connections 2*	*CR6*			*BIGGE*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
67	*Gantry Crane Drive Truck Arrangement*	*CR7*			*BIGGE*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
68	*Gantry Crane Interfaces*	*CR8*			*BIGGE*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
69	Gantry Crane Power and Control	CR9			BIGGE	1	0%	60%	100%	
70	Gantry Crane Details 1	CR10			BIGGE	1	0%	60%	100%	
71	Gantry Crane Details 2	CR11			BIGGE	1	0%	60%	100%	
72	Gantry Crane Details 3	CR12			BIGGE	1	0%	60%	100%	
73	Gantry Crane Details 4	CR13			BIGGE	1	0%	60%	100%	
74	Gantry Crane Details 5	CR14			BIGGE	1	0%	60%	100%	
75	Gantry Crane Details 6	CR15			BIGGE	1	0%	60%	100%	
76	Gantry Crane Details 7	CR16			BIGGE	1	0%	60%	100%	
77	Gantry Crane Details 8	CR17			BIGGE	1	0%	60%	100%	
78	Gantry Crane Details 9	CR18			BIGGE	1	0%	60%	100%	
79	Gantry Crane Details 10	CR19			BIGGE	1	0%	60%	100%	
	Hydraulic Gantry System for SMF									
80	Hydraulic Gantry System General Arrangement	HG1	5-01j	Yes	BIGGE	1	0%	90%	100%	*defered to 60% submittal*
81	Hydraulic Ganry Crane System Sections	HG2	5-01j	Yes	BIGGE	1	0%	90%	100%	*defered to 60% submittal*
82	Hydraulic Gantry System 3-D	HG3	5-01j	Yes	BIGGE	1	30%	90%	100%	
83	*Hydraulic Gantry Support 1*	*HG4*			*BIGGE*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
84	*Hydraulic Gantry Support 2*	*HG5*			*BIGGE*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
85	Hydraulic Gantry Support 3	HG6			BIGGE	1	0%	90%	100%	
86	*Hydraulic Gantry System Beam and Spreader System 1*	*HG7*			*BIGGE*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
87	Hydraulic Gantry System Beam and Spreader System 2	HG8			BIGGE	1	0%	90%	100%	
88	*Hydraulic Gantry System Details 1*	*HG9*			*BIGGE*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
89	Hydraulic Gantry System Details 2	HG10			BIGGE	1	0%	60%	100%	
	Transport Equipment									
90	Transport Equipment General Notes	TE1	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	0%	90%	100%	
91	12 Goldhofer Line Arrangement	TE2	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	0%	90%	100%	
92	24 Goldhofer Line Arrangement	TE3	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	0%	90%	100%	
93	36 Goldhofer Line Arrangement	TE4	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	0%	60%	100%	
94	48 Goldhofer Line Arrangement	TE5	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	0%	90%	100%	
95	60 Goldhofer Line Arrangement	TE6	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	0%	90%	100%	

Count		Preliminary Drawing Number	Exhibit I Submittal Number(s)	Calculations Yes or No For Each Drawing	Made By	Shts	Drawing Status at Submittal: 30%	60%	100%	NOTES:
	Transport General									
96	Transport and ERDF Set Down General	TG1	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	30%	60%	100%	
97	Transport Route and notes	TG2	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	60%	60%	100%	
97	Transport Details 1 - 324 Area	TG3	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	60%	60%	100%	
98	Transport Details 2 - Perpendicular Exit from REC to Cypress	TG4	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	60%	60%	100%	
99	Transport Details 3 - Parallel Exit from REC to Cypress	TG5	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	60%	60%	100%	
100	Transport Details 4 - Cypress Street Turning	TG6	5-01m,5-02m,5-03m,5-04m,5-05m	No	BIGGE	1	60%	60%	100%	
101	ERDF Site Details 1	TG7	5-01p,5-02p,5-03p,5-04p,5-05p	No	BIGGE	1	0%	60%	100%	
102	ERDF Site Details 2	TG8	5-01p,5-02p,5-03p,5-04p,5-05p	No	BIGGE	1	0%	60%	100%	
103	General Set Down Arrangement 1	TG9	5-01p,5-02p,5-03p,5-04p,5-05p	No	BIGGE	1	0%	60%	100%	
104	ERDF Set Down Details	TG10	5-01p,5-02p,5-03p,5-04p,5-05p	No	BIGGE	1	0%	60%	100%	
	REC / HLV / LLV General Drawings									
105	REC Pre-Demolition Work	REC1	5-02d,5-02f	Yes	DCI	1	0%	60%	100%	defered to 60% submittal
106	REC Lifting Embed Plate Details	REC2	5-02j	Yes	DCI	1	30%	90%	100%	
107	REC Lifting Embed Plate Details 2	REC3	5-02j	Yes	DCI	1	30%	90%	100%	
108	REC Cutting Plan 1	REC4	5-02c	No	BIGGE	1	90%	90%	100%	
109	REC Cutting Plan 2	REC5	5-02c	No	BIGGE	1	90%	90%	100%	
110	REC Cutting Plan 3	REC6	5-02c	No	BIGGE	1	90%	90%	100%	
111	Cutting Equipment Set Up Locations	REC7	5-02f	yes	DCI	1	0%	60%	100%	defered to 60% submittal
112	Cutting Equipment Protection Details 1	REC8	5-02a	NO	BLUEGRASS	1	30%	90%	100%	SEE BG4 DRAWINGS
113	Cutting Equipment Protection Details 2	REC9	5-02a	NO	BLUEGRASS	1	30%	90%	100%	SEE BG4 DRAWINGS
114	Cutting Equipment Protection Details 3	REC10	5-02a	NO	BLUEGRASS	1	30%	90%	100%	SEE BG4 DRAWINGS
115	REC Monoliths General 1	REC11	5-02c	No	BIGGE	1	0%	90%	100%	
116	REC Monoliths General 2	REC12	5-02c	No	BIGGE	1	0%	90%	100%	
117	HLV and LLV Monoliths	REC13	5-04c,5-05c	No	BIGGE	1	0%	90%	100%	
	REC /HLV / LLV Monolith Drawings	**Monolith**								
	Airlock Roof North	1								
118	Monolith 1 Dimensions, weight, CG, RAD	M1A	5-02a	yes	DCI	1	30%	90%	100%	
119	Monolith 1 Lifting Arrangement	M1B	5-02l	Yes	BIGGE	1	90%	90%	100%	
120	Monolith 1 Lifting Attachments	M1C	5-02l	Yes	DCI	1	30%	90%	100%	
120A	Monolith 1 Lifting Attachments	M1C1	5-02l	Yes	DCI	1	30%	90%	100%	
120B	Monolith 1 Lifting Attachments	M1C2	5-02l	Yes	DCI	1	30%	90%	100%	
121	Monolith 1 Rigging Details	M1D	5-02l	Yes	BIGGE	1	30%	60%	100%	
122	Monolith 1 Shielding	M1E			DCI / MACTEC	1	0%	60%	100%	defered to 60% submittal, need input from MACTEC to prepare
123	Monolith 1 Transport Arrangement	M1F	5-02o	Yes	BIGGE	1	30%	90%	100%	
124	Monolith 1 Transport Details	M1G	5-02o	Yes	BIGGE	1	0%	60%	100%	
125	Monolith 1 ERDF Set Down Details	M1H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	Airlock Roof South	2								
126	Monolith 2 Dimensions, weight, CG, RAD	M2A	5-02a	Yes	DCI	1	30%	90%	100%	
127	Monolith 2 Lifting Arrangement	M2B	5-02l	Yes	BIGGE	1	90%	90%	100%	
128	Monolith 2 Lifting Attachments	M2C	5-02l	Yes	DCI	1	30%	90%	100%	
128A	Monolith 2 Lifting Attachments	M2C1	5-02l	Yes	DCI	1	30%	90%	100%	
128B	Monolith 2 Lifting Attachments	M2C2	5-02l	Yes	DCI	1	30%	90%	100%	
129	Monolith 2 Rigging Details	M2D	5-02l	Yes	BIGGE	1	30%	60%	100%	
130	Monolith 2 Shielding	M2E			DCI / MACTEC	1	0%	60%	100%	defered to 60% submittal, need input from MACTEC to prepare
131	Monolith 2 Transport Arrangement	M2F	5-02o	Yes	BIGGE	1	30%	90%	100%	
132	Monolith 2 Transport Details	M2G	5-02o	Yes	BIGGE	1	0%	60%	100%	
133	Monolith 2 ERDF Set Down Details	M2H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	Airlock Front Wall	3								
134	Monolith 3 Dimensions, weight, CG, RAD	M3A	5-02a	yes	DCI	1	30%	90%	100%	
135	Monolith 3 Lifting Arrangement	M3B	5-02l	Yes	BIGGE	1	90%	90%	100%	
136	Monolith 3 Lifting Attachments	M3C	5-02l	Yes	DCI	1	30%	90%	100%	
136A	Monolith 3 Lifting Attachments	M3C1	5-02l	Yes	DCI	2	30%	90%	100%	
136B	Monolith 3 Lifting Attachments	M3C2	5-02l	Yes	DCI	3	30%	90%	100%	
137	Monolith 3 Rigging Details	M3D	5-02l	Yes	BIGGE	1	30%	60%	100%	
138	Monolith 3 Shielding	M3E			DCI / MACTEC	1	0%	60%	100%	defered to 60% submittal, need input from MACTEC to prepare
139	Monolith 3 Transport Arrangement	M3F	5-02o	Yes	BIGGE	1	30%	90%	100%	
140	Monolith 3 Transport Details	M3G	5-02o	Yes	BIGGE	1	0%	60%	100%	
141	Monolith 3 ERDF Set Down Details	M3H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	A-Cell Top	4								
142	Monolith 4 Dimensions, weight, CG, RAD	M4A	5-02a	yes	DCI	1	30%	90%	100%	
143	Monolith 4 Lifting Arrangement	M4B	5-02l	Yes	BIGGE	1	90%	90%	100%	
144	Monolith 4 Lifting Attachments	M4C	5-02l	Yes	DCI	1	30%	90%	100%	
144A	Monolith 4 Lifting Attachments	M4C1	5-02l	Yes	DCI	1	30%	90%	100%	
144B	Monolith 4 Lifting Attachments	M4C2	5-02l	Yes	DCI	1	30%	90%	100%	
145	Monolith 4 Rigging Details	M4D	5-02l	Yes	BIGGE	1	30%	60%	100%	
146	Monolith 4 Shielding	M4E			DCI / MACTEC	1	0%	60%	100%	defered to 60% submittal, need input from MACTEC to prepare
147	Monolith 4 Transport Arrangement	M4F	5-02o	Yes	BIGGE	1	30%	90%	100%	

Count		Preliminary Drawing Number	Exhibit I Submittal Number (s)	Calculations Yes or No For Each Drawing	Made By	Shts	Drawing Status at Submittal: 30%	60%	100%	NOTES:
148	Monolith 4 Transport Details	M4G	5-02o	Yes	BIGGE	1	0%	60%	100%	
149	Monolith 4 ERDF Set Down Details	M4H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	A-Cell Bottom	5								
150	Monolith 5 Dimensions, weight, CG, RAD	M5A	5-02a	yes	DCI	1	30%	90%	100%	
151	Monolith 5 Lifting Arrangement	M5B	5-02l	Yes	BIGGE	1	90%	90%	100%	
152	Monolith 5 Lifting Attachments	M5C	5-02l	Yes	DCI	1	30%	90%	100%	
152A	Monolith 5 Lifting Attachments	M5C1	5-02l	Yes	DCI	1	30%	90%	100%	
152B	Monolith 5 Lifting Attachments	M5C2	5-02l	Yes	DCI	1	30%	90%	100%	
153	Monolith 5 Rigging Details	M5D	5-02l	Yes	BIGGE	1	30%	60%	100%	
154	*Monolith 5 Shielding*	*M5E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
155	Monolith 5 Transport Arrangement	M5F	5-02o	Yes	BIGGE	1	30%	90%	100%	
156	Monolith 5 Transport Details	M5G	5-02o	Yes	BIGGE	1	0%	60%	100%	
157	Monolith 5 ERDF Set Down Details	M5H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	D-Cell	6								
158	Monolith 6 Dimensions, weight, CG, RAD	M6A	5-02a	yes	DCI	1	30%	90%	100%	
159	Monolith 6 Lifting Arrangement	M6B	5-02l	Yes	BIGGE	1	90%	90%	100%	
160	Monolith 6 Lifting Attachments	M6C	5-02l	Yes	DCI	1	30%	90%	100%	
160A	Monolith 6 Lifting Attachments	M6C1	5-02l	Yes	DCI	1	30%	90%	100%	
160B	Monolith 6 Lifting Attachments	M6C2	5-02l	Yes	DCI	1	30%	90%	100%	
161	Monolith 6 Rigging Details	M6D	5-02l	Yes	BIGGE	1	30%	60%	100%	
162	*Monolith 6 Shielding*	*M6E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
163	Monolith 6 Transport Arrangement	M6F	5-02o	Yes	BIGGE	1	30%	90%	100%	
164	Monolith 6 Transport Details	M6G	5-02o	Yes	BIGGE	1	0%	60%	100%	
165	Monolith 6 ERDF Set Down Details	M6H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	C-Cell	7								
166	Monolith 7 Dimensions, weight, CG, RAD	M7A	5-02a	yes	DCI	1	30%	90%	100%	
167	Monolith 7 Lifting Arrangement	M7B	5-02l	Yes	BIGGE	1	90%	90%	100%	
168	Monolith 7 Lifting Attachments	M7C	5-02l	Yes	DCI	1	30%	90%	100%	
168A	Monolith 7 Lifting Attachments	M7C1	5-02l	Yes	DCI	1	30%	90%	100%	
168B	Monolith 7 Lifting Attachments	M7C2	5-02l	Yes	DCI	1	30%	90%	100%	
169	Monolith 7 Rigging Details	M7D	5-02l	Yes	BIGGE	1	30%	60%	100%	
170	*Monolith 7 Shielding*	*M7E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
171	Monolith 7 Transport Arrangement	M7F	5-02o	Yes	BIGGE	1	30%	90%	100%	
172	Monolith 7 Transport Details	M7G	5-02o	Yes	BIGGE	1	0%	60%	100%	
173	Monolith 7 ERDF Set Down Details	M7H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	B-Cell Top	8								
174	Monolith 8 Dimensions, weight, CG, RAD	M8A	5-02a	yes	DCI	1	30%	90%	100%	
175	Monolith 8 Lifting Arrangement	M8B	5-02l	Yes	BIGGE	1	90%	90%	100%	
176	Monolith 8 Lifting Attachments	M8C	5-02l	Yes	DCI	1	30%	90%	100%	
176A	Monolith 8 Lifting Attachments	M8C1	5-02l	Yes	DCI	1	30%	90%	100%	
176B	Monolith 8 Lifting Attachments	M8C2	5-02l	Yes	DCI	1	30%	90%	100%	
177	Monolith 8 Rigging Details	M8D	5-02l	Yes	BIGGE	1	30%	60%	100%	
178	*Monolith 8 Shielding*	*M8E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
179	Monolith 8 Transport Arrangement	M8F	5-02o	Yes	BIGGE	1	30%	90%	100%	
180	Monolith 8 Transport Details	M8G	5-02o	Yes	BIGGE	1	0%	60%	100%	
181	Monolith 8 ERDF Set Down Details	M8H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	B-Cell Middle	9								
182	Monolith 9 Dimensions, weight, CG, RAD	M9A	5-02a	yes	DCI	1	30%	90%	100%	
183	Monolith 9 Lifting Arrangement	M9B	5-02l	Yes	BIGGE	1	90%	90%	100%	
184	Monolith 9 Lifting Attachments	M9C	5-02l	Yes	DCI	1	30%	90%	100%	
184A	Monolith 9 Lifting Attachments	M9C1	5-02l	Yes	DCI	1	30%	90%	100%	
184B	Monolith 9 Lifting Attachments	M9C2	5-02l	Yes	DCI	1	30%	90%	100%	
185	Monolith 9 Rigging Details	M9D	5-02l	Yes	BIGGE	1	30%	60%	100%	
186	*Monolith 9 Shielding*	*M9E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
187	Monolith 9 Transport Arrangement	M9F	5-02o	Yes	BIGGE	1	30%	90%	100%	
188	Monolith 9 Transport Details	M9G	5-02o	Yes	BIGGE	1	0%	60%	100%	
189	Monolith 9 ERDF Set Down Details	M9H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	B-Cell Bottom, Slab, and Pipe Trench	10								
190	Monolith 10 Dimensions, weight, CG, RAD	M10A	5-02a	yes	DCI	1	30%	90%	100%	
191	Monolith 10 Lifting Arrangement	M10B	5-02l	Yes	BIGGE	1	90%	90%	100%	
192	Monolith 10 Lifting Attachments	M10C	5-02l	Yes	DCI	1	30%	90%	100%	
192A	Monolith 10 Lifting Attachments	M10C1	5-02l	Yes	DCI	1	30%	90%	100%	
192B	Monolith 10 Lifting Attachments	M10C2	5-02l	Yes	DCI	1	30%	90%	100%	
193	Monolith 10 Rigging Details	M10D	5-02l	Yes	BIGGE	1	30%	60%	100%	
194	*Monolith 10 Shielding*	*M10E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
195	Monolith 10 Transport Arrangement	M10F	5-02o	Yes	BIGGE	1	30%	90%	100%	
196	Monolith 10 Transport Details	M10G	5-02o	Yes	BIGGE	1	0%	60%	100%	
197	Monolith 10 ERDF Set Down Details	M10H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	A-Frame	11								
198	Monolith 11 Dimensions, weight, CG, RAD	M11A	5-03a	yes	DCI	1	30%	90%	100%	

Count		Preliminary Drawing Number	Exhibit I Submittal Number (s)	Calculations Yes or No For Each Drawing	Made By	Shts	Drawing Status at Submittal: 30%	60%	100%	NOTES:
199	Monolith 11 Lifting Arrangement	M11B	5-03l	Yes	BIGGE	1	90%	90%	100%	
200	Monolith 11 Lifting Attachments	M11C	5-03l	Yes	DCI	1	30%	90%	100%	
200A	Monolith 11 Lifting Attachments	M11C1	5-03l	Yes	DCI	1	30%	90%	100%	
200B	Monolith 11 Lifting Attachments	M11C2	5-03l	Yes	DCI	1	30%	90%	100%	
201	Monolith 11 Rigging Details	M11D	5-03l	Yes	BIGGE	1	30%	60%	100%	
202	*Monolith 11 Shielding*	*M11E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
203	Monolith 11 Transport Arrangement	M11F	5-03o	Yes	BIGGE	1	30%	90%	100%	
204	Monolith 11 Transport Details	M11G	5-03o	Yes	BIGGE	1	0%	60%	100%	
205	Monolith 11 ERDF Set Down Details	M11H	5-03r	Yes	BIGGE	1	0%	90%	100%	
	Airlock Slab	12								
206	Monolith 12 Dimensions, weight, CG, RAD	M12A	5-02a	yes	DCI	1	30%	90%	100%	
207	Monolith 12 Lifting Arrangement	M12B	5-02l	Yes	BIGGE	1	90%	90%	100%	
208	Monolith 12 Lifting Attachments	M12C	5-02l	Yes	DCI	1	30%	90%	100%	
208A	Monolith 12 Lifting Attachments	M12C1	5-02l	Yes	DCI	1	30%	90%	100%	
208B	Monolith 12 Lifting Attachments	M12C2	5-02l	Yes	DCI	1	30%	90%	100%	
209	Monolith 12 Rigging Details	M12D	5-02l	Yes	BIGGE	1	30%	60%	100%	
210	*Monolith 12 Shielding*	*M12E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
211	Monolith 12 Transport Arrangement	M12F	5-02o	Yes	BIGGE	1	30%	90%	100%	
212	Monolith 12 Transport Details	M12G	5-02o	Yes	BIGGE	1	0%	60%	100%	
213	Monolith 12 ERDF Set Down Details	M12H	5-02r	Yes	BIGGE	1	0%	90%	100%	
	HLV	13								
214	Monolith 13 Dimensions, weight, CG, RAD	M13A	5-04a	yes	DCI	1	30%	90%	100%	
215	Monolith 13 Lifting Arrangement	M13B	5-04l	Yes	BIGGE	1	90%	90%	100%	
216	Monolith 13 Lifting Attachments	M13C	5-04l	Yes	DCI	1	30%	90%	100%	
216A	Monolith 13 Lifting Attachments	M13C1	5-04l	Yes	DCI	1	30%	90%	100%	
216B	Monolith 13 Lifting Attachments	M13C2	5-04l	Yes	DCI	1	30%	90%	100%	
217	Monolith 13 Rigging Details	M13D	5-04l	Yes	BIGGE	1	30%	60%	100%	
218	*Monolith 13 Shielding*	*M13E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
219	Monolith 13 Transport Arrangement	M13F	5-04o	Yes	BIGGE	1	30%	90%	100%	
220	Monolith 13 Transport Details	M13G	5-04o	Yes	BIGGE	1	0%	60%	100%	
221	Monolith 13 ERDF Set Down Details	M13H	5-04r	Yes	BIGGE	1	0%	90%	100%	
	LLV	14								
222	Monolith 14 Dimensions, weight, CG, RAD	M14A	5-05a	yes	DCI	1	30%	90%	100%	
223	Monolith 14 Lifting Arrangement	M14B	5-05l	Yes	BIGGE	1	90%	90%	100%	
224	Monolith 14 Lifting Attachments	M14C	5-05l	Yes	DCI	1	30%	90%	100%	
224A	Monolith 14 Lifting Attachments	M14C1	5-05l	Yes	DCI	1	30%	90%	100%	
224B	Monolith 14 Lifting Attachments	M14C2	5-05l	Yes	DCI	1	30%	90%	100%	
224C	Monolith 14 Lifting Attachments	M14C3	5-05l	Yes	DCI	1	30%	90%	100%	
224D	Monolith 14 Lifting Attachments	M14C4	5-05l	Yes	DCI	1	30%	90%	100%	
225	Monolith 14 Rigging Details	M14D	5-05l	Yes	BIGGE	1	30%	60%	100%	
226	*Monolith 14 Shielding*	*M14E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
227	Monolith 14 Transport Arrangement	M14F	5-05o	Yes	BIGGE	1	30%	90%	100%	
228	Monolith 14 Transport Details	M14G	5-05o	Yes	BIGGE	1	0%	60%	100%	
229	Monolith 14 ERDF Set Down Details	M14H	5-05r	Yes	BIGGE	1	0%	90%	100%	
	SMF General Drawings									
230	SMF Pre-Demolition Work	SMF1	5-01d,5-01f	Yes	DCI	1	30%	60%	100%	
231	SMF Attachment Embed Plate Details 1	SMF2	*5-01j,5-01k,5-01l*	Yes	*DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal*
231A	SMF Attachment Embed Plate Details 2	SMF2A	*5-01j,5-01k,5-01l*	Yes	*DCI*	*1*	*0%*	*60%*	*100%*	
232	SMF Cutting Plan	*SMF3*	*5-01a*	No	*BIGGE*	*1*	60%	90%	100%	*defered to 60% submittal, need input from Bluegrass to prepare*
233	*Cutting Equipment Set Up Locations*	*SMF4*			*DCI*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from Bluegrass to prepare*
234	Cutting Equipment Protection Details 1	SMF5	5-01a	NO	BLUEGRASS	1	60%	90%	100%	
235	Cutting Equipment Protection Details 2	SMF6	5-01a	NO	BLUEGRASS	1	60%	90%	100%	
236	SMF Monoliths General	*SMF7*	*5-01a*	No	*BIGGE*	*1*	30%	*60%*	*100%*	
	SMF Monolith Drawings	**Monolith**								
	SMF South Roof	15								
237	Monolith 15 Dimensions, weight, CG, RAD	M15A	5-01a,5-01b,5-01c,5-01d,5-01e,5-01f	yes	DCI	1	30%	60%	100%	
238	Monolith 15 Lifting Arrangement	M15B	5-01l	Yes	BIGGE	1	90%	90%	100%	
239	Monolith 15 Lifting Attachments	M15C	5-01l	Yes	*DCI*	*1*	*30%*	*60%*	*100%*	
239A	Monolith 15 Lifting Attachments	M15C1	5-01l	Yes	*DCI*	*1*	*30%*	*60%*	*100%*	
239B	Monolith 15 Lifting Attachments	M15C2	5-01l	Yes	*DCI*	*1*	*30%*	*60%*	*100%*	
240	Monolith 15 Rigging Details	M15D	5-01l	Yes	BIGGE	1	30%	60%	100%	
241	*Monolith 15 Shielding*	*M15E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
242	Monolith 15 Transport Arrangement	M15F	5-01o	Yes	BIGGE	1	30%	90%	100%	
243	Monolith 15 Transport Details	M15G	5-01o	Yes	BIGGE	1	0%	60%	100%	
244	Monolith 15 ERDF Set Down Details	M15H	5-01r	Yes	BIGGE	1	0%	60%	100%	
	SMF North Roof	16								
245	Monolith 16 Dimensions, weight, CG, RAD	M16A	5-01a,5-01b,5-01c,5-01d,5-01e,5-01f	yes	DCI	1	30%	60%	100%	
246	Monolith 16 Lifting Arrangement	M16B	5-01l	Yes	BIGGE	1	90%	90%	100%	

Count		Preliminary Drawing Number	Exhibit I Submittal Number (s)	Calculations Yes or No For Each Drawing	Made By	Shts	Drawing Status at Submittal: 30%	60%	100%	NOTES:
247	Monolith 16 Lifting Attachments	M16C	5-01l	Yes	DCI	1	30%	60%	100%	
247A	Monolith 16 Lifting Attachments	M16C1	5-01l	Yes	DCI	1	30%	60%	100%	
247B	Monolith 16 Lifting Attachments	M16C2	5-01l	Yes	DCI	1	30%	60%	100%	
248	Monolith 16 Rigging Details	M16D	5-01l	Yes	BIGGE	1	30%	60%	100%	
249	*Monolith 16 Shielding*	*M16E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
250	Monolith 16 Transport Arrangement	M16F	5-01o	Yes	BIGGE	1	30%	90%	100%	
251	Monolith 16 Transport Details	M16G	5-01o	Yes	BIGGE	1	0%	60%	100%	
252	Monolith 16 ERDF Set Down Details	M16H	5-01r	Yes	BIGGE	1	0%	60%	100%	
	SMF South	17								
253	Monolith 17 Dimensions, weight, CG, RAD	M17A	5-01a,5-01b,5-01c,5-01d,5-01e,5-01f	yes	DCI	1	30%	60%	100%	
254	Monolith 17 Lifting Arrangement	M17B	5-01l	Yes	BIGGE	1	90%	90%	100%	
255	Monolith 17 Lifting Attachments	M17C	5-01l	Yes	DCI	1	30%	60%	100%	
255A	Monolith 17 Lifting Attachments	M17C1	5-01l	Yes	DCI	1	30%	60%	100%	
255B	Monolith 17 Lifting Attachments	M17C2	5-01l	Yes	DCI	1	30%	60%	100%	
256	Monolith 17 Rigging Details	M17D	5-01l	Yes	BIGGE	1	30%	60%	100%	
257	*Monolith 17 Shielding*	*M17E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
258	Monolith 17 Transport Arrangement	M17F	5-01o	Yes	BIGGE	1	30%	90%	100%	
259	Monolith 17 Transport Details	M17G	5-01o	Yes	BIGGE	1	0%	60%	100%	
260	Monolith 17 ERDF Set Down Details	M17H	5-01r	Yes	BIGGE	1	0%	60%	100%	
	SMF Mid	18								
261	Monolith 18 Dimensions, weight, CG, RAD	M18A	5-01a,5-01b,5-01c,5-01d,5-01e,5-01f	yes	DCI	1	90%	90%	100%	
262	Monolith 18 Lifting Arrangement	M18B	5-01l	Yes	BIGGE	1	90%	90%	100%	
263	Monolith 18 Lifting Attachments	M18C	5-01l	Yes	DCI	1	30%	60%	100%	
263A	Monolith 18 Lifting Attachments	M18C1	5-01l	Yes	DCI	1	30%	60%	100%	
263B	Monolith 18 Lifting Attachments	M18C2	5-01l	Yes	DCI	1	30%	60%	100%	
264	Monolith 18 Rigging Details	M18D	5-01l	Yes	BIGGE	1	30%	60%	100%	
265	*Monolith 18 Shielding*	*M18E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
266	Monolith 18 Transport Arrangement	M18F	5-01o	Yes	BIGGE	1	30%	90%	100%	
267	Monolith 18 Transport Details	M18G	5-01o	Yes	BIGGE	1	0%	60%	100%	
268	Monolith 18 ERDF Set Down Details	M18H	5-01r	Yes	BIGGE	1	0%	60%	100%	
	SMF North	19								
269	Monolith 19 Dimensions, weight, CG, RAD	M19A	5-01a,5-01b,5-01c,5-01d,5-01e,5-01f	yes	DCI	1	90%	90%	100%	
270	Monolith 19 Lifting Arrangement	M19B	5-01l	Yes	BIGGE	1	90%	90%	100%	
271	Monolith 19 Lifting Attachments	M19C	5-01l	Yes	DCI	1	30%	60%	100%	
271A	Monolith 19 Lifting Attachments	M19C1	5-01l	Yes	DCI	1	30%	60%	100%	
271B	Monolith 19 Lifting Attachments	M19C2	5-01l	Yes	DCI	1	30%	60%	100%	
272	Monolith 19 Rigging Details	M19D	5-01l	Yes	BIGGE	1	30%	60%	100%	
273	*Monolith 19 Shielding*	*M19E*			*DCI / MACTEC*	*1*	*0%*	*60%*	*100%*	*defered to 60% submittal, need input from MACTEC to prepare*
274	Monolith 19 Transport Arrangement	M19F	5-01o	Yes	BIGGE	1	30%	90%	100%	
275	Monolith 19 Transport Details	M19G	5-01o	Yes	BIGGE	1	0%	60%	100%	
276	Monolith 19 ERDF Set Down Details	M19H	5-01r	Yes	BIGGE	1	0%	60%	100%	

324

DRAWING NO.	REV. NO.
G1	A

TITLE: 324 BUILDING HOT CELL DISPOSITION

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS Established 1974
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
TITLE SHEET

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	G1.DWG

TASK	DRAWING NO.	REV. NO.
	G1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
G2	A

324 BUILDING HOT CELL DISPOSITION DRAWING LIST

DWG. NO.	GENERAL DRAWINGS	STATUS
G1	TITLE SHEET	60%
G2	DRAWING LIST	60%
G3	PROJECT KEY PLAN	90%
G4	300 AREA MAP	60%
G5	324 BUILDING AREA	90%
G6	324 BUILDING WORK AREA 3-D VIEW	60%
G7	324 EXISTING BUILDINGS TO BE DEMOLISHED PLAN	90%
G8	324 EXISTING BUILDINGS TO BE DEMOLISHED SECTIONS 1	90%
G9	324 EXISTING BUILDINGS TO BE DEMOLISHED SECTIONS 2	90%
G10	GENERAL NOTES	60%
G11	GENERAL SPECIFICATIONS 1	0%
G12	GENERAL SPECIFICATIONS 2	0%
G13	FACILITY LAYOUT	90%
G14	SITE LIGHTING AND UTILITIES	0%
G15	SITE RADIATION PROTECTION FACILITIES	0%
G16	REC/HLV/LLV MONOLITH SEGMENTATION PLAN	90%
G17	SMF MONOLITH SEGMENTATION PLAN	90%
G18	B-CELL FLOOR STABILIZATION	60%
G19	REC WORK SITE PLAN W 24 GOLDHOFERS	60%
G20	REC WORK SITE SECTION W 24 GOLDHOFERS	60%
G21	REC WORK SITE PLAN W 60 GOLDHOFERS	60%
G22	REC WORK SITE SECTION W 60 GOLDHOFERS	60%
G23	HLV/LLV WORK SITE PLAN	60%
G24	HLV/LLV WORK SITE SECTION	60%
G25	SMF WORK SITE PLAN	30%
G26	SMF WORK SITE SECTION	30%
G27	REC/HLV/LLV GANTRY CRANE GENERAL ARRANGEMENT	60%
G28	SMF HYDRAULIC GANTRY SYSTEM	30%
G29	GANTRY CRANE DESIGN CRITERIA, WHEEL LOADS AND INTERFACES	60%
G30	SECTIONS RAIL FOUNDATIONS	60%
G31	ELEVATIONS RAIL FOUNDATIONS	60%
G32	SECTIONS GRADING 1	0%
G33	SECTIONS GRADING 2	0%
	SITE EXCAVATION AND GRADING	
EX1	SITE EXCAVATION AND GRADING GENERAL NOTES	30%
EX2	SITE EXCAVATION AND GRADING SPECIFICATIONS 1	30%
EX3	SITE EXCAVATION AND GRADING SPECIFICATIONS 2	30%
EX4	SITE EXCAVATION AND GRADING GENERAL 1	0%
EX5	SITE EXCAVATION AND GRADING GENERAL 2	0%
EX6	SITE EXCAVATION AND GRADING DETAILS 1	0%
EX7	SITE EXCAVATION AND GRADING DETAILS 1	0%
	CRANE RAIL AND FOUNDATION	
R1	CRANE RAIL FOUNDATION GENERAL NOTES	30%
R2	CRANE RAIL FOUNDATION SPECIFICATIONS 1	30%
R3	CRANE RAIL FOUNDATION SPECIFICATIONS 2	30%
R4	CRANE RAIL FOUNDATION GENERAL ARRANGEMENT	60%
R5	CRANE FOUNDATION DETAILS 1	30%
R6	CRANE FOUNDATION DETAILS 2	30%
R7	CRANE FOUNDATION DETAILS 3	30%
R8	CRANE FOUNDATION DETAILS 4	30%
R9	CRANE FOUNDATION DETAILS 5	30%
R10	CRANE RAIL INTERFACES (END STOPS, PIN POINTS, HOLD DOWNS)	Z E
R11	RAIL DETAILS 1	0%
R12	RAIL DETAILS 2	0%
	CUTTING EQUIPMENT	
BG1	CUTTING GENERAL NOTES	30%

BG2-1	CUTTING EQUIPMENT AND GENERAL SETUP	60%
BG2-2	CUTTING EQUIPMENT AND GENERAL SETUP	60%
BG3-1	EQUIPMENT DETAILS	60%
BG3-2	EQUIPMENT DETAILS	60%
BG4-1	WATER CONTROL DETAILS	60%
BG4-2	WATER CONTROL DETAILS	60%
BG4-3	WATER CONTROL DETAILS	60%
BG4-4	WATER CONTROL DETAILS	60%
	GANTRY CRANE FOR REC / HLV / LLV	
CR1	GANTRY CRANE GENERAL ARRANGEMENT	60%
CR2	GANTRY CRANE SECTIONS	60%
CR3	GANTRY CRANE PLAN VIEW	60%
CR4	GANTRY CRANE 3-D VIEW	60%
CR5	GANTRY CRANE TROLLEY ARRANGEMENT	0%
CR6	GANTRY CRANE TO MONOLITH CONNECTIONS 1	0%
CR7	GANTRY CRANE DRIVE TRUCK ARRANGEMENT	0%
CR8	GANTRY CRANE INTERFACES	0%
CR9	GANTRY CRANE POWER AND CONTROL	0%
CR10	GANTRY CRANE DETAILS 1	0%
CR11	GANTRY CRANE DETAILS 2	0%
CR12	GANTRY CRANE DETAILS 3	0%
CR13	GANTRY CRANE DETAILS 4	0%
CR14	GANTRY CRANE DETAILS 5	0%
CR15	GANTRY CRANE DETAILS 6	0%
CR16	GANTRY CRANE DETAILS 7	0%
CR17	GANTRY CRANE DETAILS 8	0%
CR18	GANTRY CRANE DETAILS 9	0%
CR19	GANTRY CRANE DETAILS 10	0%
	HYDRAULIC GANTRY SYSTEM FOR SMF	
HG1	HYDRAULIC GANTRY SYSTEM GENERAL ARRANGEMENT	0%
HG2	HYDRAULIC GANRY CRANE SYSTEM SECTIONS	0%
HG3	HYDRAULIC GANTRY SYSTEM 3-D	30%
HG4	HYDRAULIC GANTRY SUPPORT 1	0%
HG5	HYDRAULIC GANTRY SUPPORT 2	0%
HG6	HYDRAULIC GANTRY SUPPORT 3	0%
HG7	HYDRAULIC GANTRY SYSTEM BEAM AND SPREADER SYSTEM 1	0%
HG8	HYDRAULIC GANTRY SYSTEM BEAM AND SPREADER SYSTEM 2	0%
HG9	HYDRAULIC GANTRY SYSTEM DETAILS 1	0%
HG10	HYDRAULIC GANTRY SYSTEM DETAILS 2	0%
	TRANSPORT EQUIPMENT	
TE1	TRANSPORT EQUIPMENT GENERAL NOTES	0%
TE2	12 GOLDHOFER LINE ARRANGEMENT	0%
TE3	24 GOLDHOFER LINE ARRANGEMENT	0%
TE4	36 GOLDHOFER LINE ARRANGEMENT	0%
TE5	48 GOLDHOFER LINE ARRANGEMENT	0%
TE6	60 GOLDHOFER LINE ARRANGEMENT	0%
	TRANSPORT GENERAL	
TG1	TRANSPORT AND ERDF SET DOWN GENERAL	30%
TG2	TRANSPORT ROUTE AND NOTES	60%
TG3	TRANSPORT DETAILS 1 - 324 AREA	60%
TG4	TRANSPORT DETAILS 2 - PERPENDICULAR EXIT FROM REC TO CYPRESS	60%
TG5	TRANSPORT DETAILS 3 - PARALLEL EXIT FROM REC TO CYPRESS	60%
TG6	TRANSPORT DETAILS 4 - CYPRESS STREET TURNING	60%
TG7	ERDF SITE DETAILS 1	0%
TG8	ERDF SITE DETAILS 2	0%
TG9	GENERAL SET DOWN ARRANGEMENT 1	0%
TG10	ERDF SET DOWN DETAILS	0%
	REC / HLV / LLV GENERAL DRAWINGS	
REC1	REC DEMOLITION PREPARATION GENERAL	60%
REC2	REC DEMOLITION PREPARATION DETAILS 1	30%
REC3	REC DEMOLITION PREPARATION DETAILS 2	30%

REC4	REC CUTTING PLAN 1	90%
REC5	REC CUTTING PLAN 2	90%
REC6	REC CUTTING PLAN 3	90%
REC7	CUTTING EQUIPMENT SET UP LOCATIONS	0%
REC8	CUTTING EQUIPMENT PROTECTION DETAILS 1	30%
REC9	CUTTING EQUIPMENT PROTECTION DETAILS 2	30%
REC10	CUTTING EQUIPMENT PROTECTION DETAILS 3	30%
REC11	REC MONOLITHS GENERAL 1	0%
REC12	REC MONOLITHS GENERAL 2	0%
REC13	HLV AND LLV MONOLITHS	0%
MONOLITH	**REC / HLV / LLV MONOLITH DRAWINGS**	
1	**AIRLOCK ROOF NORTH**	
M1A	MONOLITH 1 DIMENSIONS, WEIGHT, CG, RAD	90%
M1B	MONOLITH 1 LIFTING ARRANGEMENT	90%
M1C	MONOLITH 1 LIFTING ATTACHMENTS	30%
M1C1	MONOLITH 1 LIFTING ATTACHMENTS	30%
M1C2	MONOLITH 1 LIFTING ATTACHMENTS	30%
M1D	MONOLITH 1 RIGGING DETAILS	30%
M1E	MONOLITH 1 SHIELDING	0%
M1F	MONOLITH 1 TRANSPORT ARRANGEMENT	30%
M1G	MONOLITH 1 TRANSPORT DETAILS	0%
M1H	MONOLITH 1 ERDF SET DOWN DETAILS	0%
2	**AIRLOCK ROOF SOUTH**	
M2A	MONOLITH 2 DIMENSIONS, WEIGHT, CG, RAD	90%
M2B	MONOLITH 2 LIFTING ARRANGEMENT	60%
M2C	MONOLITH 2 LIFTING ATTACHMENTS	30%
M2C1	MONOLITH 2 LIFTING ATTACHMENTS	30%
M2C2	MONOLITH 2 LIFTING ATTACHMENTS	30%
M2D	MONOLITH 2 RIGGING DETAILS	30%
M2E	MONOLITH 2 SHIELDING	0%
M2F	MONOLITH 2 TRANSPORT ARRANGEMENT	30%
M2G	MONOLITH 2 TRANSPORT DETAILS	0%
M2H	MONOLITH 2 ERDF SET DOWN DETAILS	0%
3	**AIRLOCK FRONT WALL**	
M3A	MONOLITH 3 DIMENSIONS, WEIGHT, CG, RAD	90%
M3B	MONOLITH 3 LIFTING ARRANGEMENT	60%
M3C	MONOLITH 3 LIFTING ATTACHMENTS	30%
M3C1	MONOLITH 3 LIFTING ATTACHMENTS	30%
M3C2	MONOLITH 3 LIFTING ATTACHMENTS	30%
M3D	MONOLITH 3 RIGGING DETAILS	30%
M3E	MONOLITH 3 SHIELDING	0%
M3F	MONOLITH 3 TRANSPORT ARRANGEMENT	30%
M3G	MONOLITH 3 TRANSPORT DETAILS	0%
M3H	MONOLITH 3 ERDF SET DOWN DETAILS	0%
4	**A-CELL TOP**	
M4A	MONOLITH 4 DIMENSIONS, WEIGHT, CG, RAD	90%
M4B	MONOLITH 4 LIFTING ARRANGEMENT	60%
M4C	MONOLITH 4 LIFTING ATTACHMENTS	30%
M4C1	MONOLITH 4 LIFTING ATTACHMENTS	30%
M4C2	MONOLITH 4 LIFTING ATTACHMENTS	30%
M4D	MONOLITH 4 RIGGING DETAILS	30%
M4E	MONOLITH 4 SHIELDING	0%
M4F	MONOLITH 4 TRANSPORT ARRANGEMENT	30%
M4G	MONOLITH 4 TRANSPORT DETAILS	0%
M4H	MONOLITH 4 ERDF SET DOWN DETAILS	0%
5	**A-CELL BOTTOM**	
M5A	MONOLITH 5 DIMENSIONS, WEIGHT, CG, RAD	90%
M5B	MONOLITH 5 LIFTING ARRANGEMENT	60%
M5C	MONOLITH 5 LIFTING ATTACHMENTS	30%
M5C1	MONOLITH 5 LIFTING ATTACHMENTS	30%
M5C2	MONOLITH 5 LIFTING ATTACHMENTS	30%
M5D	MONOLITH 5 RIGGING DETAILS	30%
M5E	MONOLITH 5 SHIELDING	0%
M5F	MONOLITH 5 TRANSPORT ARRANGEMENT	30%
M5G	MONOLITH 5 TRANSPORT DETAILS	0%
M5H	MONOLITH 5 ERDF SET DOWN DETAILS	0%

6	**D-CELL**	
M6A	MONOLITH 6 DIMENSIONS, WEIGHT, CG, RAD	90%
M6B	MONOLITH 6 LIFTING ARRANGEMENT	60%
M6C	MONOLITH 6 LIFTING ATTACHMENTS	30%
M6C1	MONOLITH 6 LIFTING ATTACHMENTS	30%
M6C2	MONOLITH 6 LIFTING ATTACHMENTS	30%
M6D	MONOLITH 6 RIGGING DETAILS	30%
M6E	MONOLITH 6 SHIELDING	60%
M6F	MONOLITH 6 TRANSPORT ARRANGEMENT	30%
M6G	MONOLITH 6 TRANSPORT DETAILS	30%
M6H	MONOLITH 6 ERDF SET DOWN DETAILS	30%
7	**C-CELL**	
M7A	MONOLITH 7 DIMENSIONS, WEIGHT, CG, RAD	90%
M7B	MONOLITH 7 LIFTING ARRANGEMENT	60%
M7C	MONOLITH 7 LIFTING ATTACHMENTS	30%
M7C1	MONOLITH 7 LIFTING ATTACHMENTS	30%
M7C2	MONOLITH 7 LIFTING ATTACHMENTS	30%
M7D	MONOLITH 7 RIGGING DETAILS	30%
M7E	MONOLITH 7 SHIELDING	0%
M7F	MONOLITH 7 TRANSPORT ARRANGEMENT	30%
M7G	MONOLITH 7 TRANSPORT DETAILS	0%
M7H	MONOLITH 7 ERDF SET DOWN DETAILS	0%
8	**B-CELL TOP**	
M8A	MONOLITH 8 DIMENSIONS, WEIGHT, CG, RAD	90%
M8B	MONOLITH 8 LIFTING ARRANGEMENT	60%
M8C	MONOLITH 8 LIFTING ATTACHMENTS	30%
M8C1	MONOLITH 8 LIFTING ATTACHMENTS	30%
M8C2	MONOLITH 8 LIFTING ATTACHMENTS	30%
M8D	MONOLITH 8 RIGGING DETAILS	30%
M8E	MONOLITH 8 SHIELDING	0%
M8F	MONOLITH 8 TRANSPORT ARRANGEMENT	30%
M8G	MONOLITH 8 TRANSPORT DETAILS	0%
M8H	MONOLITH 8 ERDF SET DOWN DETAILS	0%
9	**B-CELL MIDDLE**	
M9A	MONOLITH 9 DIMENSIONS, WEIGHT, CG, RAD	90%
M9B	MONOLITH 9 LIFTING ARRANGEMENT	60%
M9C	MONOLITH 9 LIFTING ATTACHMENTS	30%
M9C1	MONOLITH 9 LIFTING ATTACHMENTS	30%
M9C2	MONOLITH 9 LIFTING ATTACHMENTS	30%
M9D	MONOLITH 9 RIGGING DETAILS	30%
M9E	MONOLITH 9 SHIELDING	0%
M9F	MONOLITH 9 TRANSPORT ARRANGEMENT	30%
M9G	MONOLITH 9 TRANSPORT DETAILS	0%
M9H	MONOLITH 9 ERDF SET DOWN DETAILS	0%
10	**B-CELL BOTTOM, SLAB, AND PIPE TRENCH**	
M10A	MONOLITH 10 DIMENSIONS, WEIGHT, CG, RAD	90%
M10B	MONOLITH 10 LIFTING ARRANGEMENT	60%
M10C	MONOLITH 10 LIFTING ATTACHMENTS	30%
M10C1	MONOLITH 10 LIFTING ATTACHMENTS	30%
M10C2	MONOLITH 10 LIFTING ATTACHMENTS	30%
M10D	MONOLITH 10 RIGGING DETAILS	30%
M10E	MONOLITH 10 SHIELDING	0%
M10F	MONOLITH 10 TRANSPORT ARRANGEMENT	30%
M10G	MONOLITH 10 TRANSPORT DETAILS	0%
M10H	MONOLITH 10 ERDF SET DOWN DETAILS	0%
11	**A-FRAME**	
M11A	MONOLITH 11 DIMENSIONS, WEIGHT, CG, RAD	90%
M11B	MONOLITH 11 LIFTING ARRANGEMENT	60%
M11C	MONOLITH 11 LIFTING ATTACHMENTS	30%
M11C1	MONOLITH 11 LIFTING ATTACHMENTS	30%
M11C2	MONOLITH 11 LIFTING ATTACHMENTS	30%
M11D	MONOLITH 11 RIGGING DETAILS	30%
M11E	MONOLITH 11 SHIELDING	0%
M11F	MONOLITH 11 TRANSPORT ARRANGEMENT	30%
M11G	MONOLITH 11 TRANSPORT DETAILS	0%
M11H	MONOLITH 11 ERDF SET DOWN DETAILS	0%
12	**AIRLOCK SLAB**	

M12A	MONOLITH 12 DIMENSIONS, WEIGHT, CG, RAD	90%
M12B	MONOLITH 12 LIFTING ARRANGEMENT	60%
M12C	MONOLITH 12 LIFTING ATTACHMENTS	30%
M12C1	MONOLITH 12 LIFTING ATTACHMENTS	30%
M12C2	MONOLITH 12 LIFTING ATTACHMENTS	30%
M12D	MONOLITH 12 RIGGING DETAILS	30%
M12E	MONOLITH 12 SHIELDING	0%
M12F	MONOLITH 12 TRANSPORT ARRANGEMENT	30%
M12G	MONOLITH 12 TRANSPORT DETAILS	0%
M12H	MONOLITH 12 ERDF SET DOWN DETAILS	0%
13	**HLV**	
M13A	MONOLITH 13 DIMENSIONS, WEIGHT, CG, RAD	90%
M13B	MONOLITH 13 LIFTING ARRANGEMENT	60%
M13C	MONOLITH 13 LIFTING ATTACHMENTS	30%
M13C1	MONOLITH 13 LIFTING ATTACHMENTS	30%
M13C2	MONOLITH 13 LIFTING ATTACHMENTS	30%
M13D	MONOLITH 13 RIGGING DETAILS	30%
M13E	MONOLITH 13 SHIELDING	0%
M13F	MONOLITH 13 TRANSPORT ARRANGEMENT	30%
M13G	MONOLITH 13 TRANSPORT DETAILS	0%
M13H	MONOLITH 13 ERDF SET DOWN DETAILS	0%
14	**LLV**	
M14A	MONOLITH 14 DIMENSIONS, WEIGHT, CG, RAD	90%
M14B	MONOLITH 14 LIFTING ARRANGEMENT	60%
M14C	MONOLITH 14 LIFTING ATTACHMENTS	30%
M14C1	MONOLITH 14 LIFTING ATTACHMENTS	30%
M14C2	MONOLITH 14 LIFTING ATTACHMENTS	30%
M14D	MONOLITH 14 RIGGING DETAILS	30%
M14E	MONOLITH 14 SHIELDING	0%
M14F	MONOLITH 14 TRANSPORT ARRANGEMENT	30%
M14G	MONOLITH 14 TRANSPORT DETAILS	0%
M14H	MONOLITH 14 ERDF SET DOWN DETAILS	0%
	SMF GENERAL DRAWINGS	
SMF1	SMF DEMOLITION PREPARATION GENERAL	60%
SMF2	SMF DEMOLITION PREPARATION DETAILS	30%
SMF3	SMF CUTTING PLAN	30%
SMF4	CUTTING EQUIPMENT SET UP LOCATIONS	0%
SMF5	CUTTING EQUIPMENT PROTECTION DETAILS 1	60%
SMF6	CUTTING EQUIPMENT PROTECTION DETAILS 2	60%
SMF7	SMF MONOLITHS GENERAL	0%
MONOLITH	**SMF MONOLITH DRAWINGS**	
15	**SMF SOUTH ROOF**	
M15A	MONOLITH 15 DIMENSIONS, WEIGHT, CG, RAD	90%
M15B	MONOLITH 15 LIFTING ARRANGEMENT	60%
M15C	MONOLITH 15 LIFTING ATTACHMENTS	30%
M15C1	MONOLITH 15 LIFTING ATTACHMENTS	30%
M15C2	MONOLITH 15 LIFTING ATTACHMENTS	30%
M15D	MONOLITH 15 RIGGING DETAILS	30%
M15E	MONOLITH 15 SHIELDING	0%
M15F	MONOLITH 15 TRANSPORT ARRANGEMENT	30%
M15G	MONOLITH 15 TRANSPORT DETAILS	0%
M15H	MONOLITH 15 ERDF SET DOWN DETAILS	0%
16	**SMF NORTH ROOF**	
M16A	MONOLITH 16 DIMENSIONS, WEIGHT, CG, RAD	90%
M16B	MONOLITH 16 LIFTING ARRANGEMENT	60%
M16C	MONOLITH 16 LIFTING ATTACHMENTS	30%
M16C1	MONOLITH 16 LIFTING ATTACHMENTS	30%
M16C2	MONOLITH 16 LIFTING ATTACHMENTS	30%
M16D	MONOLITH 16 RIGGING DETAILS	30%
M16E	MONOLITH 16 SHIELDING	0%
M16F	MONOLITH 16 TRANSPORT ARRANGEMENT	30%
M16G	MONOLITH 16 TRANSPORT DETAILS	0%
M16H	MONOLITH 16 ERDF SET DOWN DETAILS	0%
17	**SMF SOUTH**	

M17A	MONOLITH 17 DIMENSIONS, WEIGHT, CG, RAD	90%
M17B	MONOLITH 17 LIFTING ARRANGEMENT	60%
M17C	MONOLITH 17 LIFTING ATTACHMENTS	30%
M17C1	MONOLITH 17 LIFTING ATTACHMENTS	30%
M17C2	MONOLITH 17 LIFTING ATTACHMENTS	30%
M17D	MONOLITH 17 RIGGING DETAILS	30%
M17E	MONOLITH 17 SHIELDING	0%
M17F	MONOLITH 17 TRANSPORT ARRANGEMENT	30%
M17G	MONOLITH 17 TRANSPORT DETAILS	0%
M17H	MONOLITH 17 ERDF SET DOWN DETAILS	0%
18	**SMF MID**	
M18A	MONOLITH 18 DIMENSIONS, WEIGHT, CG, RAD	90%
M18B	MONOLITH 18 LIFTING ARRANGEMENT	60%
M18C	MONOLITH 18 LIFTING ATTACHMENTS	30%
M18C1	MONOLITH 18 LIFTING ATTACHMENTS	30%
M18C2	MONOLITH 18 LIFTING ATTACHMENTS	30%
M18D	MONOLITH 18 RIGGING DETAILS	30%
M18E	MONOLITH 18 SHIELDING	0%
M18F	MONOLITH 18 TRANSPORT ARRANGEMENT	30%
M18G	MONOLITH 18 TRANSPORT DETAILS	0%
M18H	MONOLITH 18 ERDF SET DOWN DETAILS	0%
19	**SMF NORTH**	
M19A	MONOLITH 19 DIMENSIONS, WEIGHT, CG, RAD	90%
M19B	MONOLITH 19 LIFTING ARRANGEMENT	60%
M19C	MONOLITH 19 LIFTING ATTACHMENTS	30%
M19C1	MONOLITH 19 LIFTING ATTACHMENTS	30%
M19C2	MONOLITH 19 LIFTING ATTACHMENTS	30%
M19D	MONOLITH 19 RIGGING DETAILS	30%
M19E	MONOLITH 19 SHIELDING	0%
M19F	MONOLITH 19 TRANSPORT ARRANGEMENT	30%
M19G	MONOLITH 19 TRANSPORT DETAILS	0%
M19H	MONOLITH 19 ERDF SET DOWN DETAILS	0%

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELL DISPOSITION
DRAWING LIST

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	G1.DWG

TASK	DRAWING NO.	REV. NO.
	G2	A

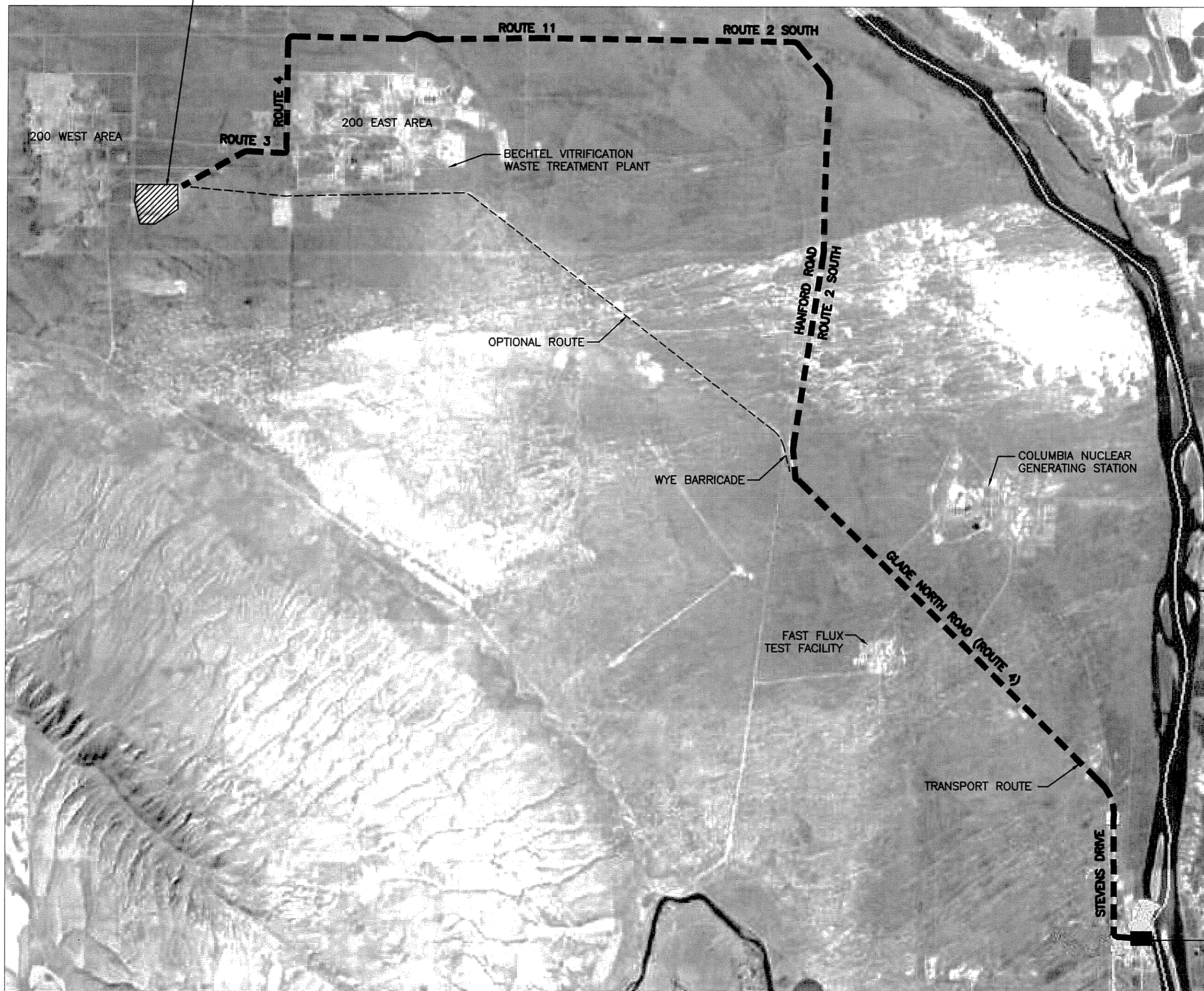
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

2234_WCH-SUB.DWG 06/05

DRAWING NO.	REV. NO.
XX	A

ERDF SET–DOWN AREA
SEE DWG. XX FOR
DETAIL DRAWINGS



COLUMBIA RIVER

300 AREA
SEE DWG. G4, G5 FOR
DETAIL DRAWINGS

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	XX		SH	SH		

SCALE: NOT TO SCALE

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WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

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BLDG. 324 HOT CELLS
PROJECT KEY PLAN
300 AREA AND ERDF SET DOWN AREA MAP

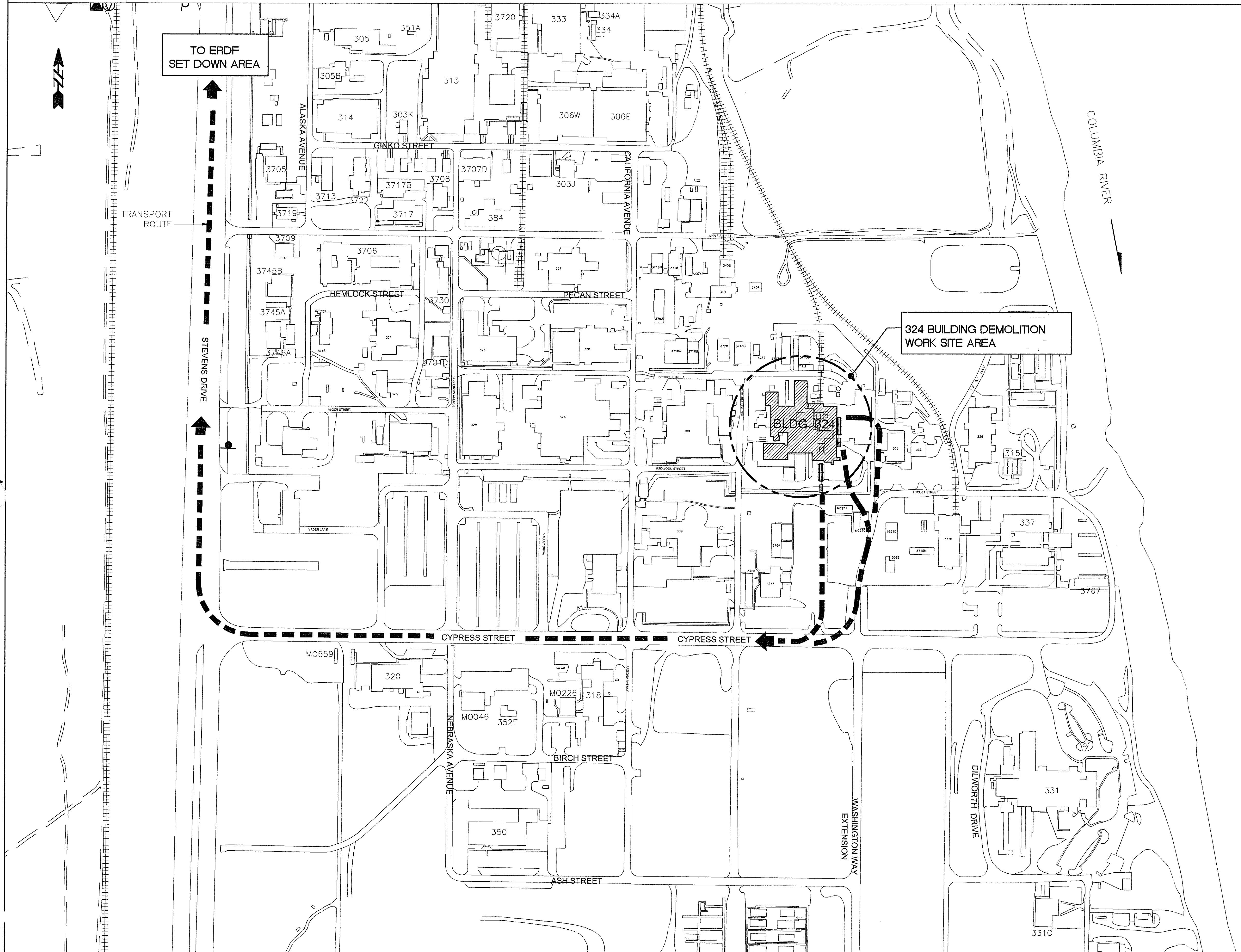
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G3	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
300 AREA MAP

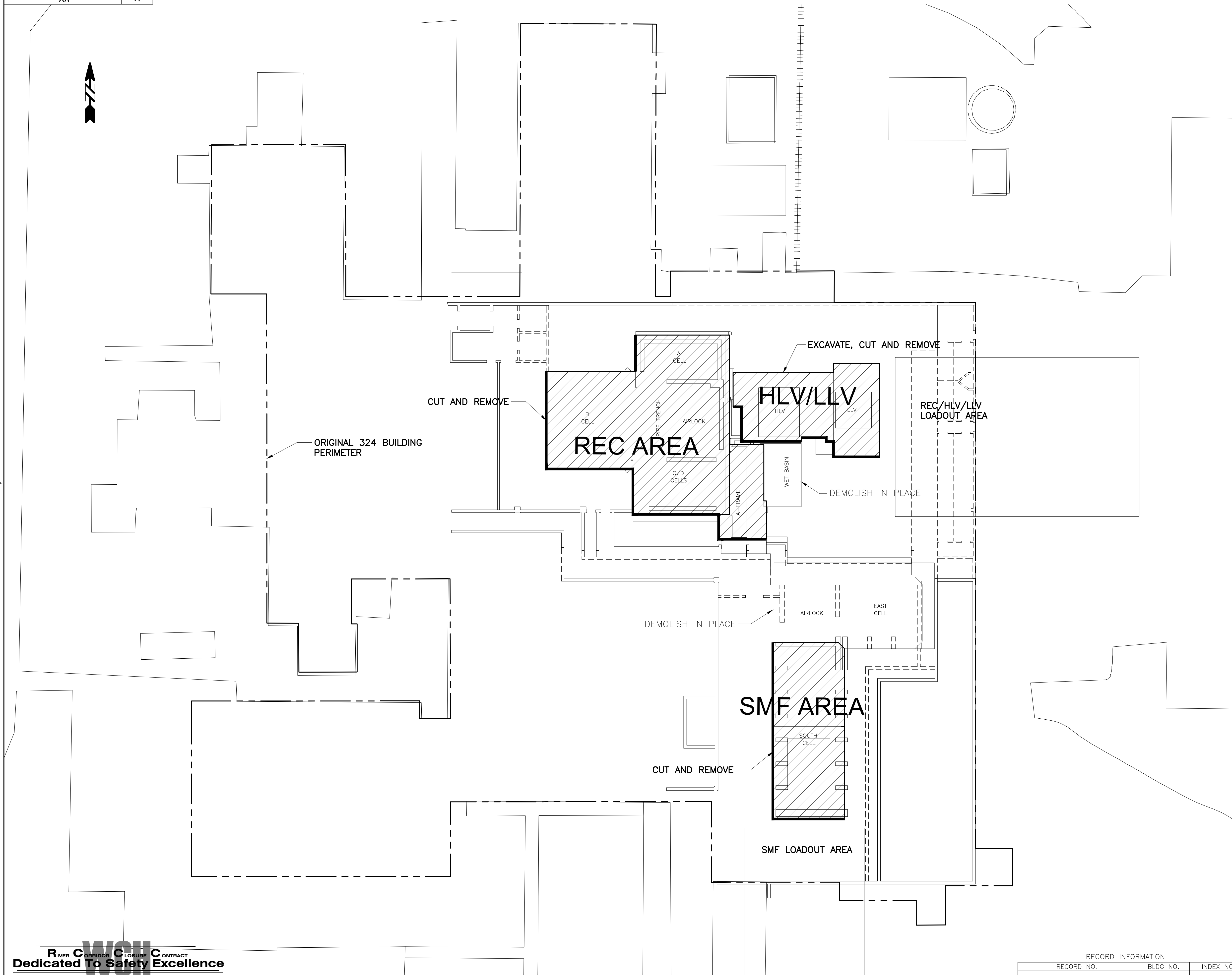
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G4	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

For improved legibility this sheet has been replaced with the corresponding sheet from the 60% Design.

60% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
B	11/23/10							
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: 1/16" = 1'-0"

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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

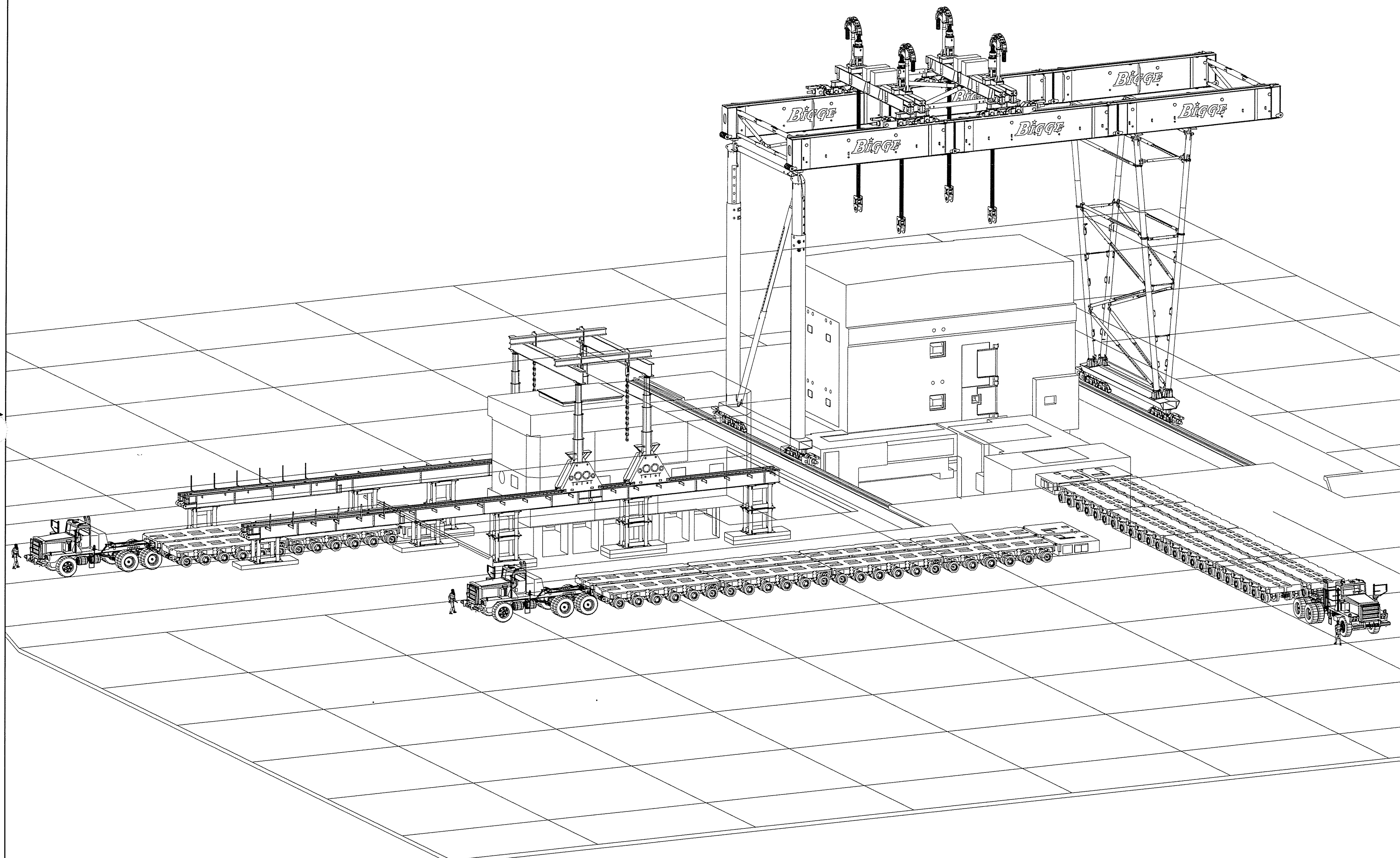
NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
324 BUILDING AREA

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G5	A

DRAWING NO.	REV. NO.
XX	A



NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS Established 1974
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
324 BUILDING WORK AREA
3D ISOMETRIC VIEW

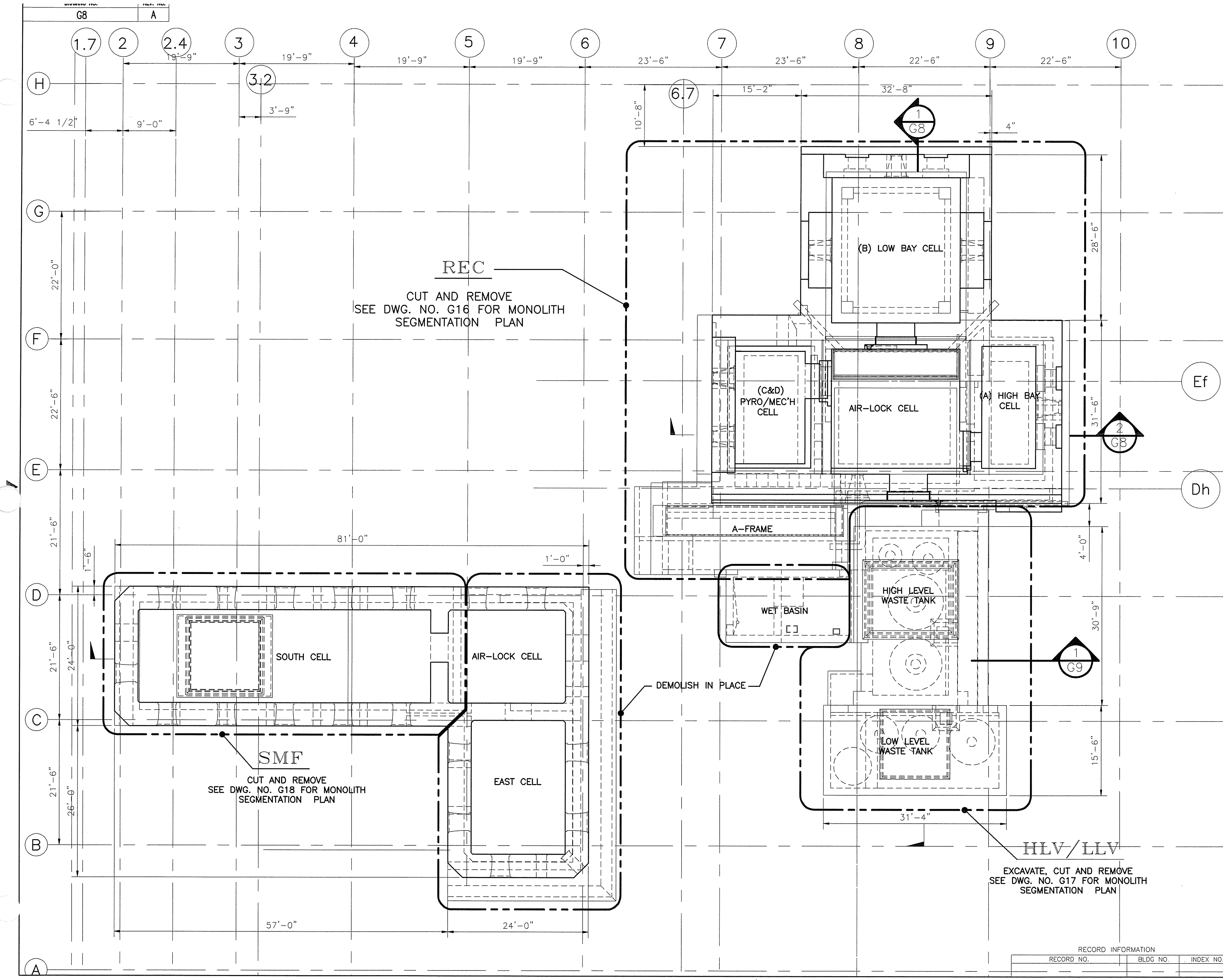
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G6	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

2234_WCH-SUB.DWG 09/05



RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

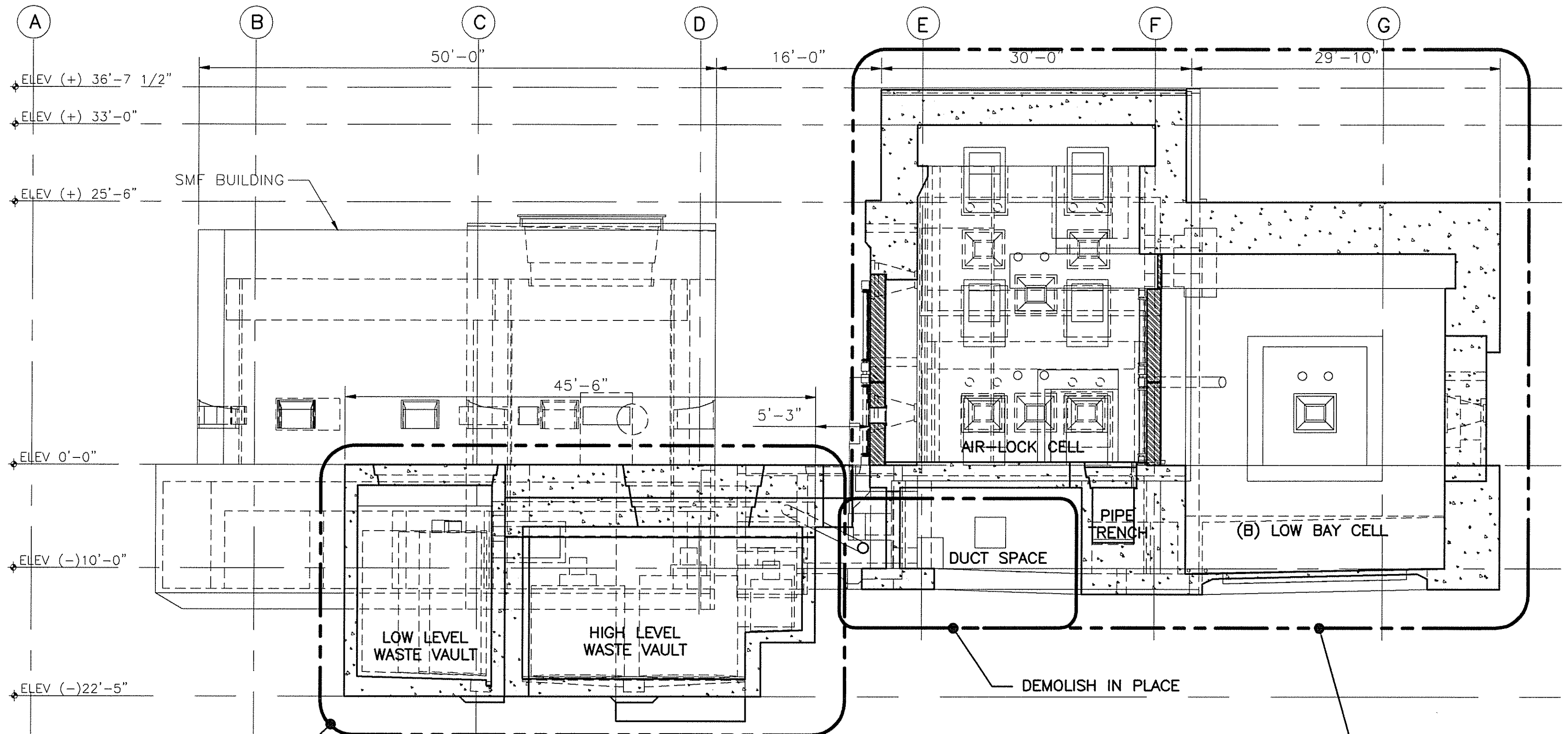
NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
324 EXISTING BUILDINGS TO BE DEMOLISHED
WORK SITE PLAN EXISTING

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	G8.DWG

TASK	DRAWING NO.	REV. NO.
	G7	A

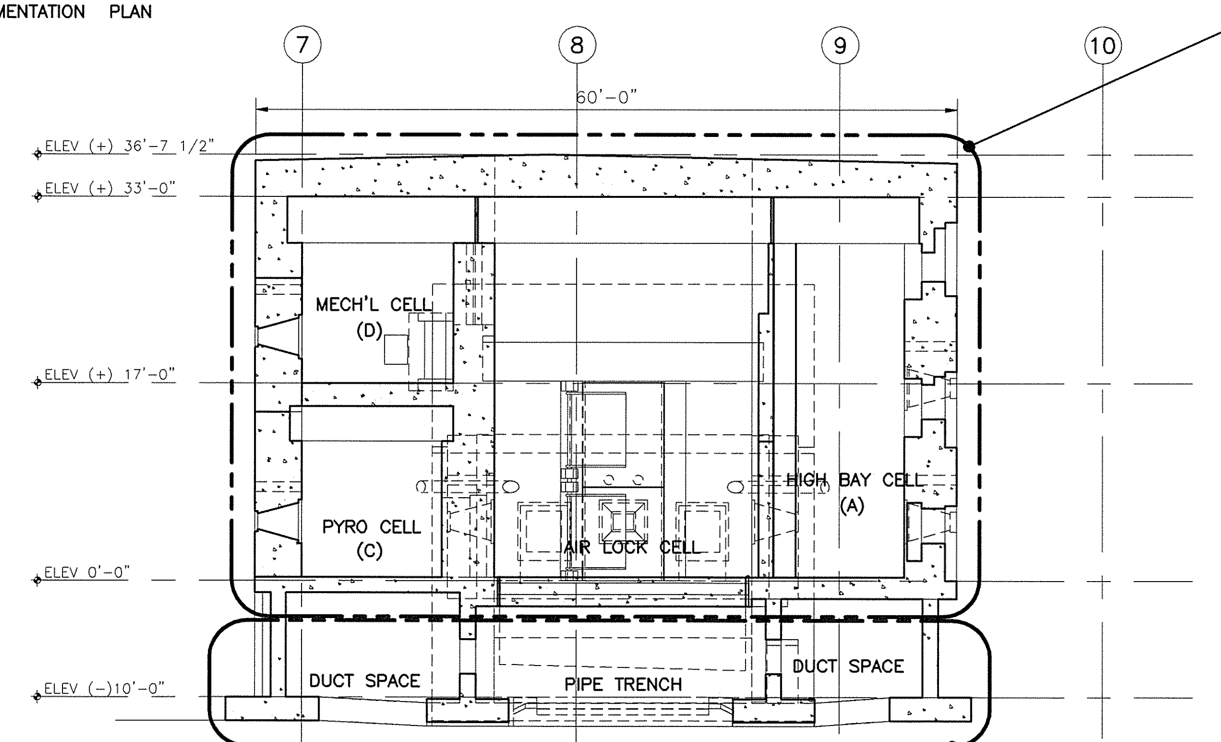
DRAWING NO.	REV. NO.
G8	A



SECTION 1 / G8
SCALE: 1/8"=1'-0"

HLV/LLV
EXCAVATE, CUT AND REMOVE
SEE DWG. NO. G17 FOR MONOLITH
SEGMENTATION PLAN

REC
CUT AND REMOVE
SEE DWG. NO. G16 FOR MONOLITH
SEGMENTATION PLAN



SECTION 2 / G8
SCALE: 1/8"=1'-0"

DEMOLISH IN PLACE

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
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BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
324 BUILDING AREA TO BE DEMOLISHED
SECTIONAL ELEVATIONS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	G8.DWG

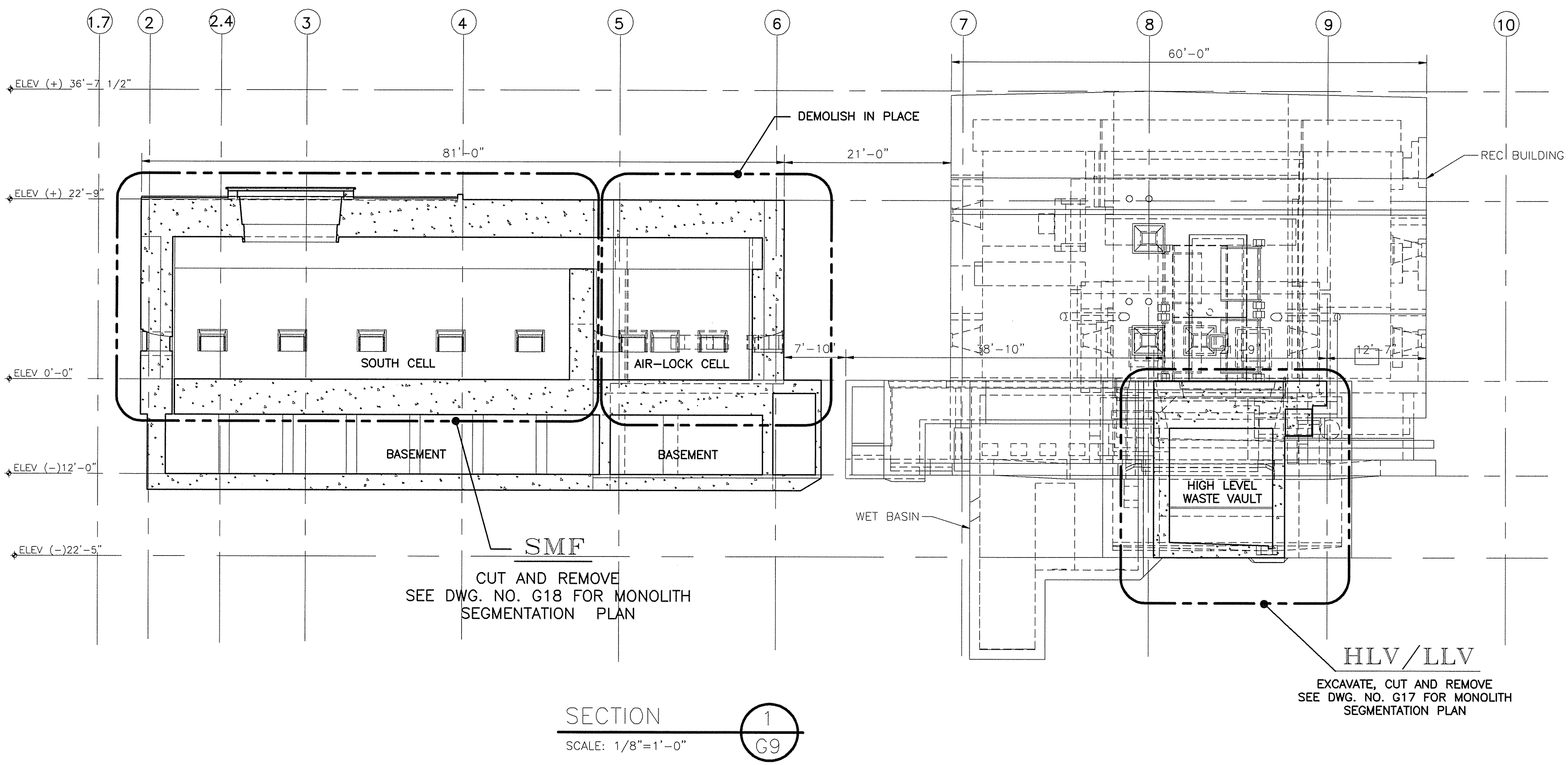
TASK	DRAWING NO.	REV. NO.
	G8	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
G8	A

NOTES



30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
324 EXISTING BUILDING AREA TO BE DEMOLISHED
SECTIONAL ELEVATION

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G9	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A

THESE NOTES APPLY TO STEEL WORK BY BIGGE AND ITS SUB-CONTRACTORS

APPLICABLE CODES AND STANDARDS

EXCEPT AS OTHERWISE SPECIFIED, ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF THE FOLLOWING CODES AND STANDARDS, TOGETHER WITH THE CURRENT SUPPLEMENTS AND ADDENDA PERTAINING THERETO:

- THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS," ANSI / AISC 360-05
- THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES", AISC 303-05
- THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A 325 OR A 490 BOLTS"
- THE AMERICAN WELDING SOCIETY, "STRUCTURAL WELDING CODE", AWS-D1.1-06

MATERIALS

ALL MATERIALS SHALL BE NEW AND CONFORM TO THE FOLLOWING SPECIFICATIONS UNLESS OTHERWISE NOTED:

PLATE	ASTM A36 ASTM A514 ASTM A572 GRADE 50 API-X70 API-X80
W-SHAPES	ASTM A992
HSS SHAPES	ASTM A500 GRADE B
ANGLE AND CHANNEL	ASTM A36 ASTM A572 GRADE 50
PIPE	ASTM A53 GRADE B ANSI/API SPEC. 5L-07 X52 PSL 1 ANSI/API SPEC. 5L-07 X70 PSL 1 ANSI/API SPEC. 5L-07 X80 PSL 2
CAST STEEL	ASTM A148/A 105-85 ASTM A148/A 110-90
ROUND BAR	AISI 1018 AISI 4130 AISI 4140 AISI 4340
BOLTS	ASTM A325 ASTM A490
CAP SCREWS	SAE J429
NUTS	ASTM A563 DH OR 2H
WELDING ELECTRODE	SEE WELD FILLER METAL TABLE

ALL STRUCTURAL STEEL, EXCEPT AS APPROVED IN WRITING BY THE ENGINEER OF RECORD, SHALL HAVE A MINIMUM CHARPY V NOTCH (CVN) IMPACT VALUE OF 30 FT-LBS AT -30 DEGREES FAHRENHEIT. CVN VALUES SHALL BE PROVIDED IN MILL SOURCE MATERIAL TEST REPORTS OR INDEPENDENT ACCREDITED TESTING LAB CERTIFICATIONS.

WELD ELECTRODE, WELD WIRE, AND WELD FLUX COMBINATIONS FOR PREQUALIFIED WELD PROCEDURE SPECIFICATIONS (WPS) SHALL MEET THE REQUIREMENTS OF AWS D1.1, TABLE 3.1. FOR WPS QUALIFIED BY TEST, WELD MATERIAL COMBINATIONS SHALL MEET OR EXCEED THE PHYSICAL CHARACTERISTICS OF THE LOWEST STRENGTH BASE METAL. FOR ALL WELDS, WELD MATERIAL COMBINATIONS SHALL MEET OR EXCEED THE CHARPY V NOTCH (CVN) IMPACT VALUES OF THE BASE METALS, AS EVIDENCED BY TESTING IN ACCORDANCE WITH AWS D1.1, SECTION 4, PART D.

MATERIAL CERTIFICATION AND TRACEABILITY

THE CONTRACTOR SHALL MAINTAIN INDEPENDENT MATERIAL TRACEABILITY FOR ALL STRUCTURAL STEEL AND FASTENERS, FROM PRIME MILL SOURCE THROUGH ALL MANUFACTURING PROCESSES, INCLUDING EACH FINISHING STEP, TO DELIVERY AND ACCEPTANCE.

IN ADDITION, THE CONTRACTOR SHALL FURNISH THE FOLLOWING DOCUMENTS FOR ALL STRUCTURAL MATERIALS, IN ENGLISH, TO BIGGE:

- A REPRODUCIBLE COPY OF ORIGINAL MILL TEST REPORTS, AND CERTIFICATES OF SUPPLEMENTARY PROCESSES AND TESTS
- COPIES OF PURCHASE ORDERS AND SHIPPING DOCUMENTS TO ESTABLISH TRACEABILITY OF MATERIALS (PRICING INFORMATION CAN BE OMITTED)

QUALITY CONTROL

THE SUB-CONTRACTOR SHALL HAVE A WRITTEN QUALITY CONTROL PROGRAM, APPROVED BY BIGGE, UNDER WHICH ALL WORK SHALL BE PERFORMED.

ANY DEFECTS DISCOVERED IN THE RAW STRUCTURAL MATERIALS DURING FABRICATION SHALL BE IMMEDIATELY REPORTED TO BIGGE AND THE PRODUCING MILL SHALL BE CONTACTED FOR REPLACEMENT. SHOULD TIME NOT PERMIT REPLACEMENT, THE CONTRACTOR SHALL SUBMIT A WRITTEN REPAIR PROCEDURE TO BIGGE FOR APPROVAL. FABRICATION UTILIZING THE AFFECTED MATERIAL SHALL NOT PROCEED UNTIL WRITTEN APPROVAL OF THE REPAIR PROCEDURE HAS BEEN RECEIVED FROM BIGGE.

MATERIALS, PROCEDURES, OR WORKMANSHIP NOT CONFORMING TO THE PROVISIONS OF THE DRAWINGS OR THESE NOTES MAY BE CONSIDERED DEFECTIVE AND CAN BE REJECTED BY BIGGE AT ANY TIME DURING THE PROGRESS OF WORK. REJECTED MATERIAL AND WORKMANSHIP SHALL BE REPAIRED OR REPLACED IN A MANNER APPROVED BY BIGGE. THE COST OF THIS WORK, INCLUDING RETESTING AND INSPECTION, SHALL BE THE CONTRACTORS RESPONSIBILITY, AND NO EXTENSION OF TIME SHALL BE GRANTED BECAUSE OF SUCH WORK.

WELDING

ALL WORK SHALL BE PERFORMED IN A MANNER CONSISTENT WITH THE MANUFACTURE OF HIGH GRADE MACHINERY.

EVERY WELD SHALL BE PERFORMED IN ACCORDANCE WITH A WRITTEN PROCEDURE THAT CONFORMS TO THE REQUIREMENTS OF AWS D1.1. THE CONTRACTOR SHALL SUPPLY COPIES OF ALL WELD PROCEDURES, AND THE TEST RESULTS OF WELD PROCEDURES QUALIFIED BY TESTING, TO BIGGE.

EXCEPT FOR PREQUALIFIED WELD PROCEDURE SPECIFICATIONS (WPS) IN CONFORMANCE WITH AWS D1.1, SECTION 3, A WPS FOR USE IN PRODUCTION WELDING SHALL BE QUALIFIED IN CONFORMANCE WITH THE REQUIREMENTS FOUND IN AWS D1.1, SECTION 4, PART A, B, AND D.

WELDERS AND WELDING OPERATORS SHALL HAVE CURRENT CERTIFICATIONS FOR THE MATERIALS, PROCESSES, AND PROCEDURES TO BE USED, IN ACCORDANCE WITH AWS D1.1, SECTION 4, PART C. A COPY OF EACH WELDER'S CERTIFICATION SHALL BE SUBMITTED TO BIGGE PRIOR TO THEIR PERFORMANCE OF ANY WORK. EACH INDIVIDUAL SHALL BE ASSIGNED A UNIQUE IDENTIFICATION MARKER, AND SHALL MARK EACH WELD THEY PERFORM. THE CONTRACTOR SHALL MAINTAIN A LIST OF IDENTIFICATION MARKERS AND PROVIDE A FINAL COPY TO BIGGE AT THE COMPLETION OF WORK.

THE SUB-CONTRACTOR SHALL CONSTRUCT A WELD MAP DOCUMENT TO IDENTIFY ALL WELDS ON EACH COMPONENT OF THE PROJECT. COPIES OF WELD MAPS SHALL BE SUPPLIED TO BIGGE AS EACH COMPONENT IS COMPLETED. THESE DOCUMENTS SHALL CONTAIN THE FOLLOWING INFORMATION AS A MINIMUM:

- IDENTIFICATION OF THE WELD PROCEDURE USED TO EXECUTE THE WELD
- CONFIRMATION THAT THE WELDED COMPONENTS WERE PROPERLY FIT UP AND POSITIONED FOR WELDING
- WELDER IDENTIFICATION AND DATE OF WELD PERFORMANCE
- CONFIRMATION THAT PREHEAT TEMPERATURE, INTERPASS TEMPERATURE, AND COOLING REQUIREMENTS IDENTIFIED IN THE WELD PROCEDURE HAVE BEEN COMPLIED WITH
- INSPECTOR IDENTIFICATION AND DATE OF EACH WELD ACCEPTANCE

BACKING BARS LEFT IN PLACE SHALL HAVE MILL SCALE COMPLETELY REMOVED IN THE ROOT WELD AREA PRIOR TO WELDING, AND SHALL HAVE COMPLETE FUSION WITH THE WELD JOINT.

PARTS TO BE JOINED BY FILLET WELDS SHALL BE BROUGHT INTO AS CLOSE CONTACT AS PRACTICABLE. WELD LEG LENGTHS SHALL BE INCREASED ACCORDINGLY IF GAPS EXCEED SPECIFIED CODE LIMITS.

WELD FILLER METAL TABLE

BASE METAL		CJP WELDS (Fu)	OTHER WELDS (Fu)
(Fy)	MIN (Fu)		
≤ 55 ksi	≤ 70 ksi	70 ksi	70 ksi
70 ksi	83 ksi	90 ksi	90 ksi
80 ksi	91 ksi	90 ksi	110 ksi
> 80 ksi	≤ 110 ksi	110 ksi	110 ksi

MIN Fu IS THE LOWER VALUE OF THE TENSILE RANGE

WELDING INSPECTION AND TESTING

THE MINIMUM EXTENT OF NONDESTRUCTIVE TESTING (NDT) PERFORMED BY THE SUB-CONTRACTOR SHALL BE AS INDICATED BELOW. ADDITIONAL TESTING REQUIREMENTS MAY BE INDICATED ON THE DRAWINGS. WELD ACCEPTANCE CRITERIA SHALL CONFORM WITH AWS D1.1. FOR INSPECTIONS LESS THAN 100%, THE MAJORITY OF INSPECTION SAMPLING SHALL BE IN AREAS MOST LIKELY TO DEVELOP CRACKS, SUCH AS WELD START AND STOP LOCATIONS, WELD BEGINNINGS AND ENDS, AND AT WELDS AROUND CORNERS.

ADDITIONAL NONDESTRUCTIVE TESTING:

ALL WELDS:	100% VISUALLY INSPECTED (VT)
FILLET AND PJP WELDS:	25% MAGNETIC PARTICLE TESTING (MT)
CJP WELDS:	100% ULTRASONIC TESTING (UT) 25% MT

REJECTION OF ANY PORTION OF WELD INSPECTED ON A LESS THAN 100% BASIS SHALL REQUIRE INSPECTION OF 100% OF THAT WELD.

WELD INSPECTORS SHALL BE CERTIFIED IN ACCORDANCE WITH THE CURRENT EDITION OF THE AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT) RECOMMENDED PRACTICE NO. SNT-TC-1A. INSPECTORS SHALL HAVE AN NDT LEVEL II CERTIFICATION, OR AN NDT LEVEL I CERTIFICATION AND WORK UNDER THE SUPERVISION OF AN NDT LEVEL II INSPECTOR.

WELD INSPECTORS SHALL COMPLETE DAILY LOGS OF THEIR INSPECTION ACTIVITIES, FILL OUT INSPECTION REPORTS CONSISTENT WITH THE INFORMATION REQUIRED IN AWS D1.1 CHAPTER 6, AND AS INSPECTIONS ARE PERFORMED RECORD THE INSPECTION STATUS OF EACH WELD ON THE WELD MAP DOCUMENTS AS DESCRIBED ABOVE.

THE SUB-CONTRACTOR SHALL DEVELOP A SYSTEM FOR THE CORRECTION OF NON-CONFORMING WELDS. THE SYSTEM SHALL IDENTIFY AND MARK THE PHYSICAL LOCATION OF THE NON-CONFORMING WELD, DIRECT APPROPRIATE CORRECTIVE ACTION CONSISTENT WITH THE REQUIREMENTS OF AWS D1.1, NOTIFY THE WELDER OR WELD OPERATOR WHO PERFORMED THE WELD OF THE NON-CONFORMITY, AND RE-TEST AND CERTIFY THE WELD TO BE ACCEPTABLE. COPIES OF DOCUMENTS CREATED IN SUPPORT OF THIS SYSTEM, INCLUDING NOTICE OF NON-CONFORMANCE, TESTING, AND RECERTIFICATION DOCUMENTS SHALL BE PROVIDED TO BIGGE.

FABRICATION AND MACHINING

THE SUB-CONTRACTOR SHALL HAVE A PROGRAM IN PLACE TO ENSURE AND VERIFY PROPER FABRICATION, ALIGNMENT, AND FIT-UP OF INDIVIDUAL COMPONENTS AND ASSEMBLIES. AS A MINIMUM, THE PROGRAM SHALL INCLUDE VERIFICATION OF COMPONENT AND ASSEMBLY DIMENSIONS, FRAME AND COMPONENT ALIGNMENT, PIN AND BORE FITS, AND BOLTED CONNECTIONS.

ALL WELDED FABRICATIONS SHALL BE MACHINED AFTER WELDING IS COMPLETED UNLESS OTHERWISE NOTED. MACHINED SURFACES SHALL HAVE A TYPICAL AVERAGE SURFACE ROUGHNESS VALUE (Ra) OF 125 MICRO-INCHES UNLESS OTHERWISE NOTED ON THE DRAWINGS.

ALL MACHINING DIMENSIONS SHALL BE INSPECTED USING TESTING DEVICES THAT HAVE A RESOLUTION GREATER THAN THAT CALLED FOR BY THE DRAWING DIMENSIONS AND TOLERANCES. THE TESTING DEVICES USED SHALL HAVE BEEN CALIBRATED TO A KNOWN STANDARD WITHIN ONE YEAR OF THE INSPECTION ACTIVITY. ANY DAMAGE OR ABUSE OF AN INSPECTION INSTRUMENT SHALL REQUIRE ITS IMMEDIATE INSPECTION, REPAIR IF NECESSARY, AND RECALIBRATION.

ALL INSPECTED DIMENSIONS AND TOLERANCES SHALL BE RECORDED IN THE FORM OF A REPORT, OR AS BUILT DRAWING, FOR FUTURE REFERENCE. THE RECORDED INFORMATION SHALL INCLUDE IDENTIFICATION OF THE PART BEING INSPECTED, THE DATE OF INSPECTION, THE NAME OF THE INSPECTOR, THE DRAWING DIMENSIONS BEING INSPECTED, THE ACTUAL INSPECTED DIMENSIONS, AND CONFIRMATION THAT THE ACTUAL INSPECTED DIMENSIONS ARE IN CONFORMANCE WITH SPECIFIED TOLERANCES FOR THOSE DIMENSIONS.

MODIFICATIONS AND SUBSTITUTIONS

ANY DEVIATION FROM THE APPROVED DRAWINGS OR THESE NOTES, INCLUDING MATERIAL OR PROCESS CHANGES, SHALL BE SUBMITTED, IN WRITING, TO BIGGE FOR APPROVAL. SUBMITTALS SHALL INCLUDE INFORMATION ON THE PROPOSED MATERIAL, PROCESS, OR REVISED DETAILS AS NECESSARY TO CLEARLY CONVEY THE INTENT OF THE CHANGE. WORK RELATED TO THE PROPOSED DEVIATION SHALL NOT PROCEED UNTIL WRITTEN APPROVAL FROM BIGGE HAS BEEN RECEIVED. APPROVED SUBSTITUTIONS AND MODIFICATIONS SHALL BE ACCOMPLISHED AT NO ADDITIONAL COST TO BIGGE.

CLEANING AND PAINTING

DIRT, OIL, GREASE, AND CHEMICAL CONTAMINATION SHALL BE REMOVED BY SOLVENT WASHING OR OTHER SUITABLE MEANS FROM ALL SURFACES BEFORE THEY ARE CLEANED IN PREPARATION FOR PAINTING.

BASE SYSTEM: ALL STEEL TO BE PAINTED SHALL BE BLAST CLEANED TO THE REQUIREMENTS OF SSPC-SP6, COMMERCIAL BLAST CLEANING. PAINTING SHALL CONSIST OF A FIRST COAT OF RUST INHIBITIVE ALKYD PRIMER AND A SECOND COAT OF ACRYLIC-MODIFIED ALKYD RESIN. BOTH COATS SHALL HAVE A 1.5 TO 2 MILS DRY FILM THICKNESS.

OPTIONAL SYSTEM: ALL STEEL TO BE PAINTED SHALL BE BLAST CLEANED TO THE REQUIREMENTS OF SSPC-SP-10, COMMERCIAL BLAST CLEANING. PAINTING SHALL CONSIST OF A FIRST COAT OF ORGANIC ZINC EPOXY AND A SECOND COAT OF URETHANE EPOXY. BOTH COATS SHALL HAVE A 2.5 TO 3 MIL DRY FILM THICKNESS.

UNLESS OTHERWISE NOTED, ALL EXTERIOR SURFACES AND INTERIOR SURFACES EXPOSED TO WEATHER SHALL BE BLAST CLEANED AND PAINTED WITH FIRST AND SECOND COATS OF THE CHOSEN PAINT SYSTEM. ALL INTERIOR SURFACES NOT EXPOSED TO WEATHER, INCLUDING THE ACCESSIBLE INTERIOR OF LARGE WELDMENTS, SHALL BE BLAST CLEANED AND PAINTED WITH THE FIRST COAT OF THE CHOSEN SYSTEM. PAINT SHALL BE EXCLUDED FROM PINS, PIN HOLES, BEARING SURFACES,FIELD WELD LOCATIONS AND FAYING SURFACES UNLESS OTHERWISE INDICATED ON THE DESIGN DRAWINGS. TOUCH UP SHALL BE PER SELECTED PAINT SYSTEM MANUFACTURER'S GUIDELINES.

THE FINISHED COAT SHALL BE INDUSTRIAL ENAMEL, COLOR PANTONE No. 281C BLUE AND SHALL HAVE A MINIMUM DRY MIL THICKNESS OF 2 MILS.

NOTES

For improved legibility this sheet has been replaced with the corresponding sheet from the 60% Design.

60% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
B	11/19/10							
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
FABRICATION GENERAL NOTES

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

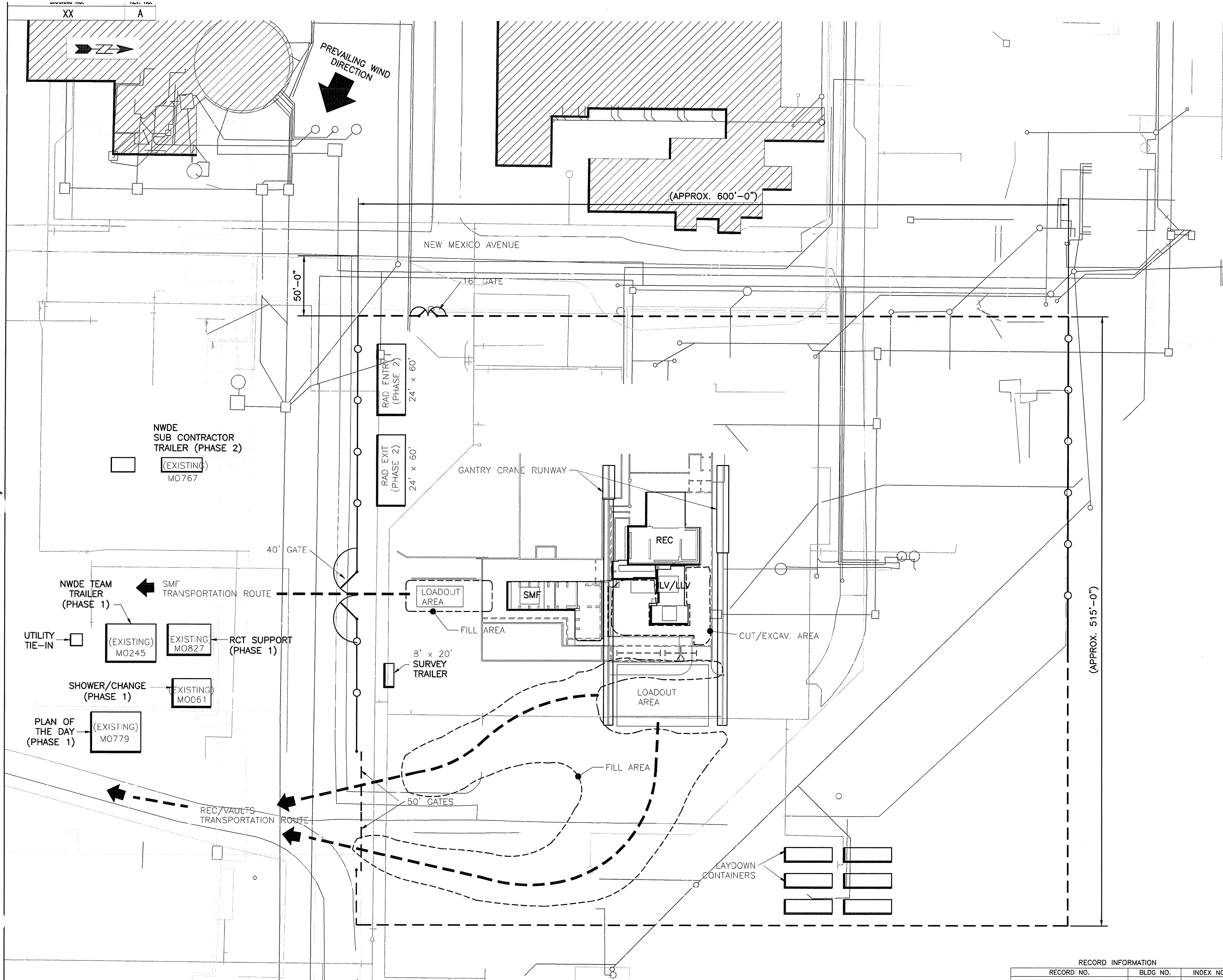
TASK	DRAWING NO.	REV. NO.
	GD1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

River Corridor Closure Contract
Dedicated to Safety and Excellence

G:\Engineering\Jobs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\Submittals\General Drawings\GD1.dwg



NOTES

— — — —	TEMP FENCE
—o——o—	EXISTING FENCE

UTILITIES LEGEND

- ELECTRICAL/COMUNICATIONS
- FUEL
- GAS/AIR
- PROCESS SEWER
- PROCESS WATER
- SANITARY WATER
- WATER
- STEAM
- STORM DRAIN SEWER
- UNKNOWN
- PROPOSED SIGN
- EXISTING SIGN
- PROPOSED AIR MONITOR
- PROPOSED UTILITY VAULT
- RAILROAD WARNING SIGNAL

NOTE:

EACH TRAILER TO HAVE MIN. 2 EXTERIOR DOORS

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
Bigge POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
FACILITY LAYOUT

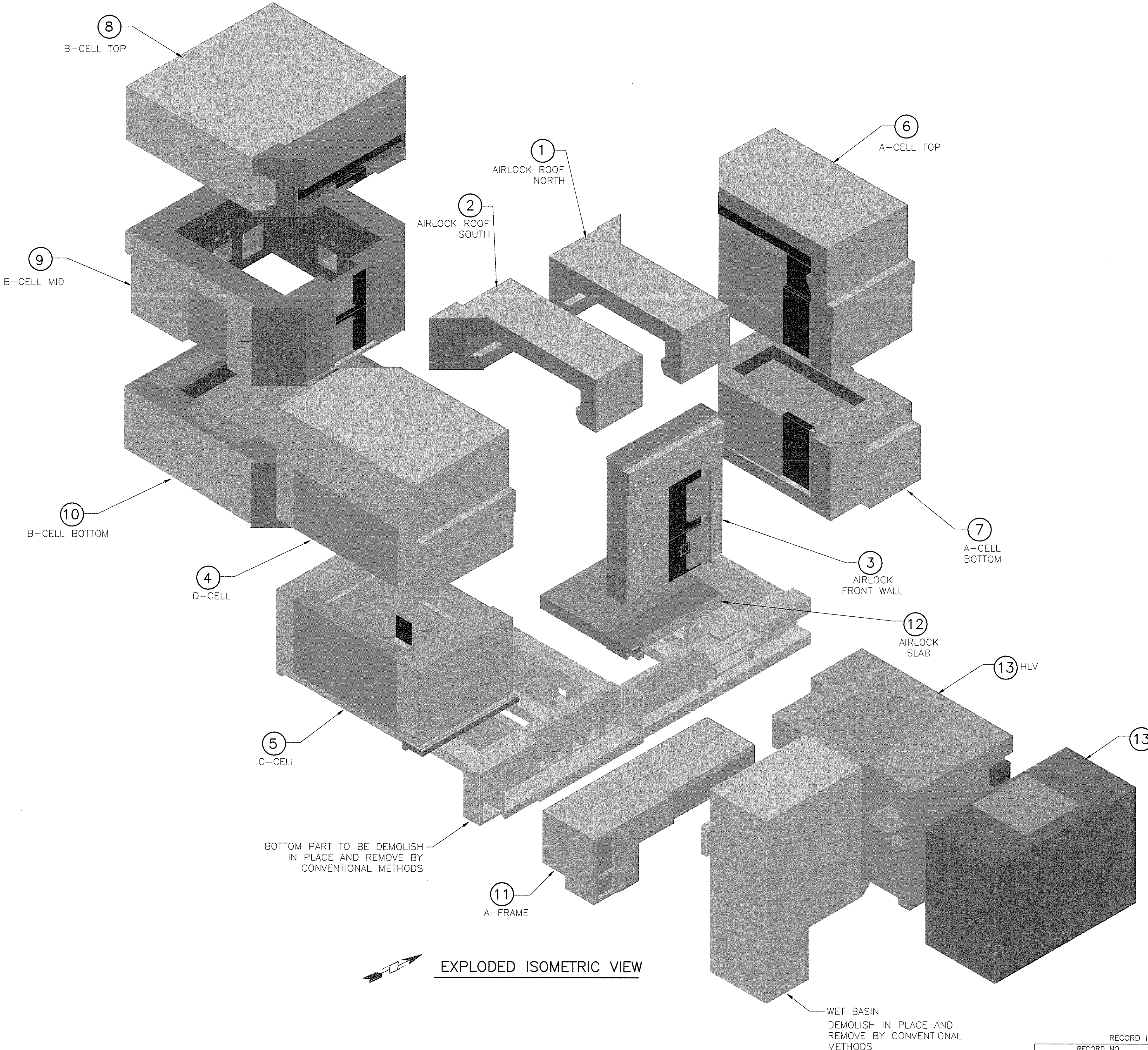
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G13	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



EXPLODED ISOMETRIC VIEW

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/HLV/LLV MONOLITH SEGMENTATION PLAN
EXPLODED ISOMETRIC VIEW

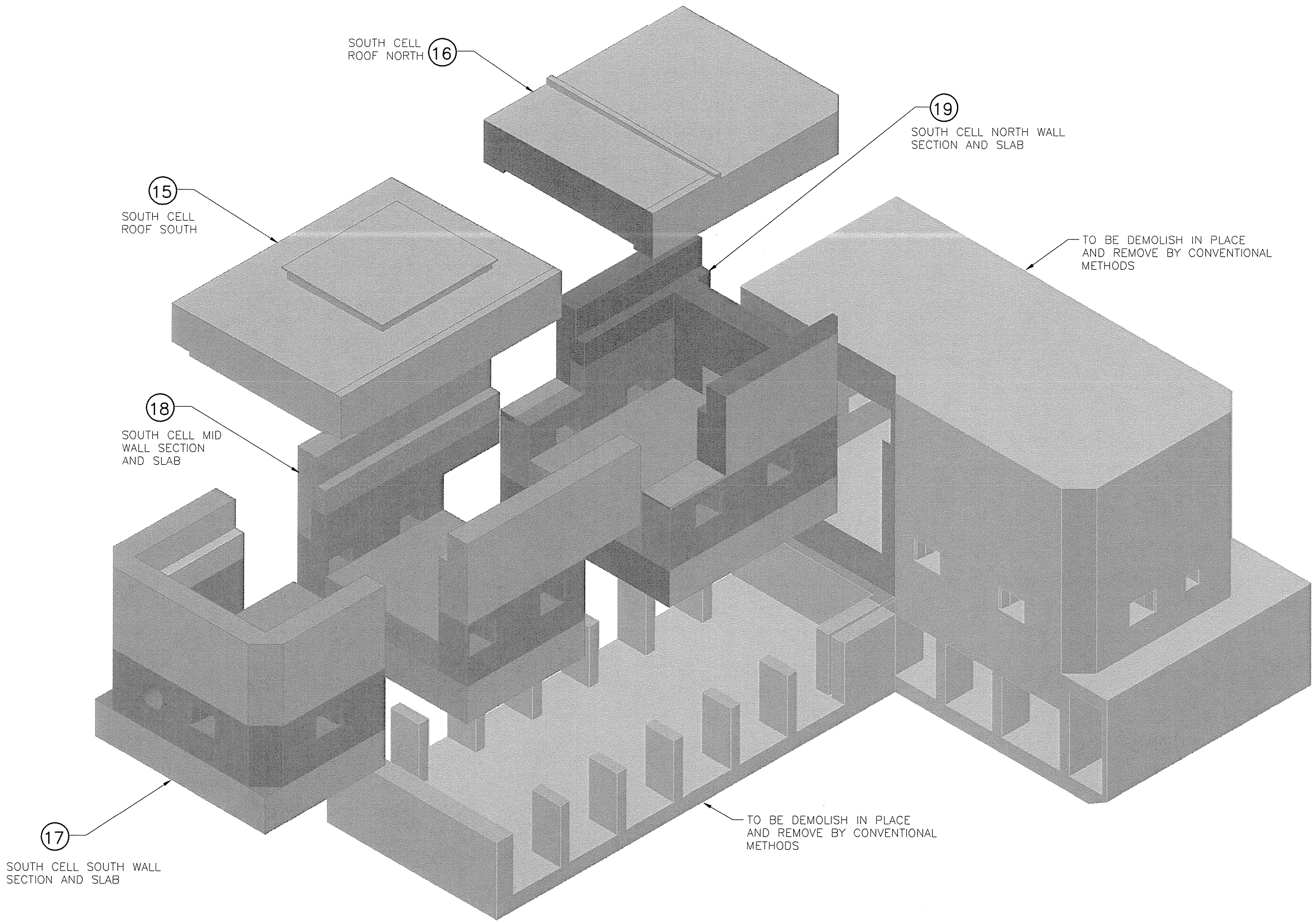
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G16	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



EXPLODED ISOMETRIC VIEW

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF MONOLITH SEGMENTATION PLAN
EXPLODED ISOMETRIC VIEW

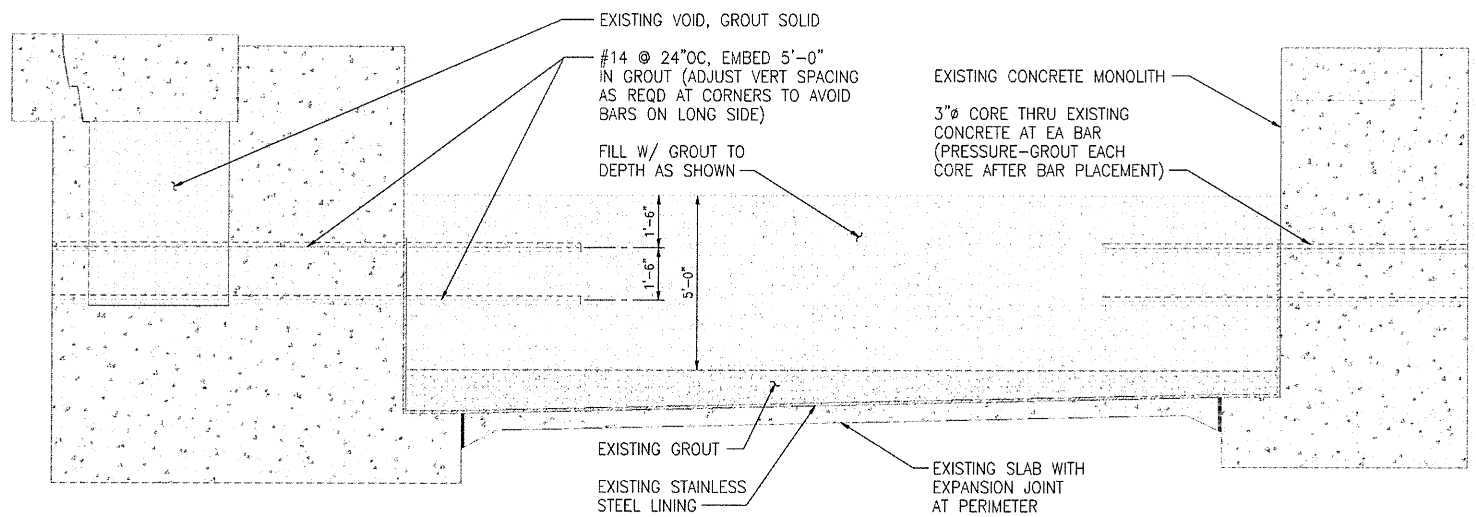
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G17	A

RECORD INFORMATION

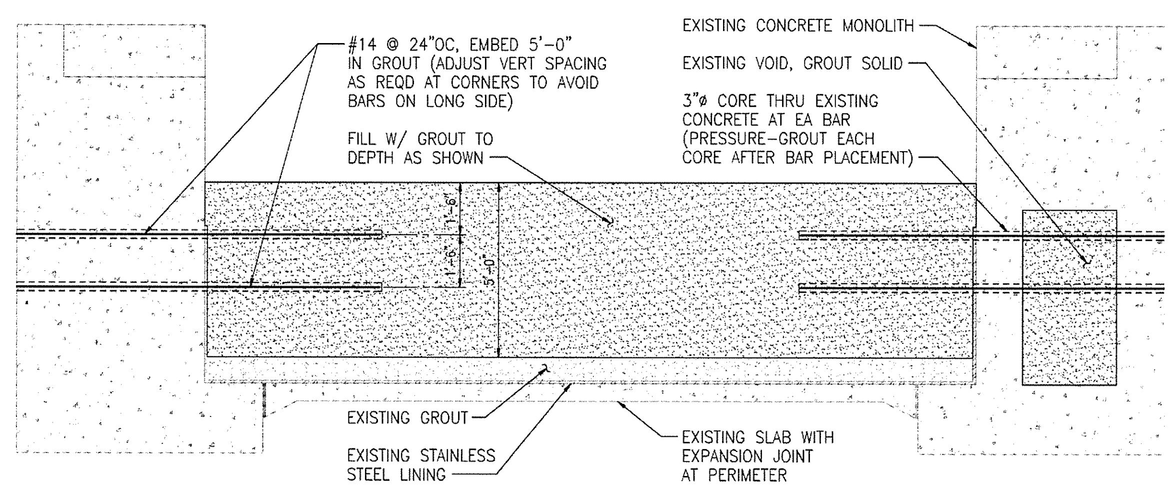
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
___-_-_____	A



1/G18 B CELL – MONOLITH 10 LONGITUDINAL SECTION

SCALE: 3/8"=1'-0"



2/G18 B CELL – MONOLITH 10 TRANSVERSE SECTION

SCALE: 3/8"=1'-0"

River Corridor Closure Contract
Dedicated WCH Excellence

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

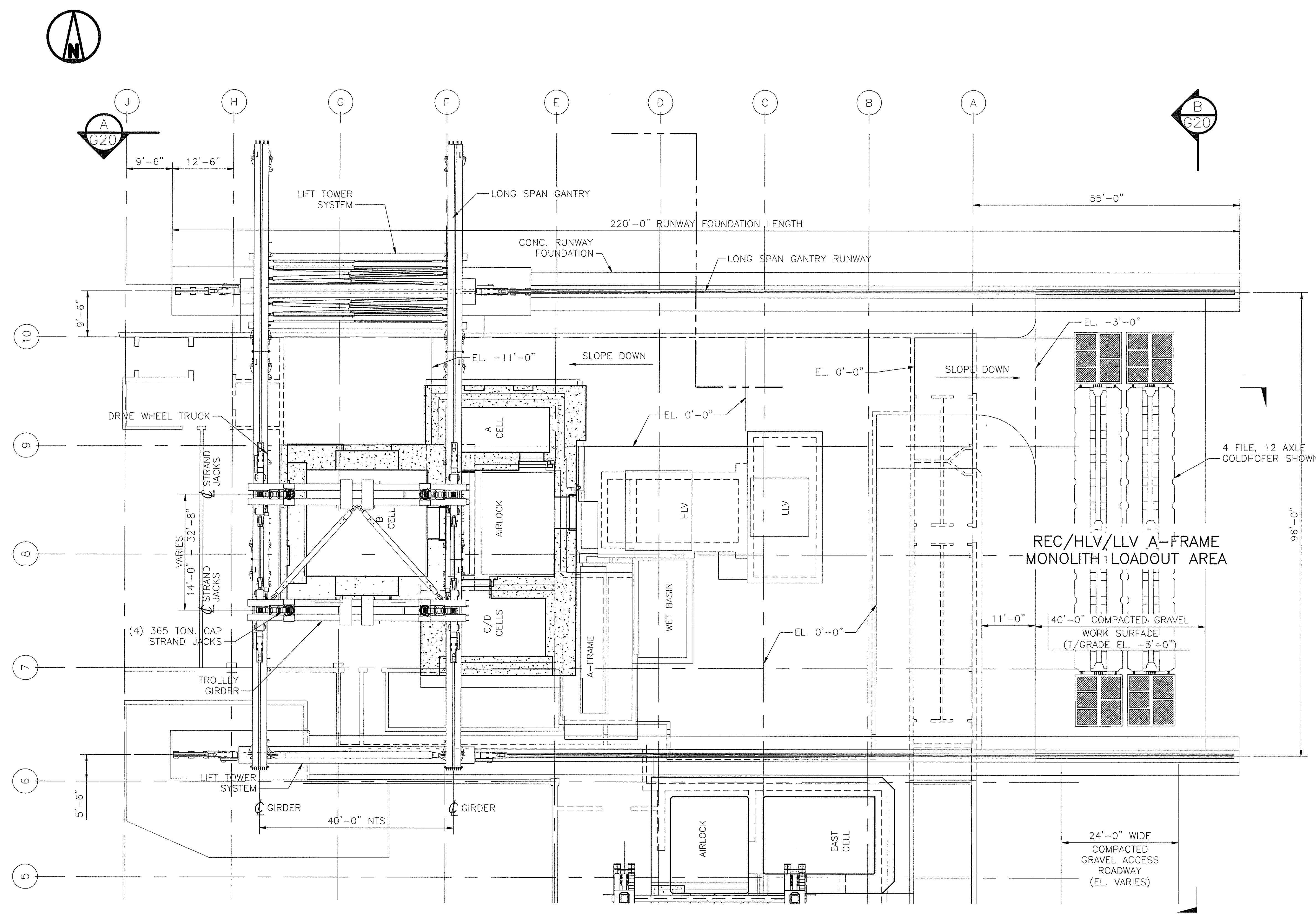
BLDG. 324 HOT CELLS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

TASK	DRAWING NO.	REV. NO.
–	G18	A

DRAWING NO.	REV. NO.
XX	A

NOTES



30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
REC WORK SITE PLAN WITH 24 GOLDHOFER LINES

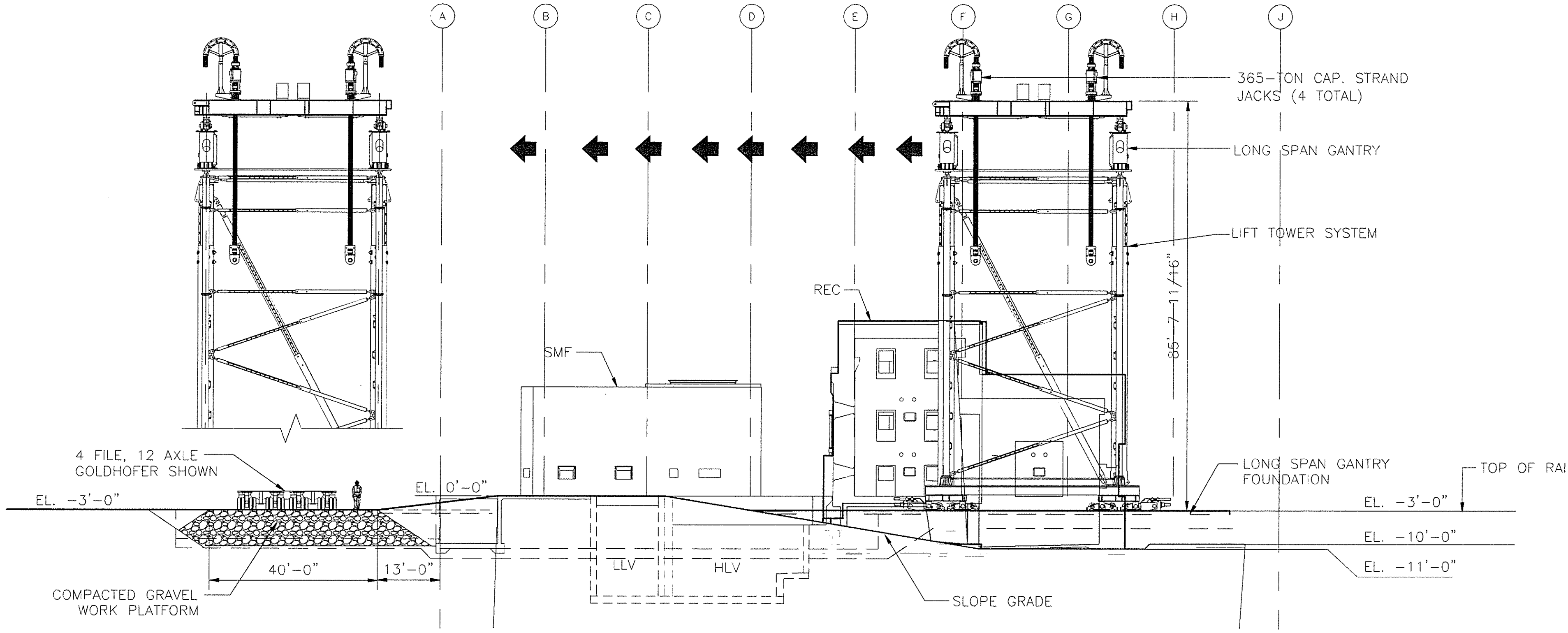
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G19	A

RECORD INFORMATION

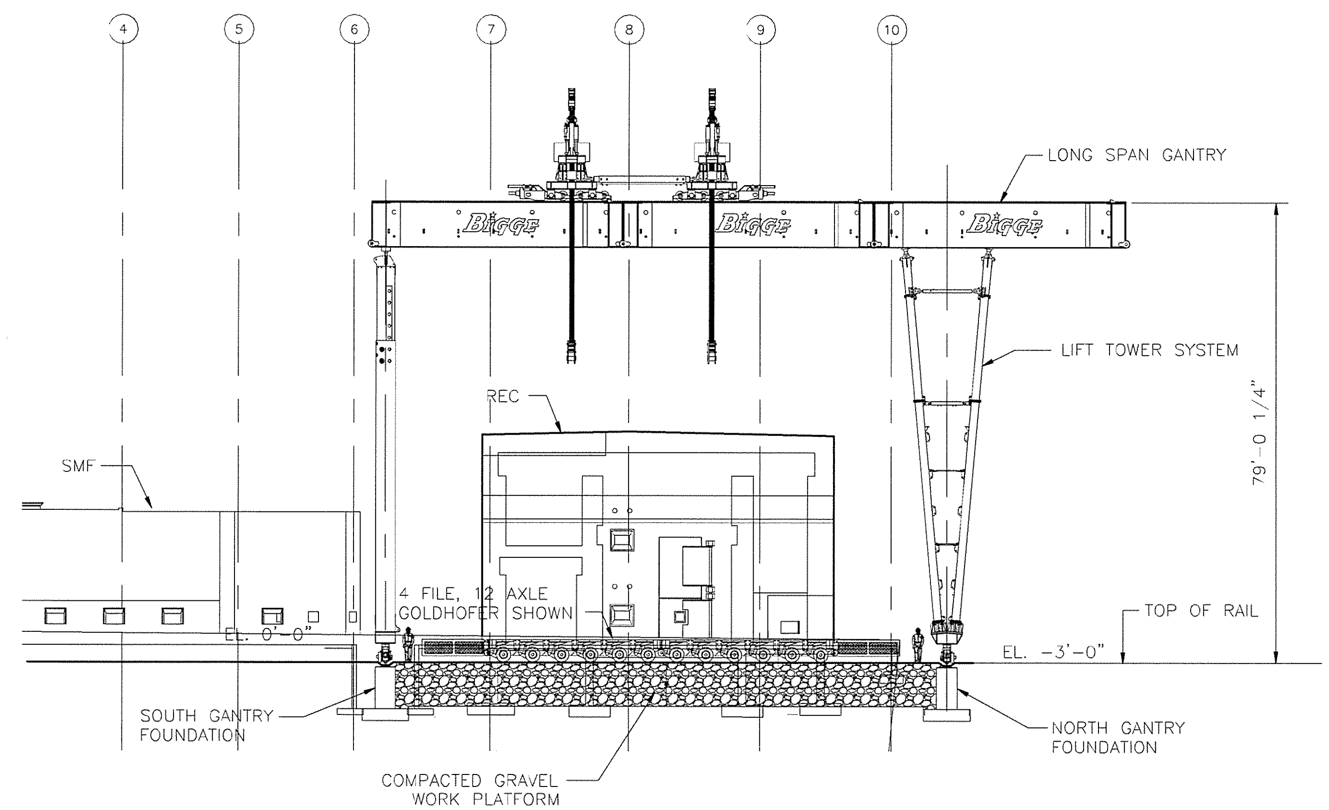
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



SECTIONAL ELEVATION A/G20

1/16" = 1'-0"



SECTIONAL ELEVATION B/G20

1/16" = 1'-0"

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	DRIG/ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	XX		SH	SH		

SCALE: AS SHOWN

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DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

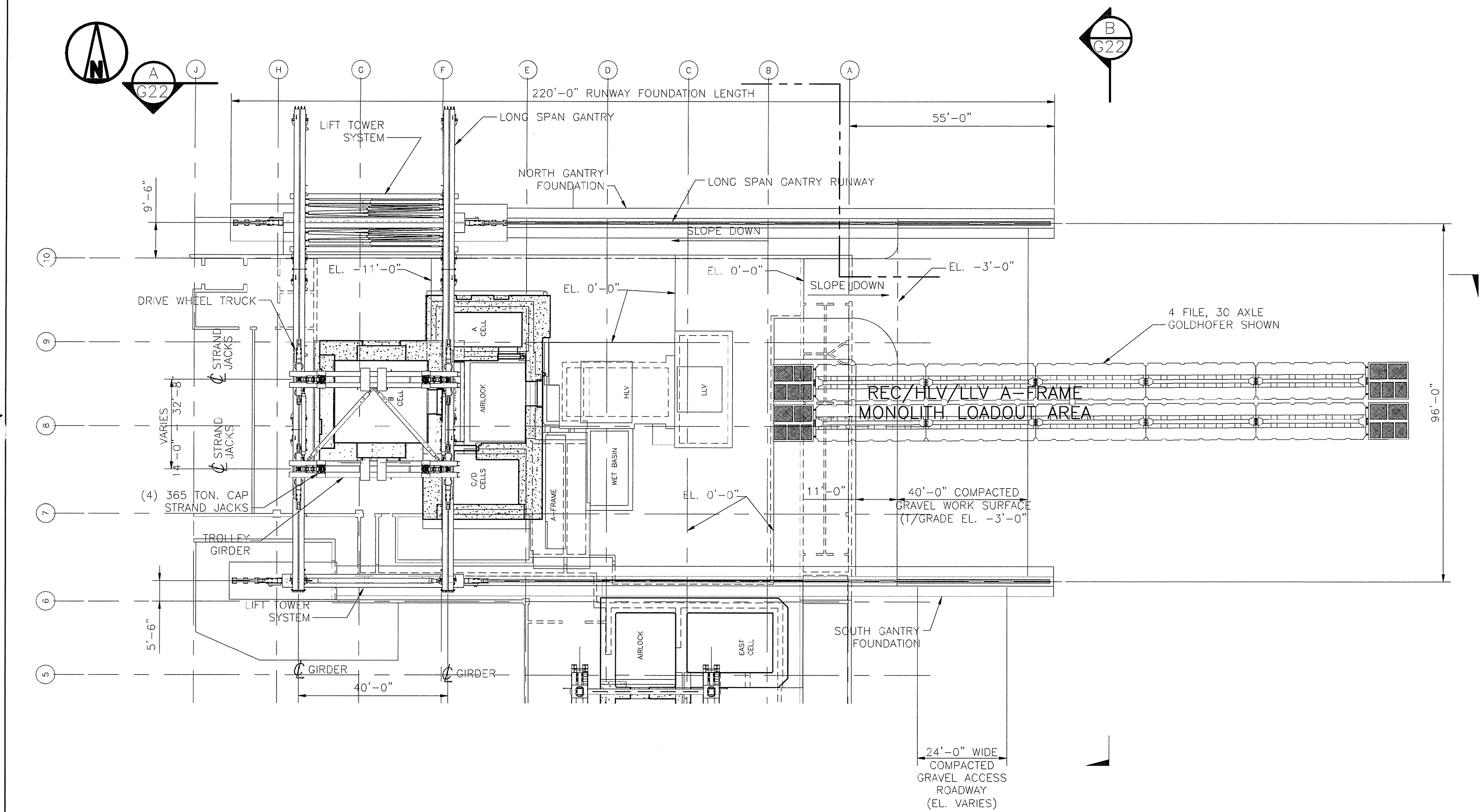
NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
REC WORK SITE SECTION WITH 24 GOLDHOFER LINES

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G20	A

DRAWING NO.	REV. NO.
XX	A



NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: 1/16"= 1'-0"

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
REC WORK SITE PLAN WITH 60 GOLDHOFER LINES

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

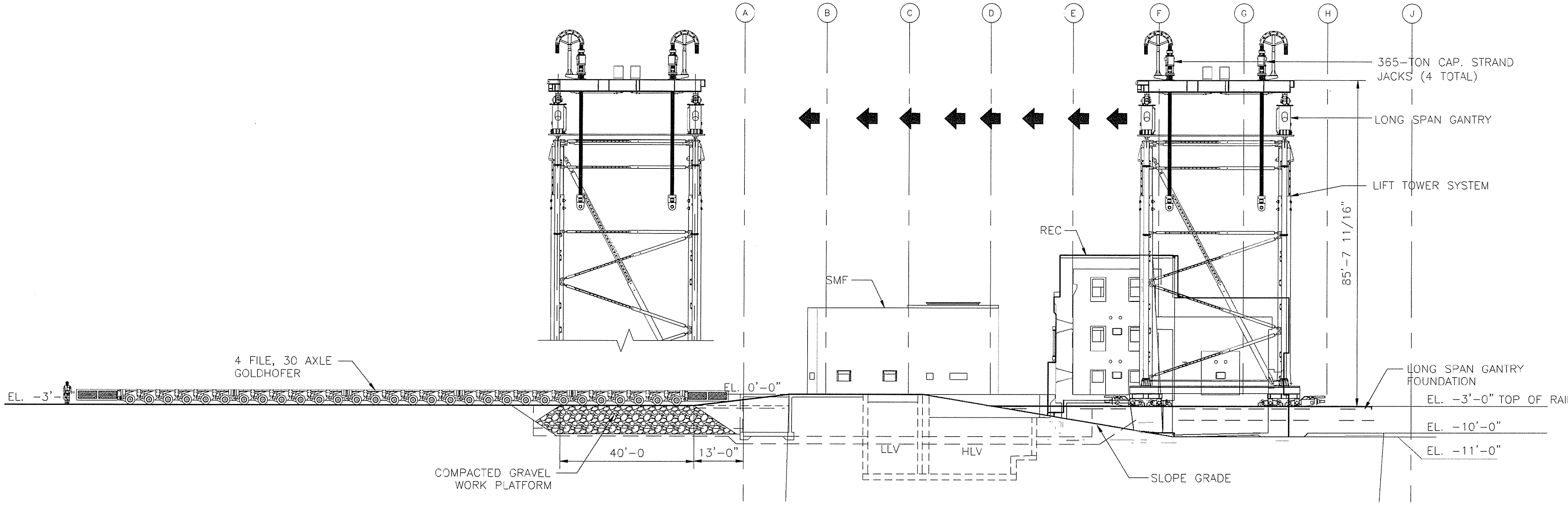
TASK	DRAWING NO.	REV. NO.
	G21	A

RECORD INFORMATION

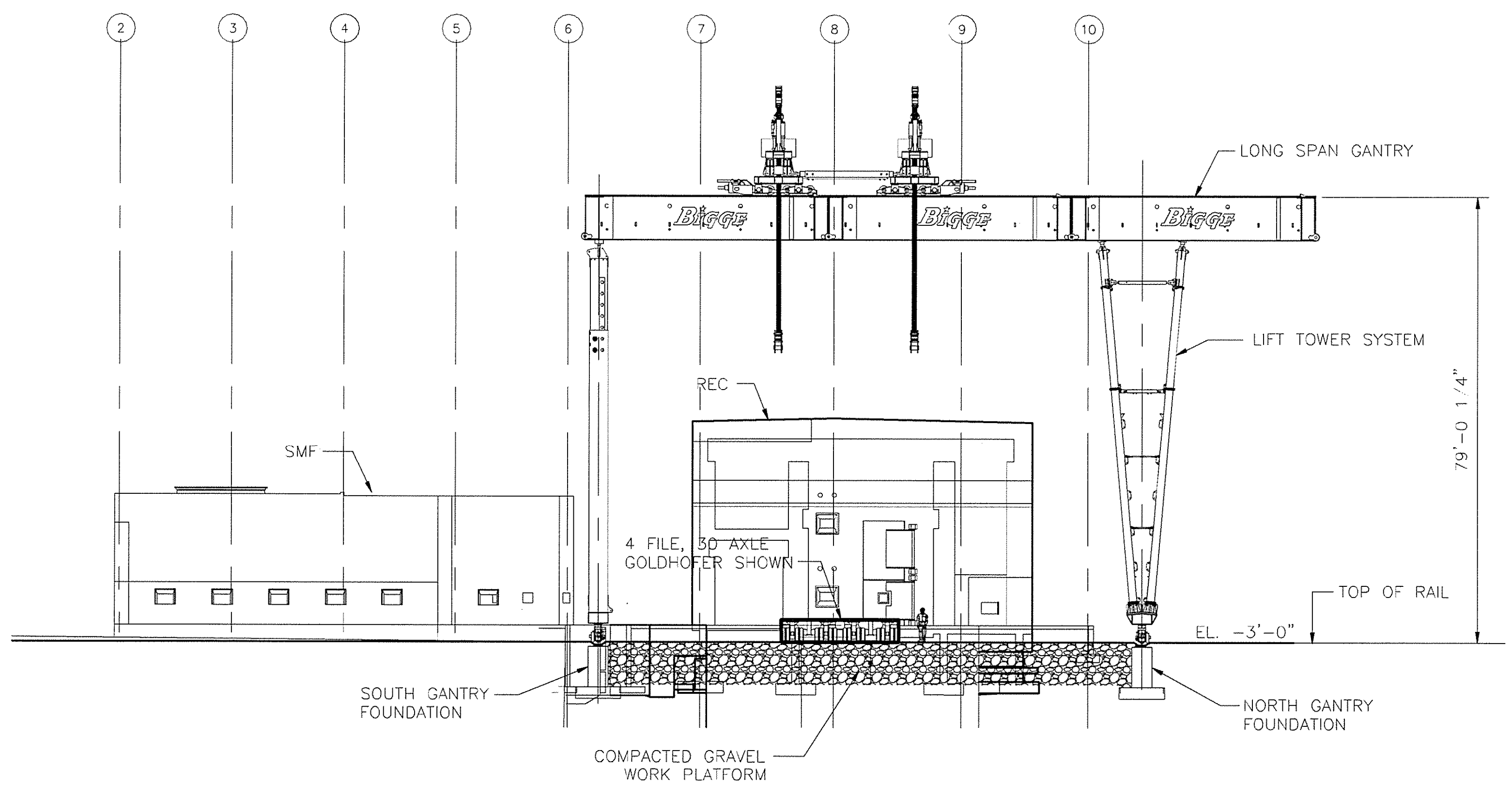
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A

NOTES



SECTIONAL ELEVATION A/G22
1/16" = 1'-0"



SECTIONAL ELEVATION B/G22
1/16" = 1'-0"

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	XX		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
REC WORK SITE SECTION WITH 60 GOLDHOFERS

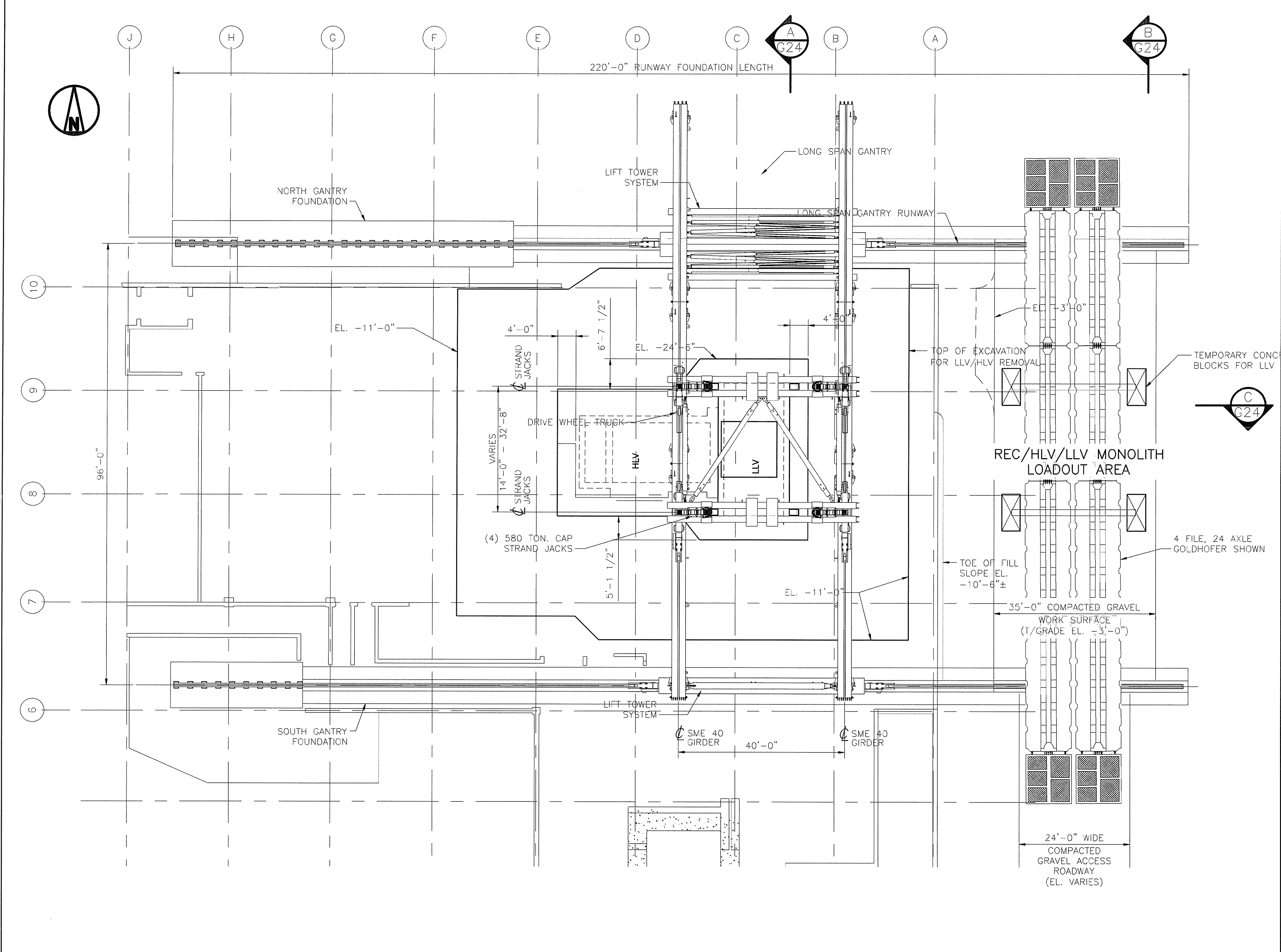
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G22	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: 3/32" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
HLV/LLV WORK SITE PLAN

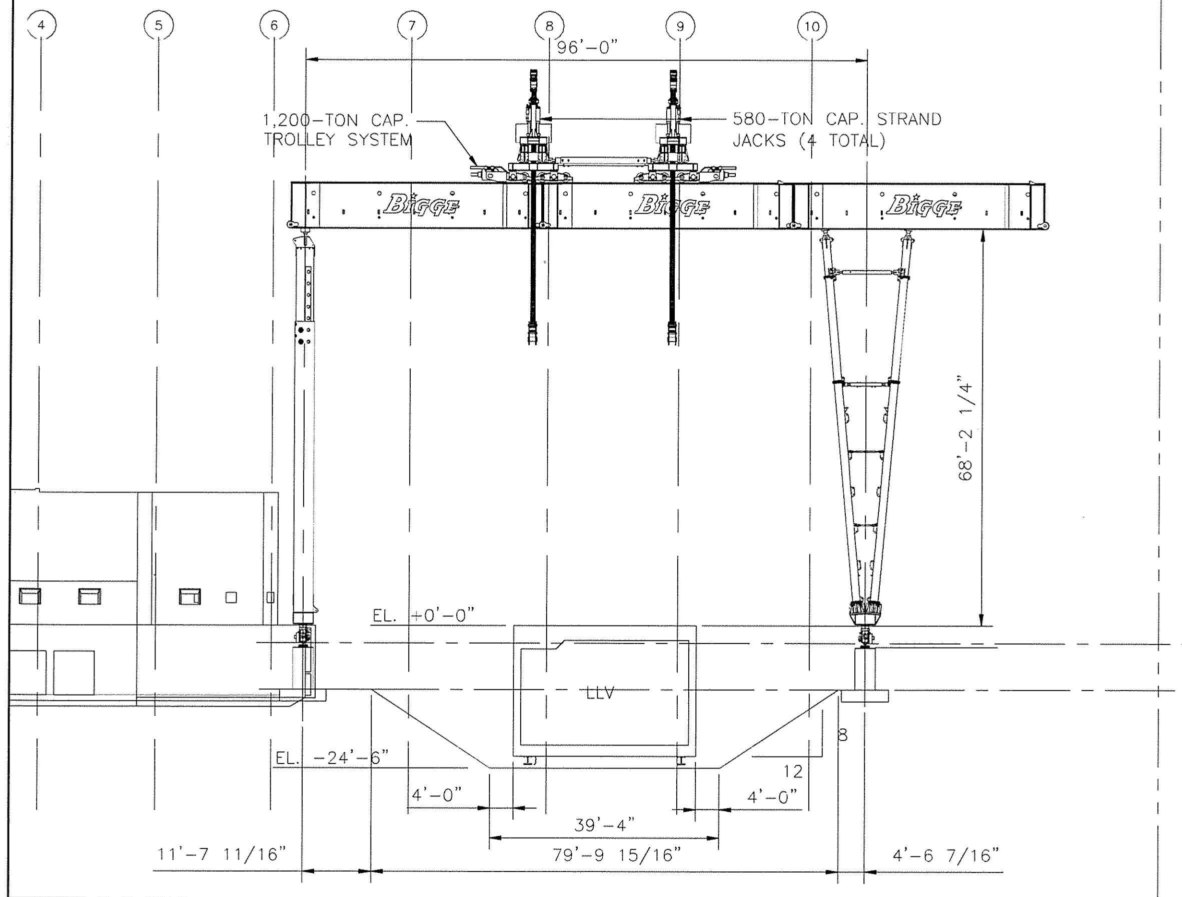
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G23	A

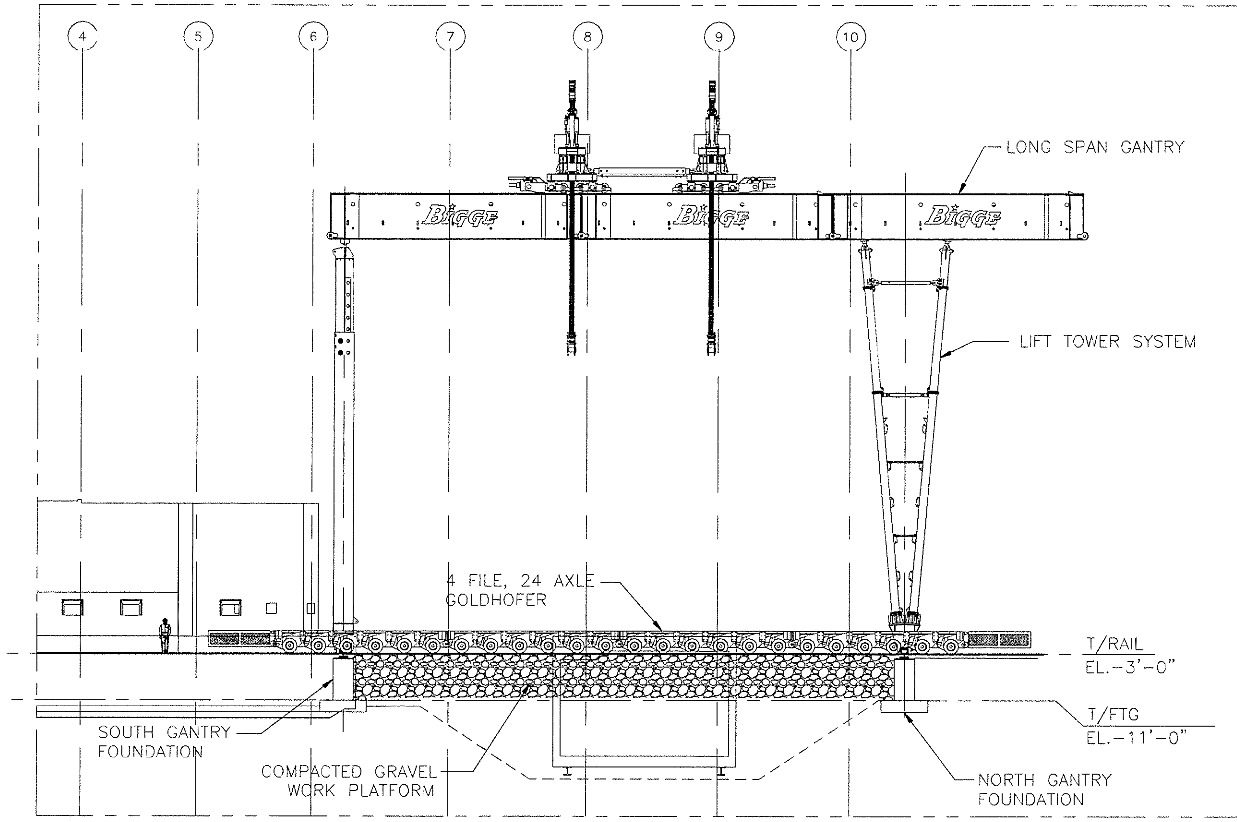
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

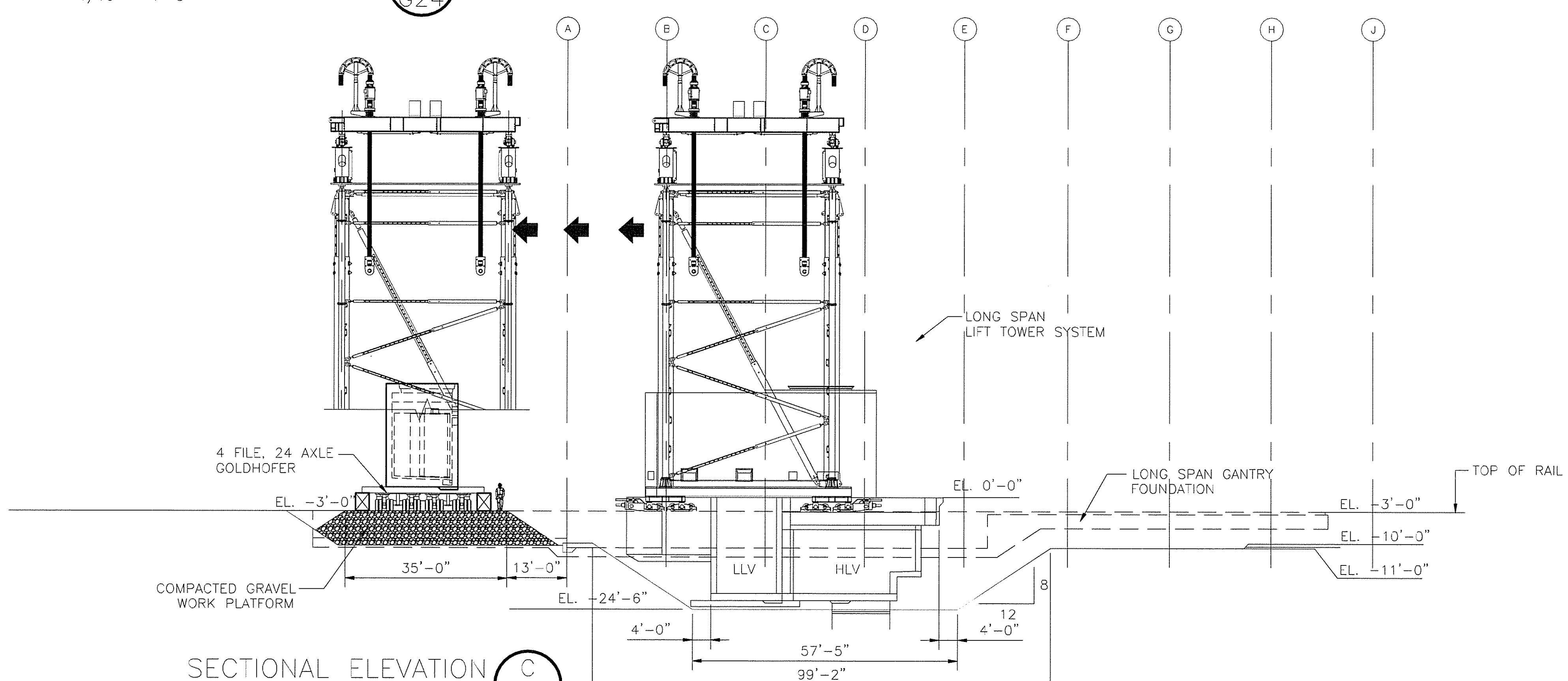
DRAWING NO.	REV. NO.
XX	A



SECTIONAL ELEVATION A / G24
1/16" = 1'-0"



SECTIONAL ELEVATION B / G24
1/16" = 1'-0"



SECTIONAL ELEVATION C / G24
1/16" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
HHV/LLV WORK SITE SECTION
SECTIONAL ELEVATIONS

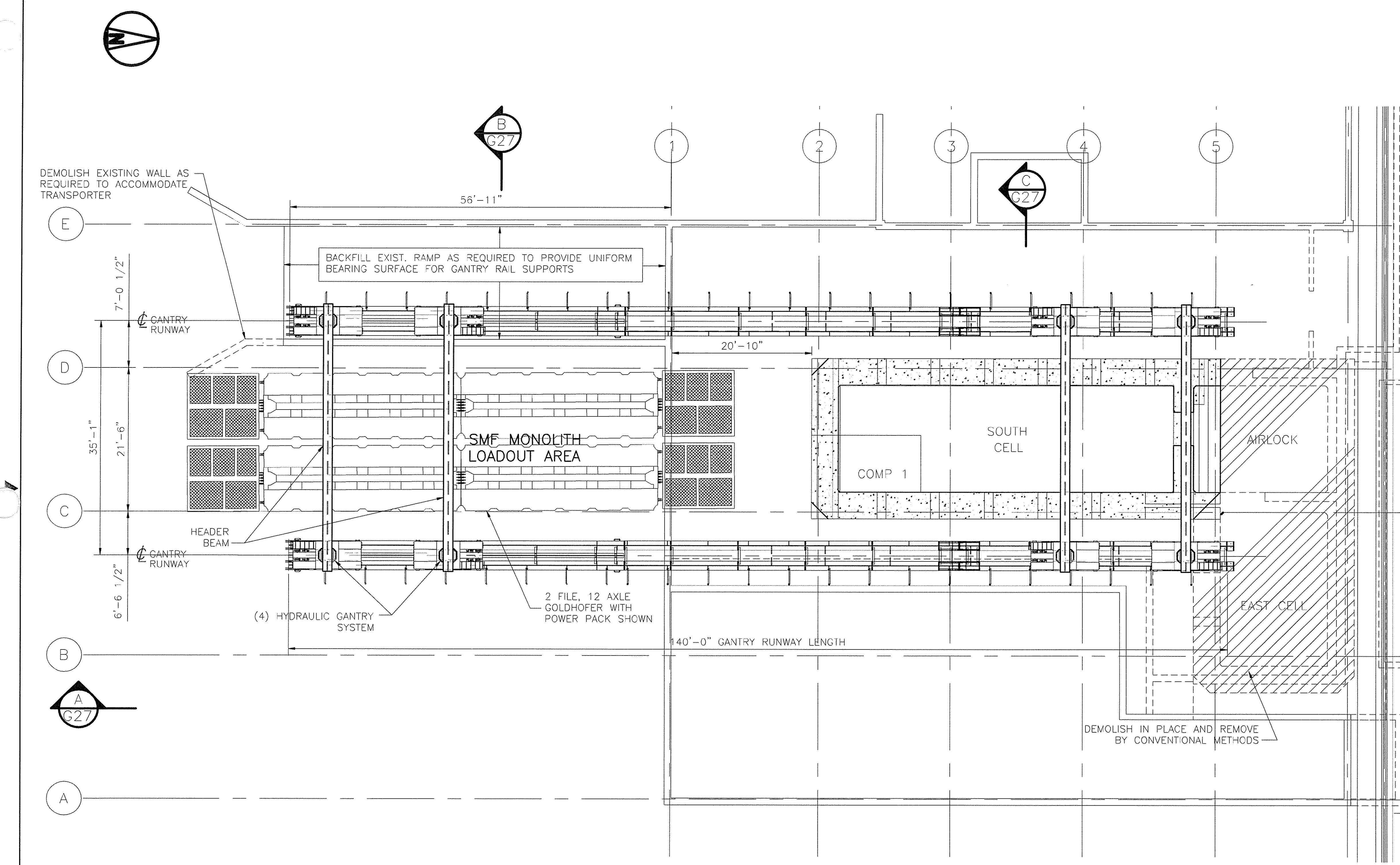
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G24	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
G24	A



NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
SMF BUILDING WORK SITE PLAN

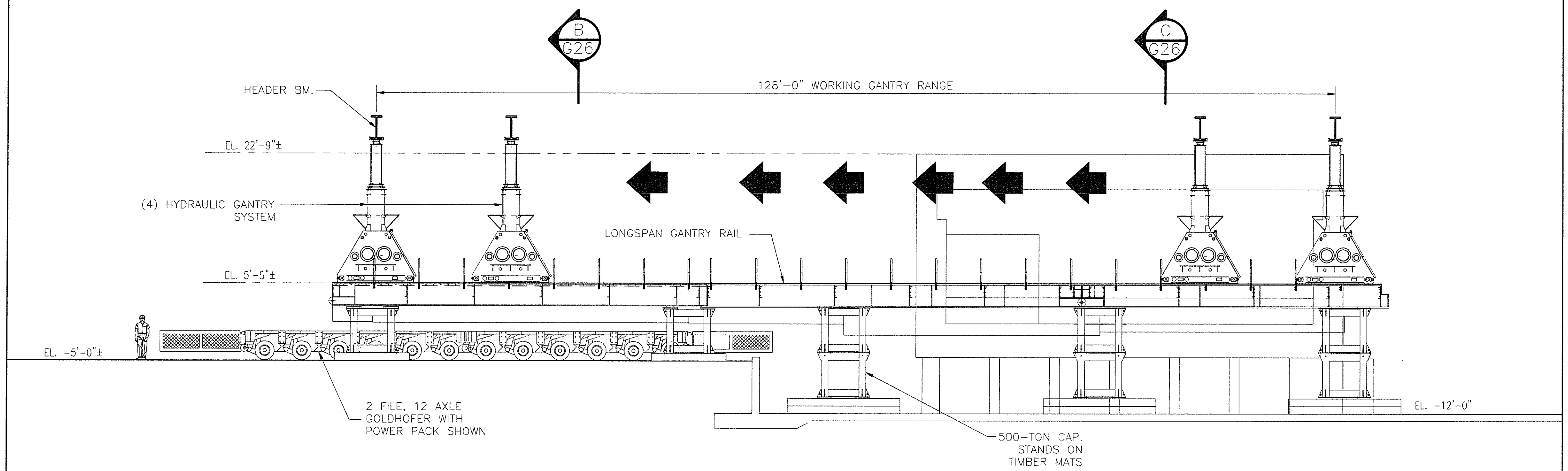
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G25	A

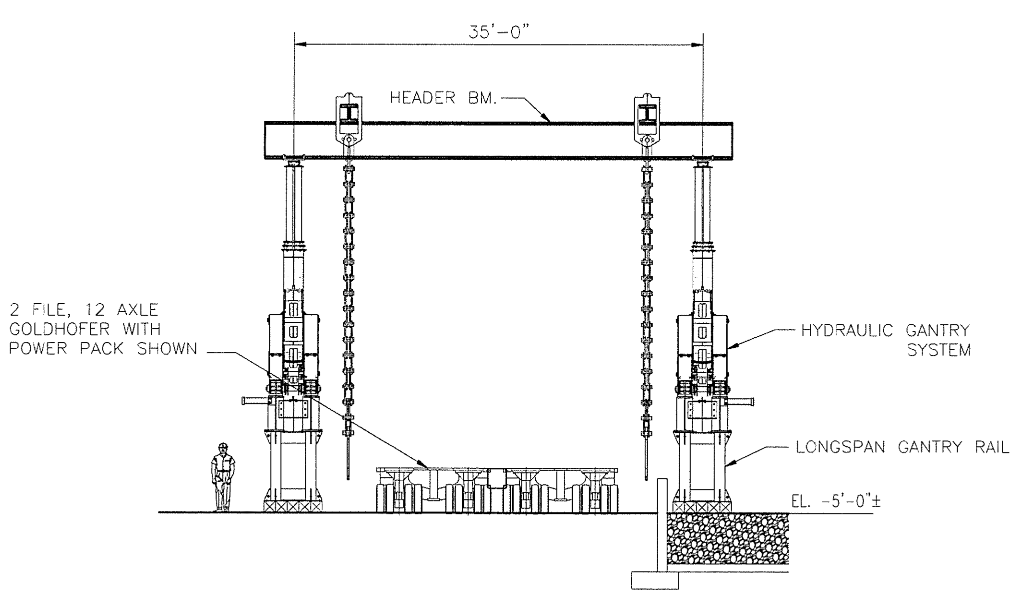
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

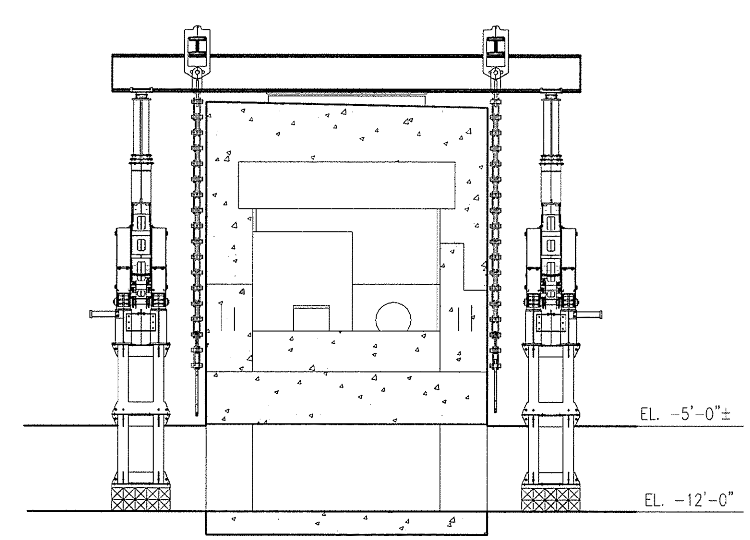
DRAWING NO.	REV. NO.
G24	A



SECTIONAL ELEVATION A/G26
1/8" = 1'-0"



SECTIONAL ELEVATION B/G26
1/8" = 1'-0"



SECTIONAL ELEVATION C/G26
1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	DRIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF WORK SITE SECTIONS
SECTIONAL ELEVATIONS

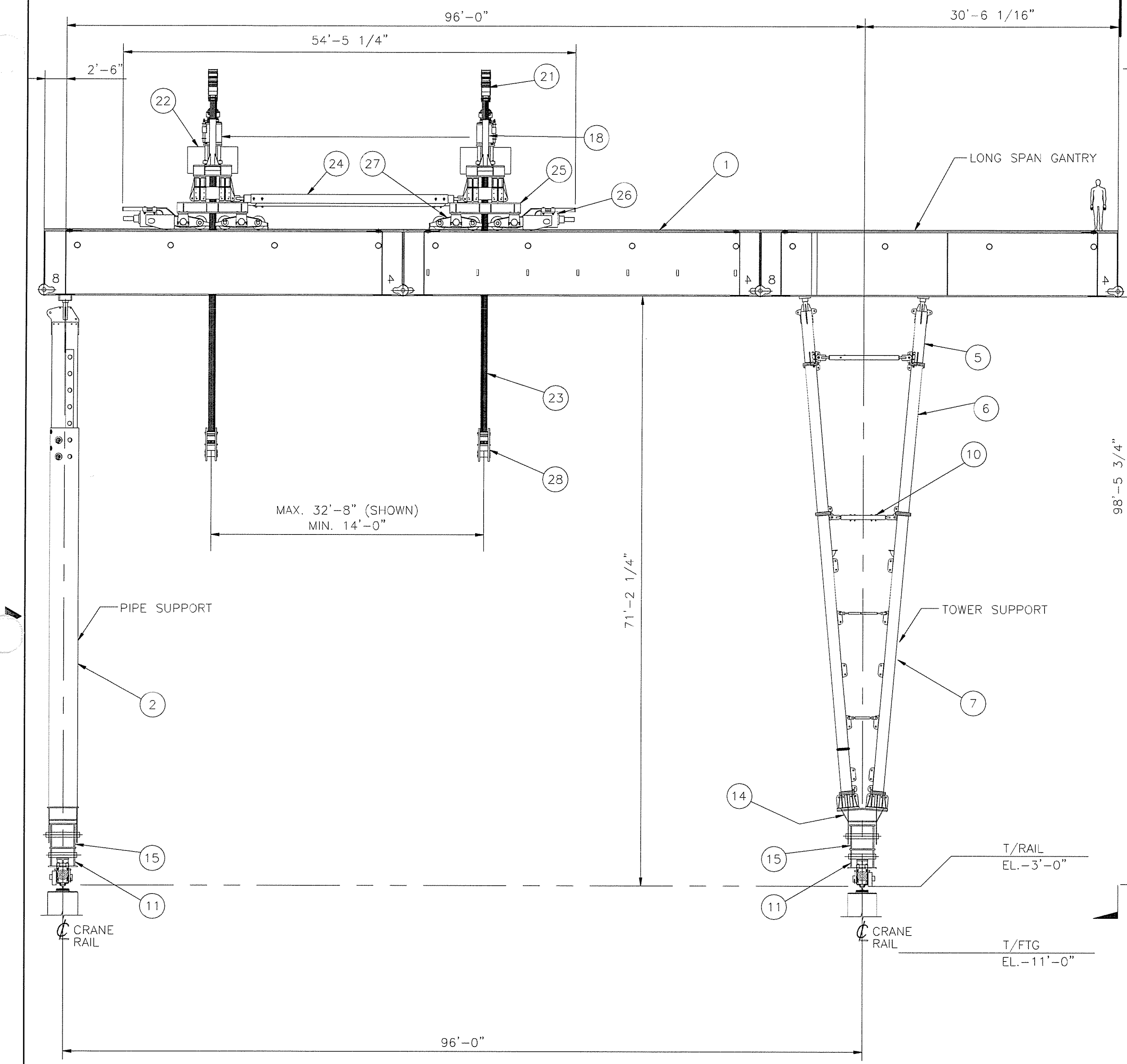
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G26	A

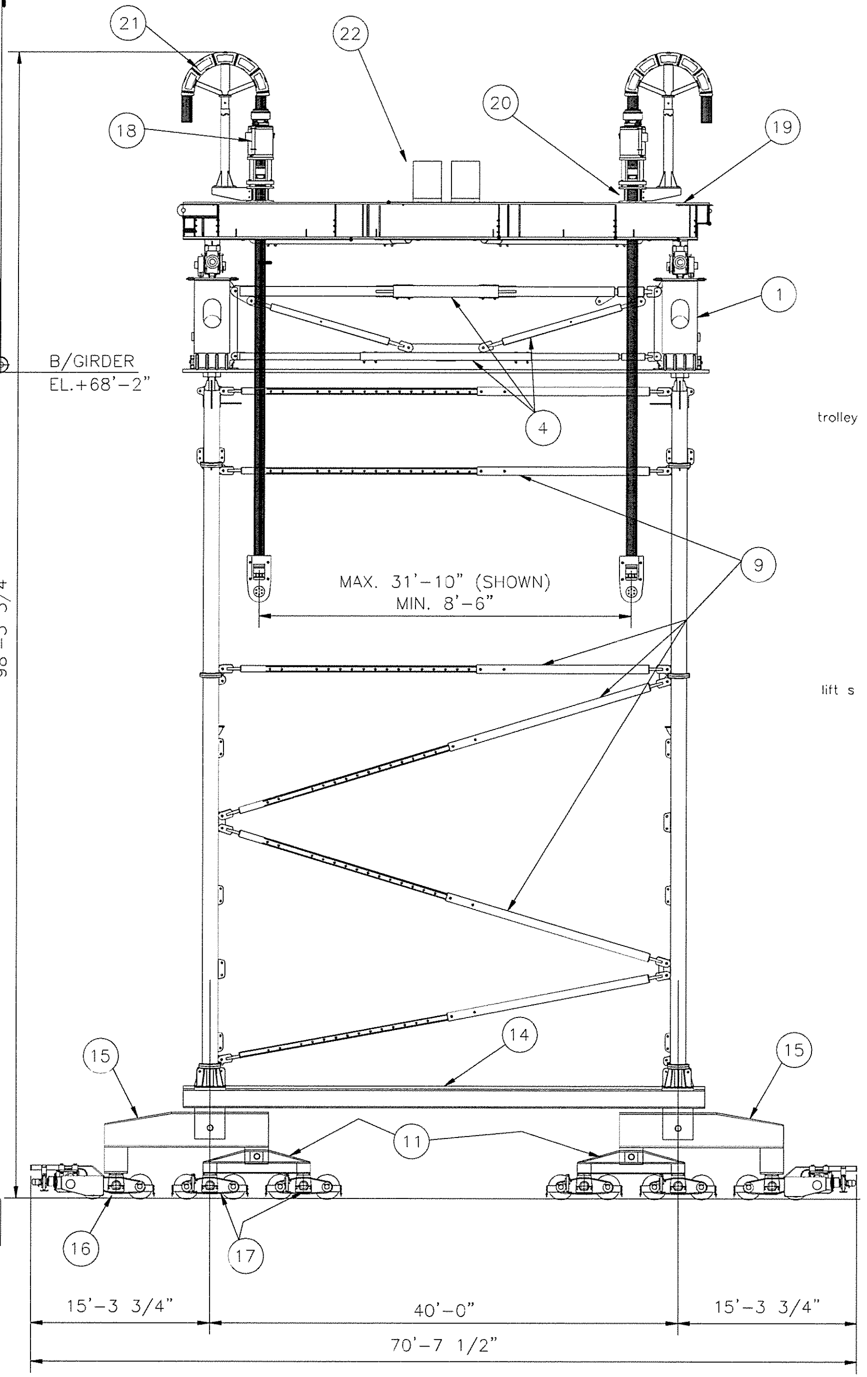
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
CR1	A



ELEVATION VIEW A/G27
SCALE: 1/8"=1'-0"



END VIEW B/G27
SCALE: 1/8"=1'-0"

NOTES

EQUIPMENT LIST

	MK.	QTY	DESCRIPTION / EQUIPMENT No.	WEIGHT EACH	TOTAL WEIGHT Lbs.
main m	1	6	SME GIRDER 40'	43,100	258,600
m	2	2	ADJUSTABLE TOWER TA402-1 & 2	23,150	46,300
m	3	1	ADJUSTABLE BRACE BA16-3-1	5,280	5,280
m	4	2	GIRDER BRACING FRAME	10,000	20,000
m	5	4	COLUMN TIP TS-COLTIP-8 (8'-0")	1,575	6,300
m	6	4	COLUMN BRACE LTS-3LBC (12'-0")	1,960	7,840
m	7	4	COLUMN LTS-COL-38 (38'-0")	5,295	21,180
m	8	10	ADJUSTABLE BRACE BA12	2,000	20,000
m	9	8	ADJUSTABLE BRACE BA8	1,380	11,040
m	10	8	COLUMN BASE LTS-BASE	1,750	14,000
m	11	4	SUB EQUALIZER	5,000	20,000
m	12	1	TA 402 CROSS BEAM BA18	4,000	4,000
m	13	1	V SILL BEAM	19,000	19,000
m	14	1	SILL BEAM	18,000	18,000
m	15	4	EQUALIZER	10,000	40,000
m	16	6	18" DRIVE TRUCK ASSEMBLY GWD	5,030	30,180
m	17	6	18" IDLER TRUCK ASSEMBLY GWI	2,850	17,100
trolley t	18	4	365 T STRAND JACK	6,400	25,600
t	19	2	HEADER BEAM HGR5	20,000	40,000
t	20	2	JACKING BEAM JB110	2,100	4,200
t	21	4	STRAND TREE	1,350	5,400
t	22	4	HYDRAULIC POWER PACK	1,800	7,200
t	23	240	STRAND 0.62" DIAMETER x 90'	93	22,320
t	24	4	TROLLEY BRACING	2,000	8,000
t	25	4	DRIVE TRUCK BRIDGE BEAM	4,000	16,000
t	26	4	24" DRIVE TRUCK ASSEMBLY GWD	5,030	20,120
t	27	4	24" IDLER TRUCK ASSEMBLY GWI	2,850	11,400
lift s ls	28	4	STRAND JEWELS	1,600	6,400
ls	29	2	SPREADER BEAM (HLV/LLV)	15,000	30,000
ls	30	4	LIFTING EARS	2,400	9,600
			MISCELLANEOUS		50,000
				TOTAL	815,060

SUMMARY DEAD LOAD

MAIN	608,820 lbs	625,000 lbs
TL	160,240 lbs	165,000 lbs
LS	46,000 lbs	50,000 lbs
	815,060 lbs	840,000 lbs

DL	840,000 lbs
LL	2,000,000 lbs
TOTAL	2,840,000 lbs

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

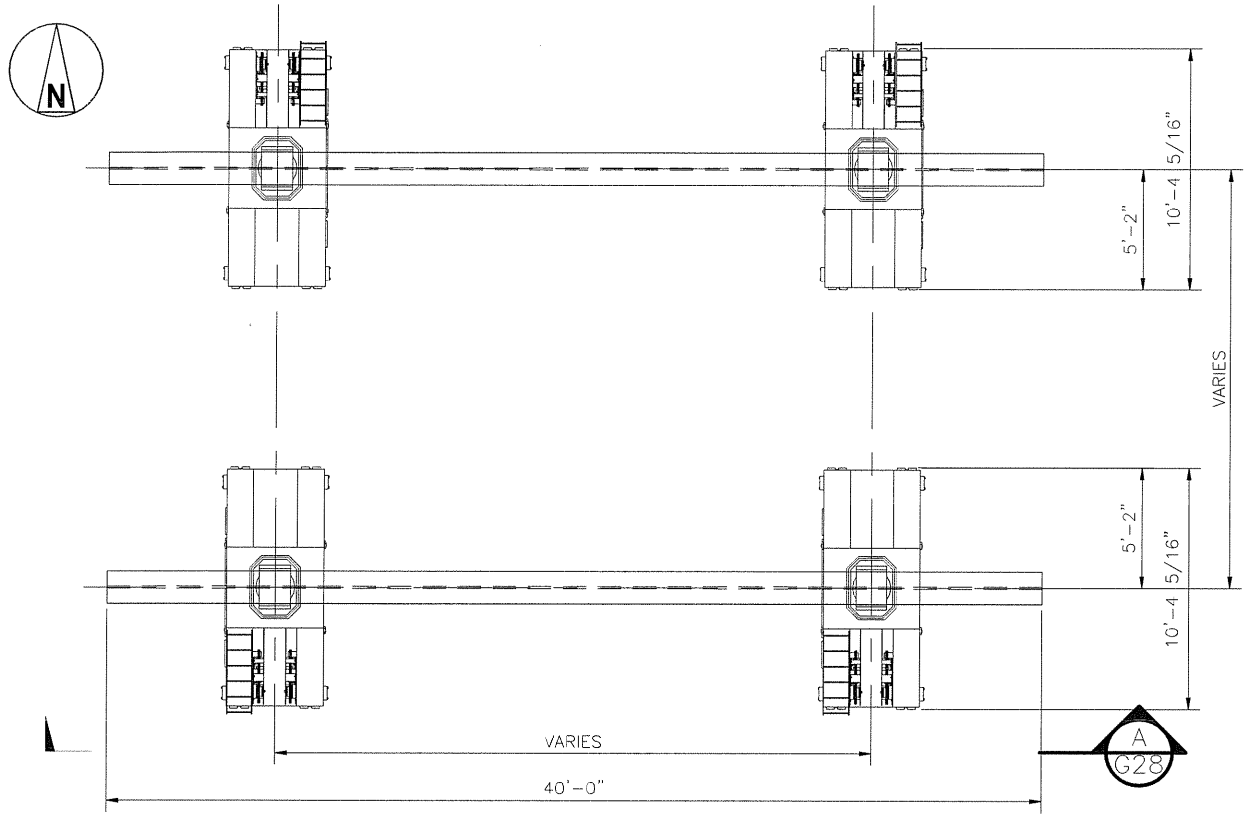
BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
GANTRY CRANE GENERAL ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	CR1.DWG

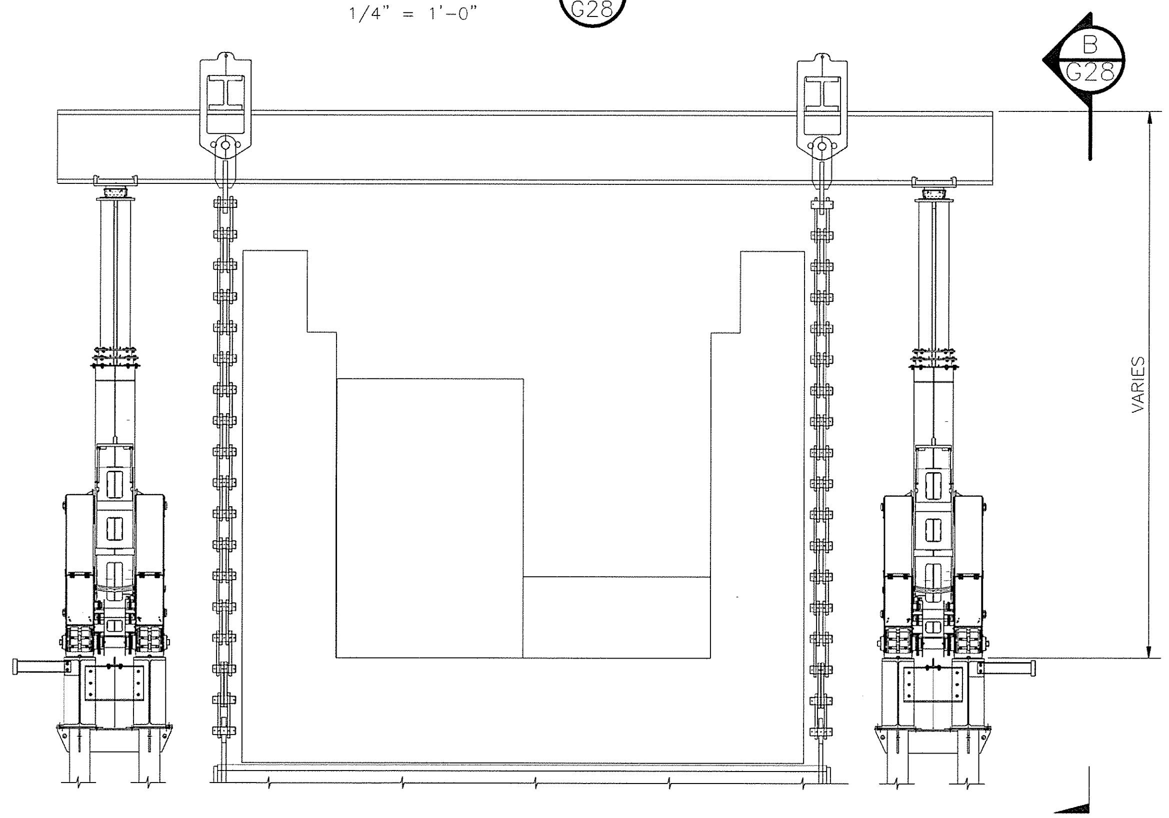
TASK	DRAWING NO.	REV. NO.
	G27	A

RECORD INFORMATION		
RECORD NO.	BLDG NO.	INDEX NO.

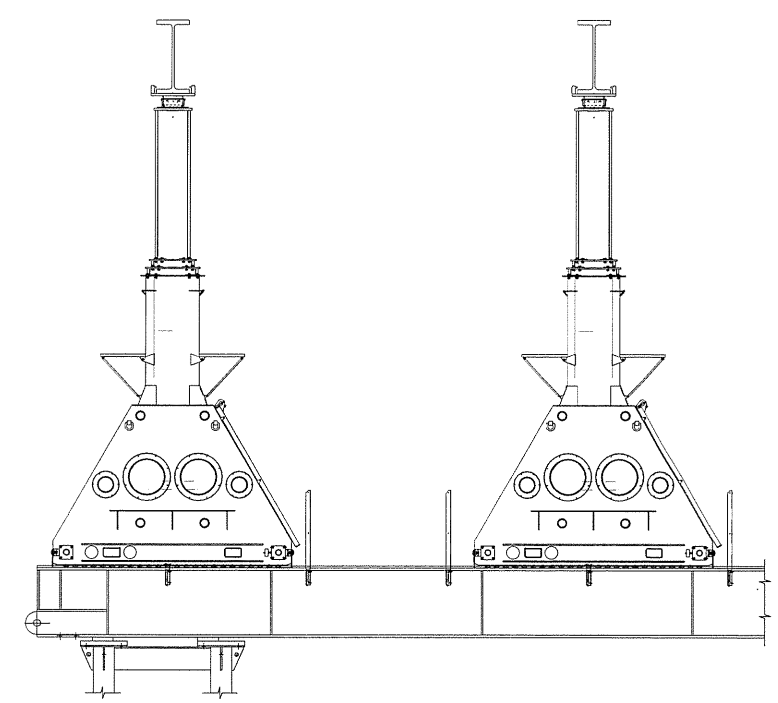
DRAWING NO.	REV. NO.
G28	A



PLAN VIEW (— / G28)
1/4" = 1'-0"



ELEVATION (A / G28)
1/4" = 1'-0"



ELEVATION (B / G28)
1/4" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/4" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF HYDRAULIC GANTRY SYSTEM
SECTIONS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	G28.DWG

TASK	DRAWING NO.	REV. NO.
	G28	A

RECORD INFORMATION

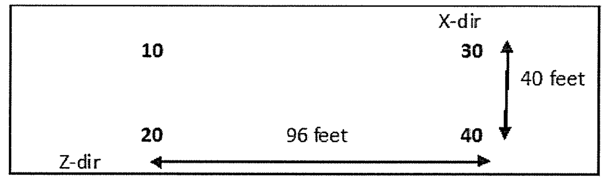
RECORD NO.	BLDG NO.	INDEX NO.

XX	A

REC / HLV / LLV GANTRY CRANE

Wheel Load Calculation Max at Corner 10

All Loads in Kips
Factor on all loads is 1.0
Trolley 20' from end of span



PRELIMINARY

VERTICAL CORNER LOADS

	Y-dir Vertical Corner Loads				
Operating	**10**	**20**	**30**	**40**	**Total**
Load					
Dead Load	175.0	175.0	137.5	137.5	625.0
Trolley + LS*	85.1	85.1	22.4	22.4	215.0
Lifted Load*	790.0	790.0	210.0	210.0	2,000.0
Skew Load	10.0	10.0	-10.0	-10.0	0.0
Service Wind Load : X-dir	14.5	-14.5	14.5	-14.5	0.0
Service Wind Load : Z-dir	1.9	-1.9	1.9	-1.9	0.0
	1,076	1,044	376	344	2,840
Out of service					
Dead Load	175.0	175.0	137.5	137.5	625.0
Trolley + LS	85.1	85.1	22.4	22.4	215
Storm Wind Load : X-dir	87.6	-87.6	87.6	-87.6	0
Storm Wind Load: Z-dir	11.6	-11.6	11.6	-11.6	0
	359	161	259	61	840

Vertical Load Summary	
Main Structure	625 kips
Trolley	165 kips
Lift System	50 kips
Lifted Load	2000 kips
Total	**2840 kips**
	1420 tons

Wind Load Summary	38.6 mph	95 mph
X-dir	Operating	Storm
Load	21.1 kips	127.8 kips
Load Height	54.8 feet	54.8 feet
Leg Distance	40.0 feet	40.0 feet
Y-Reaction	14.5 kips	87.6 kips
Z-dir	Operating	Storm
Load	12.5 kips	75.4 kips
Load Height	29.6 feet	29.6 feet
Leg Distance	96.0 feet	96.0 feet
Y-Reaction	1.9 kips	11.6 kips

Max Vertical Corner Load	**1,076 kips**	
No. of wheels/corner	4	6
Max Wheel Load	**269 kips**	**179 kips**
Wheel Spacing	4 feet	4 feet
Max Load per foot	**67 kips/ft**	**45 kips/ft**
Total Lateral Loads		
Operating Wind X	21.1 kips	
Operating Wind Z	12.5 kips	
Storm Wind X	127.8 kips	
Storm Wind Z	75.4 kips	

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: N.T.S.

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
GANTRY CRANE DESIGN CRITERIA,
WHEEL LOADS AND INTERFACES

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	G29	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
_____-__-_____	A

STRUCTURAL - GENERAL NOTES

GENERAL REQUIREMENTS

GOVERNING CODE: The design, erection, and demolition of this project is reviewed by Department of Energy (DOE) understood to be the Authority Having Jurisdiction (AHJ). The structural design will be conducted per the AISC Steel Manual, ACI-318 Concrete Manual, and the ASCE 7.

DEFINITIONS: The following definitions cover the meanings of certain terms used in these notes:

"Architect/Engineer" – The Architect of Record and the Structural Engineer of Record.

- **"Structural Engineer of Record" (SER)** – The structural engineer who is licensed to stamp & sign the structural documents for the project. The SER is responsible for the design of the Primary Structural System.
- **"Submit for review"** - Submit to the Architect/Engineer for review prior to fabrication or construction.
- **"Per Plan"** – Indicates references to the structural plans, elevations and structural general notes.

SPECIFICATIONS: Refer to the project specifications issued as part of the contract documents for information supplemental to these drawings.

STRUCTURAL DETAILS: The structural drawings are intended to show the general character and extent of the project and are not intended to show all details of the work.

STRUCTURAL RESPONSIBILITIES: The structural engineer (SER) is responsible for the strength and stability of the primary structure in its completed form.

COORDINATION: The Contractor is responsible for coordinating details and accuracy of the work; for confirming and correlating all quantities and dimensions; for selecting fabrication processes; for techniques of assembly; and for performing work in a safe and secure manner.

MEANS, METHODS and SAFETY REQUIREMENTS: The contractor is responsible for the means and methods of construction and all job related safety standards such as OSHA and DOSH (Department of Occupational Safety and Health).

TEMPORARY SHORING, BRACING: The contractor is responsible for the strength and stability of the structure during construction and shall provide temporary shoring, bracing and other elements required to maintain stability until the structure is complete. It is the contractor's responsibility to be familiar with the work required in the construction documents and the requirements for executing it properly.

NOTE PRIORITIES: Plan and detail notes and specific loading data provided on individual plans and detail drawings supplements information in the Structural General Notes.

DISCREPANCIES: In case of discrepancies between the General Notes, Specifications Plan/details or Reference Standards, the Architect/Engineer shall determine which shall govern. Discrepancies shall be brought to the attention of the Architect/Engineer before proceeding with the work. Should any discrepancy be found in the Contract Documents, the Contractor will be deemed to have included in the price the most expensive way of completing the work, unless prior to the submission of the price, the Contractor asks for a decision from the Architect as to which shall govern. Accordingly, any conflict in or between the Contract Documents shall not be a basis for adjustment in the Contract Price.

SITE VERIFICATION: The contractor shall verify all dimensions and conditions at the site. Conflicts between the drawings and actual site conditions shall be brought to the attention of the Architect/Engineer before proceeding with the work.

ALTERNATES: Alternate products of similar strength, nature and form for specified items may be submitted with adequate technical documentation to the Architect/Engineer for review. Alternate materials that are submitted without adequate technical documentation or that significantly deviate from the design intent of materials specified may be returned without review. Alternates that require substantial effort to review will not be reviewed unless authorized by the Owner.

POST-INSTALLED ANCHORS TO CONCRETE AND MASONRY: shall comply with IBC Section 1703.4. Inspections shall be in accordance with the requirements set forth in the approved ICC Evaluation Report and as indicated by the design requirements specified on the drawings. Refer to the POST INSTALLED ANCHORS section of these notes for anchors that are the basis of the design. Special inspector shall verify anchors are as specified in the POST INSTALLED ANCHORS section of these notes or as otherwise specified on the drawings. Substitutions require approval by the SER and require substantiating calculations and current 2006 IBC recognized ICC Evaluation Services (ES) Report. Special Inspector shall document in their Special Inspection Report compliance with each of the elements required within the applicable ICC Evaluation Services (ES) Report.

CONTRACTOR RESPONSIBILITY: Prior to issuance of the building permit, the Contractor is required to provide the Authority Having Jurisdiction a signed, written acknowledgement of the Contractor's responsibilities associated with the above Statement of Special Inspections addressing the requirements listed in IBC Section 1706. Contractor is referred to IBC Chapter 1707.7 and 1707.8 for architectural and MEP building systems that may be subject to additional inspections (based on the building's designated Seismic Design Category listed in the CRITERIA), including anchorage of HVAC ductwork containing hazardous materials, piping systems and mechanical units containing flammable, combustible or highly toxic materials, electrical equipment used for emergency or standby power, exterior wall panels and suspended ceiling systems.

SOILS AND FOUNDATIONS

REFERENCE STANDARDS: Conform to IBC Chapter 18 "Soils and Foundations."

GEOTECHNICAL REPORT: Recommendations contained in [Name of Report and Report Number] by [Name of Company] dated [Date] were used for design.

CONTRACTOR'S RESPONSIBILITIES: Contractor shall be responsible to review the Geotechnical Report and shall follow the recommendations specified therein including, but not limited to, subgrade preparations, pile installation procedures, ground water management and steep slope Best Management Practices."

GEOTECHNICAL SUBGRADE INSPECTION: The Geotechnical Engineer shall inspect all sub-grades and prepared soil bearing surfaces, prior to placement of foundation reinforcing steel and concrete. Geotechnical Engineers shall provide a letter to the owner stating that soils are adequate to support the "Allowable Foundation Bearing Pressure(s)" shown below.
[Assumed values shall be field verified by the Building Official or the Geotechnical Engineer prior to placing concrete.]

DESIGN SOIL VALUES:

Safety Factor per Soils Report	1.5	
Allowable Foundation Bearing Pressure	10000	PSF – Native
Passive Lateral Pressure	250	PSF/FT
Active Lateral Pressure (unrestrained)	35 PSF/FT	
Active Lateral Pressure (restrained)	55 PSF/FT	
Seismic Lateral Pressure	8HPSF	
Coefficient of Sliding Friction	0.45	

FOUNDATIONS and FOOTINGS: Foundations shall bear on **piles** either on competent native soil or compacted structural fill as per the geotechnical report.

FOOTING DEPTH: Tops of footings shall be as shown on plans with vertical changes as indicated with steps in the footings; locations of steps shown as approximate and shall be coordinated with the civil grading plans to ensure that the exterior perimeter footings bear no less than 18 inches below finish grade, or as otherwise indicated by the geotechnical engineer or building official.

River Corridor Closure Contract
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NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SITE EXCAVATION AND GRADING
GENERAL NOTES

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

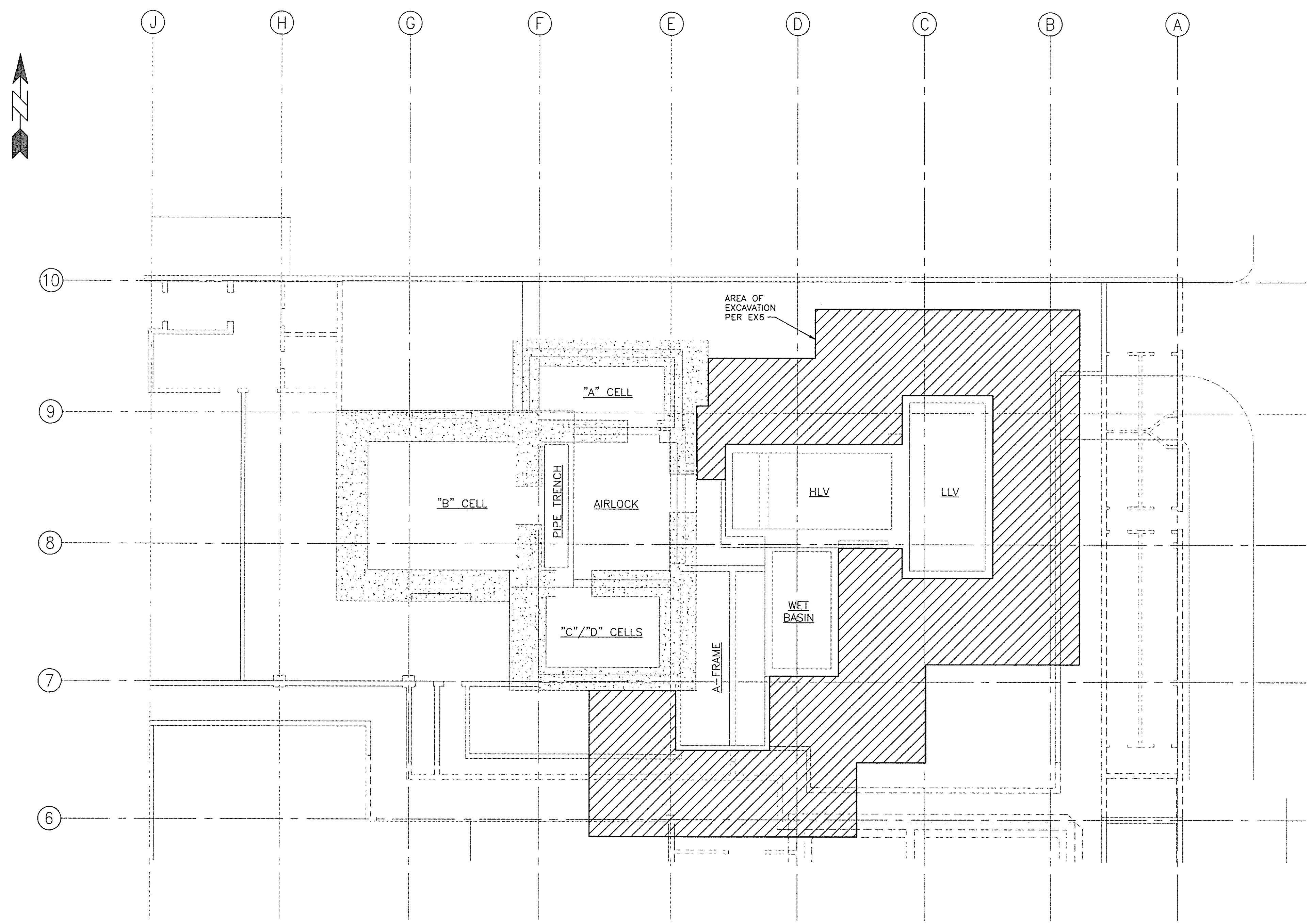
TASK	DRAWING NO.	REV. NO.
_	EX1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

2234_WCH-SUB.DWG 09/05

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
EXCAVATION PLAN
HLV AND LLV

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

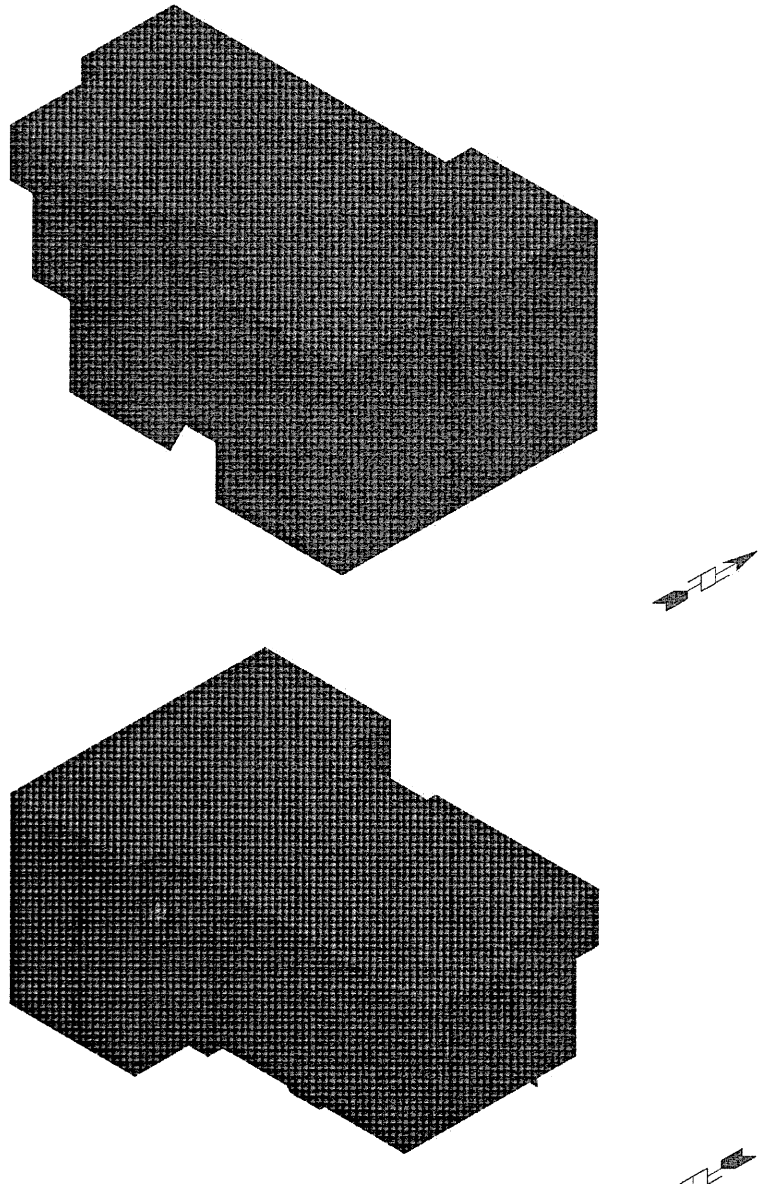
TASK	DRAWING NO.	REV. NO.
_	EX5	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

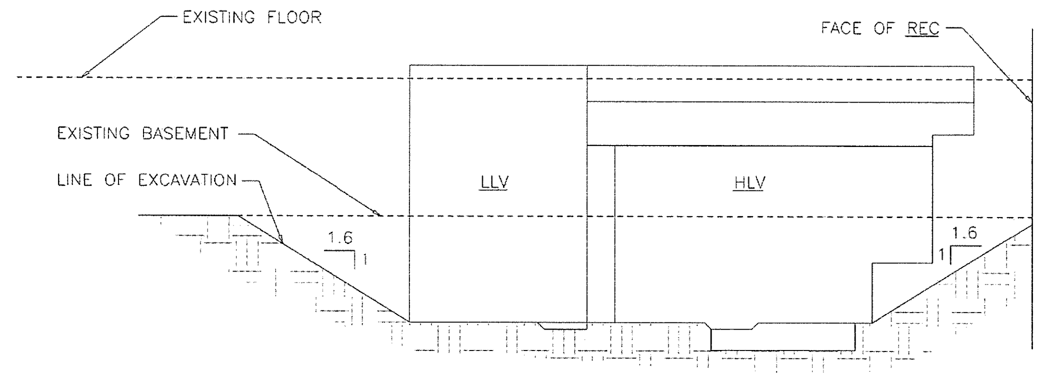
River Corridor Closure Contract
Dedicated WCH Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



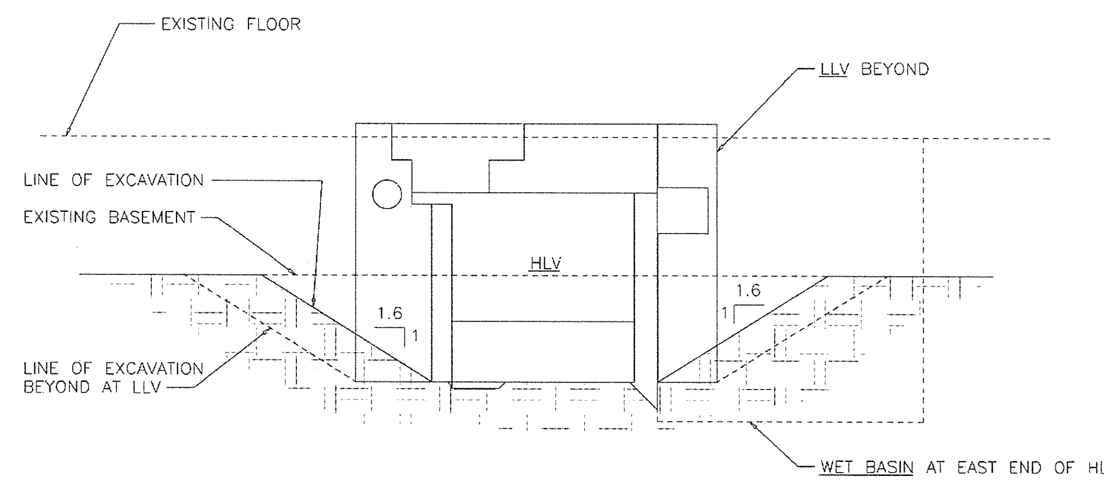
1 / EX6 — ISOMETRIC VIEWS – HLV & LLV

SCALE: NONE



2 / EX6 — HLV & LLV EXCAVATION – NORTH SIDE VIEW

SCALE: 1/8"=1'-0"



3 / EX6 — HLV & LLV EXCAVATION – WEST END VIEW

SCALE: 1/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

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RIVER CORRIDOR CLOSURE CONTRACT

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400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS

X

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
_	EX6	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract — Dedicated WCH Excellence

DRAWING NO.	REV. NO.
______-__-______	A

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SITE VERIFICATION: The contractor shall verify all dimensions and conditions at the site. Conflicts between the drawings and actual site conditions shall be brought to the attention of the Architect/Engineer before proceeding with the work.

ALTERNATES: Alternate products of similar strength, nature and form for specified items may be submitted with adequate technical documentation to the Architect/Engineer for review. Alternate materials that are submitted without adequate technical documentation or that significantly deviate from the design intent of materials specified may be returned without review. Alternates that require substantial effort to review will not be reviewed unless authorized by the Owner.

POST-INSTALLED ANCHORS TO CONCRETE AND MASONRY: shall comply with IBC Section 1703.4. Inspections shall be in accordance with the requirements set forth in the approved ICC Evaluation Report and as indicated by the design requirements specified on the drawings. Refer to the POST INSTALLED ANCHORS section of these notes for anchors that are the basis of the design. Special inspector shall verify anchors are as specified in the POST INSTALLED ANCHORS section of these notes or as otherwise specified on the drawings. Substitutions require approval by the SER and require substantiating calculations and current 2006 IBC recognized ICC Evaluation Services (ES) Report. Special Inspector shall document in their Special Inspection Report compliance with each of the elements required within the applicable ICC Evaluation Services (ES) Report.

CONTRACTOR RESPONSIBILITY: Prior to issuance of the building permit, the Contractor is required to provide the Authority Having Jurisdiction a signed, written acknowledgement of the Contractor's responsibilities associated with the above Statement of Special Inspections addressing the requirements listed in IBC Section 1706. Contractor is referred to IBC Chapter 1707.7 and 1707.8 for architectural and MEP building systems that may be subject to additional inspections (based on the building's designated Seismic Design Category listed in the CRITERIA), including anchorage of HVAC ductwork containing hazardous materials, piping systems and mechanical units containing flammable, combustible or highly toxic materials, electrical equipment used for emergency or standby power, exterior wall panels and suspended ceiling systems.

SOILS AND FOUNDATIONS

REFERENCE STANDARDS: Conform to IBC Chapter 18 "Soils and Foundations."

GEOTECHNICAL REPORT: Recommendations contained in [Name of Report and Report Number] by [Name of Company] dated [Date] were used for design.

CONTRACTOR'S RESPONSIBILITIES: Contractor shall be responsible to review the Geotechnical Report and shall follow the recommendations specified therein including, but not limited to, subgrade preparations, pile installation procedures, ground water management and steep slope Best Management Practices."

GEOTECHNICAL SUBGRADE INSPECTION: The Geotechnical Engineer shall inspect all sub-grades and prepared soil bearing surfaces, prior to placement of foundation reinforcing steel and concrete. Geotechnical Engineers shall provide a letter to the owner stating that soils are adequate to support the "Allowable Foundation Bearing Pressure(s)" shown below.
[Assumed values shall be field verified by the Building Official or the Geotechnical Engineer prior to placing concrete.]

DESIGN SOIL VALUES:

Safety Factor per Soils Report	1.5	
Allowable Foundation Bearing Pressure	10000	PSF – Native
Passive Lateral Pressure	250	PSF/FT
Active Lateral Pressure (unrestrained)	35 PSF/FT	
Active Lateral Pressure (restrained)	55 PSF/FT	
Seismic Lateral Pressure	8HPSF	
Coefficient of Sliding Friction	0.45	

FOUNDATIONS and FOOTINGS: Foundations shall bear on piles either on competent native soil or compacted structural fill as per the geotechnical report.

FOOTING DEPTH: Tops of footings shall be as shown on plans with vertical changes as indicated with steps in the footings; locations of steps shown as approximate and shall be coordinated with the civil grading plans to ensure that the exterior perimeter footings bear no less than 18 inches below finish grade, or as otherwise indicated by the geotechnical engineer or building official.

AUGER CAST PILES

REFERENCE STANDARDS: Conform to:
(1) IBC Section 1808
(2) ACI 301 "Standard Specifications for Structural Concrete."

SUBMITTALS: Conform to ACI 301 Section 3.1.1 "Submittals, Data, and Drawings." Submit the following items for review:
(1) Reinforcing fabrication drawings showing reinforcement size, configuration and grade.
(2) Grout mix design.
(3) Grout strength test results.

MATERIALS: Conform to notes for CONCRETE REINFORCEMENT and CAST-IN-PLACE CONCRETE, this sheet.

GROUT STRENGTH: Use minimum 5000 psi mix.
LOAD TEST: Pile lengths and capacity shall be validated by Load Test determined and verified at the site by the geotechnical engineer.

SIZE: Pile shape shall be as noted on the foundation drawings.

CAPACITY: Pile capacities shall be as indicated on the drawings.

PRECAST PRESTRESSED CONCRETE PILES

REFERENCE STANDARDS: Conform to:
(1) IBC Section 1808
(2) ACI 301 "Standard Specifications for Structural Concrete"
(2) PCI "Guide Specification for Precast, Prestressed Concrete"

SUBMITTALS: Conform to ACI 301 Section 3.1.1. Submit for review:
(1) Design loads, calculations and shop drawings (component design drawings) stamped by structural engineer licensed in the state of Washington.
(2) Placing drawings showing reinforcement, reinforcement grade, grout material and strength.
(3) Concrete mix design and strength test results.

MATERIALS: Conform to notes for CONCRETE REINFORCEMENT and CAST-IN-PLACE CONCRETE, this sheet.

MANUFACTURER: The manufacturing plant shall be certified by the Prestressed Concrete Institute (PCI) or conform to the PCI "Guide Specification" for quality assurance G2.

SIZE: Pile shape shall be as noted on the foundation drawings. Test piles are required for this project and shall verify pile capacities. Pile lengths shall be determined and verified at the site by the geotechnical engineer during the test pile procedure.

CAPACITY: Pile capacities shall be as noted on the foundation drawings.

CAST-IN-PLACE CONCRETE

REFERENCE STANDARDS: Conform to:
(1) ACI 301-05 "Standard Specifications for Structural Concrete",
(2) IBC Chapter 19-Concrete,
(3) ACI 318-05/318R-05

FIELD REFERENCE: The contractor shall keep a copy of ACI Field Reference manual, SP-15, "Standard Specifications for Structural Concrete (ACI 301) with Selected ACI and ASTM References."

CONCRETE MIXTURES: Conform to ACI 301 Section 4 "Concrete Mixtures."

MATERIALS: Conform to ACI 301 Section 4.2.1 "Materials" for requirements for cementitious materials, aggregates, mixing water and admixtures.

SUBMITTALS: Provide all submittals required by ACI 301 Section 4.1.2. Submit mix designs for each mix in the table below.

TABLE OF MIX DESIGN REQUIREMENTS

Member Type/Location	Strength (psi)	Test Age (days)	Maximum Aggregate	Maximum W/C Ratio	Air Content
Foundations					
• Foundations-spread footings	4000	28	1"	—	—
• Foundations-pile caps	4000	28	1"	—	—

Mix Design Notes:

(1) W/C Ratio: Water–cementitious material ratios shall be based on the total weight of cementitious materials. Ratios not shown in the table above are controlled by strength requirements.

(2) Cementitious Content:
a. The use of fly ash, other pozzolans, silica fume, or slag shall conform to ACI 301 Section 4.2.2.9.a. Maximum amount of fly ash shall be 20% of total cementitious content unless reviewed and approved otherwise by SER.
b. For concrete used in elevated floors, portland cement content shall conform to ACI 301 Section 4.2.2.1. Acceptance of lower cement content is contingent on providing supporting data to the SER for review and acceptance.

(3) Slump: Conform to ACI 301 Section 4.2.2.2. Slump shall be determined at point of placement.

(4) Chloride Content: Conform to ACI 301 Section 4.2.2.6

(5) Non-chloride accelerator: Non-chloride accelerating admixture may be used in concrete slabs placed at ambient temperatures below 50°F at the contractor's option.

FORMWORK & RESHORING: Conform to ACI 301 Section 2 "Formwork and Form Accessories." Removal of Forms shall conform to Section 2.3.2 except strength indicated in Section 2.3.2.5 shall be 0.75 f´c. [Reshoring shall conform to Section 2.3.3.] [In addition, mild reinforced (non post-tensioned) slabs shall be continuously reshored for a minimum of 14 days following placement of concrete or 7 days after concrete has reached 0.75 f'c, whichever is longer.] [Contractor shall submit formwork removal and reshore installation procedure for SER's approval.]

MEASURING, MIXING, AND DELIVERY: Conform to ACI 301 Section 4.3.

HANDLING, PLACING, CONSTRUCTING AND CURING: Conform to ACI 301 Section 5. In addition, hot weather concreting shall conform to ACI 305.1 and cold weather concreting shall conform to ACI 306.1.
CONCRETE CURING: Provide curing compounds for concrete as follows:

(1) Use membrane curing compounds that are compatible with and will not affect surfaces to be covered with finish materials applied directly to concrete.

(2) Apply curing compounds at a rate equivalent to the rate of application at which curing compound was originally tested for in conformance to the requirements of ASTM C 309 and the manufacturer's recommendations.

(3) Apply specified curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

(4) Use curing compound compatible with and applied under direction of system manufacturer of protective sealer.

(5) Apply two separate coats with first allowed to become tacky before applying second. Direction of second application shall be at right angles to direction of first.

EMBEDDED ITEMS: Position and secure in place expansion joint material, anchors and other structural and non-structural embedded items before placing concrete. Contractor shall refer to mechanical, electrical, plumbing and architectural drawings and coordinate other embedded items.

GROUT: Use 7000 psi non-shrink grout

GROUTED REBAR: See Post-Installed Anchors to Concrete.

POST-INSTALLED ANCHORS to CONCRETE: Anchor location, type, diameter and embedment shall be as indicated on drawings. Reference the POST INSTALLED ANCHORS section for applicable Post-Installed Anchor Adhesives. Anchors shall be installed and inspected in strict accordance with the applicable ICC-Evaluation Service Report (ESR). Special inspection shall be per the TESTS and INSPECTIONS section.

SHRINKAGE: Conventional and post-tensioned concrete slabs will continue to shrink after initial placement and stressing of concrete. Contractor and subcontractor shall coordinate jointing and interior material finishes to provide adequate tolerance for expected structural frame shrinkage and shall include, but not be limited to: curtain wall, drywall, storefront, skylight and ceiling suppliers. Contact Engineer for expected range of shrinkage.

TESTING AND ACCEPTANCE:

Testing: Obtain samples and conduct tests in accordance with ACI 301 Section 1.6.4.2. Additional samples may be required to obtain concrete strengths at alternate intervals than shown below.

- Cure 4 cylinders for 28-day test age test 1 cylinder at 7 days, test 2 cylinders at 28 days, and hold 1 cylinder in reserve for use as the Engineer directs. After 56 days, unless notified by the Engineer to the contrary, the reserve cylinder may be discarded without being tested for specimens meeting 28-day strength requirements.

Acceptance. Strength is satisfactory when:
(1) The averages of all sets of 3 consecutive tests equal or exceed the specified strength.
(2) No individual test falls below the specified strength by more than 500 psi.
A "test" for acceptance is the average strength of the two cylinders tested at the specified test age.

CONCRETE REINFORCEMENT

REFERENCE STANDARDS: Conform to:
(1) ACI 301-99 "Standard Specifications for Structural Concrete", Section 3 "Reinforcement and Reinforcement Supports."
(2) ACI SP-66 "ACI Detailing Manual" including ACI 315 "Details and Detailing of Concrete Reinforcement."
(3) CRSI MSP-2-98 "Manual of Standard Practice."
(4) ANSI/AWS D1.4 "Structural Welding Code - Reinforcing Steel."
(5) IBC Chapter 19-Concrete.
(6) ACI 318-05.

SUBMITTALS: Conform to ACI 301 Section 3.1.1 "Submittals, data and drawings." Submit placing drawings showing fabrication dimensions and locations for placement of reinforcement and reinforcement supports.

MATERIALS:

Reinforcing Bars	ASTM A615, Grade 60, deformed bars.
Weldable Reinforcing Bars	ASTM A706, Grade 60, deformed bars.
Bar Supports	CRSI MSP-2-98, Chapter 3 "Bar Supports."
Tie Wire	16 gage or heavier, black annealed.

FABRICATION: Conform to ACI 301, Section 3.2.2. "Fabrication", and ACI SP-66 "ACI Detailing Manual."

WELDING: Bars shall not be welded unless authorized. When authorized, conform to ACI 301, Section 3.2.2.2. "Welding" and provide ASTM A706, grade 60 reinforcement.

PLACING: Conform to ACI 301, Section 3.3.2 "Placement." Placing tolerances shall conform to Section 3.3.2.1 "Tolerances."

CONCRETE COVER: Conform to the following cover requirements from ACI 301, Table 3.3.2.3:
Concrete cast against earth....3"
Concrete exposed to earth or weather....2"

CAST-IN-PLACE CONCRETE COVER AND REINFORCING PROTECTION: Conform to the following cover and corrosion protection requirements from ACI 301, Table 3.3.2.3 :

Reinforcement Location	Minimum Cover	Rebar Protection
Footing Bottom Reinforcing	3"	Uncoated
Footing Top Reinforcing	2"	Uncoated

SPLICES: Conform to ACI 301, Section 3.3.2.7. Refer to "Typical Lap Splice and Development Length Schedule" for typical reinforcement splices. Mechanical connections may be used when approved by the SER. The splices indicated on individual sheets shall control over the schedule.

FIELD BENDING: Conform to ACI 301 Section 3.3.2.8. "Field Bending or Straightening." Bar sizes #3 through #5 may be field bent cold the first time. Other bars require preheating. Do not twist bars.

POST-INSTALLED ANCHORS (INTO CONCRETE AND MASONRY)

DESIGN STANDARDS:
Post-Installed Anchors into concrete for this project are designed in accordance with American Concrete Institute, ACI 318-05, Appendix D Specifications.

POST-INSTALLED ANCHORS: Install only where specifically shown in the details or allowed by SER. All post-installed anchors types and locations shall be approved by the SER and shall have a current ICC-Evaluation Service Report that provides relevant design values necessary to validate the available strength exceeds the required strength. Submit current manufacturer's data and ICC ESR report to SER of for alternates and all non pre-approved anchors to SER for approval. Anchors shall be installed in strict accordance to ICC-ESR and manufacturers instructions. Special inspection shall be per the TESTS and INSPECTIONS section. Anchor type, diameter and embedment shall be as indicated on drawings.

1. ADHESIVE ANCHORS: The following Adhesive-type anchoring systems have been used in the design and shall be used for anchorage to CONCRETE, as applicable and in accordance with corresponding current ICC ESR report. Drilled-in anchor embedment lengths shall be as shown on drawings, or not less than 7 times the anchor nominal diameter (7D).
   a. HILTI "HIT-RE 500 SD" – ICC ESR-2322 for anchorage to CONCRETE
   b. SIMPSON "SET-XP" – ICC ESR 2508 for anchorage to CONCRETE
2. SCREW ANCHORS: The following Screw type anchor is pre-approved for anchorage to MASONRY in accordance with corresponding current ICC ESR report:
   a. SIMPSON "TITEN HD" – ICC ESR-1056 for MASONRY Only and ICC ESR-2322 for CONCRETE Only

STRUCTURAL STEEL

DESIGN STANDARDS:
Structural Steel for this project is designed in accordance with American Institute of Steel Construction (AISC) Specifications.

Structural Steel for this project is designed per:
- AISC – "Manual of Steel Construction, Thirteenth Edition (2005).

REFERENCE STANDARDS:
1) IBC 2006, Chapter 22 – Steel, hereafter referenced as IBC.
2) ANSI/AISC 303-05 – Code of Standard Practice for Steel Buildings & Bridges, hereafter referenced as AISC 303.
3) ANSI/AISC 360-05 – Specification for Structural Steel Buildings, hereafter referenced as AISC 360.
4) AISC348-04/RCSC – Specification for Structural Joints using ASTM A325 or A490 Bolts, prepared by "Research Council on Structural Connections (RCSC), hereafter referenced as RCSC.
5) AWS D1.1 -04 – Structural Welding Code - Steel, hereafter referenced as AWS D1.1.

SUBMITTALS:
(1) Shop drawings shall be prepared in accordance with AISC 360 Section M.1 and AISC 303 Section 4.
(2) Submit welder's certificates verifying qualification within past 12 months.

MATERIALS:

Wide Flange (W), Tee (WT) Shapes	ASTM A992 Fy = 50 ksi	
Channel (C) & Angle (L) Shapes	ASTM A36, Fy = 36 ksi	
Structural Bars & Plates (PL) part of the SLRS	ASTM A572, Fy = 50ksi	
Hollow Structural Section – Square/Rect (HSS)	ASTM A500, Grade B	Fy = 46 ksi
Hollow Structural Section – Round (HSS)	ASTM A500, Grade B	Fy = 42 ksi
High-Strength Bolts	ASTM A325/F1852, Type 1, Galvanized	
Nuts	ASTM A563	
Washers (flat or beveled)	ASTM F436–required @ slotted & oversize holes	
Anchor Rods (Anchor Bolts)	ASTM F1554, Gr. 36 55 (weldable) per Supplement No.1, 105	
High Strength Threaded Rods	ASTM A193, Grade B7,	Fy = 100 ksi
Welded Headed Studs (WHS) 3/4" or 7/8"	ASTM A108 – Nelson/TRW S3L or equal	
Welded Headed Studs (WHS) 1/2" or 5/8"	ASTM A108 – Nelson/TRW H4L or equal	
Welding Electrodes	E70XX, E71TXX unless noted otherwise with a minimum toughness of 20 ft-lbs at 40 degrees Fahrenheit.	

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X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
CRANE RAIL FOUNDATION
GENERAL NOTES

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

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LDING:

1) Welding shall conform to AWS D1.1 and visually conform to AWS Section 6 and Table 6.1. Fabrication/erection inspections by the Contractor per AWS D1.1 Section 6, shall be by associate/certified inspectors (AWI/CWI) per AWS QC1 or AWS B5.1. Special Inspections (verification inspections) shall be by a certified Welding Inspector (WI) or Senior Welding Inspector (SWI) per AWS B5.1.

2) Welders shall be qualified for the specific prequalified joints required by the design and certified in accordance with AWS requirements.

3) Welding shall be done in accordance with appropriate Weld Procedure Specifications (WPS's). Welders shall be familiar with the applicable WPS's.

4) Welding shall be done with AWS Prequalified Welding Processes unless otherwise approved.

5) Welder qualifications and WPS's shall be maintained at the site of the work and shall be readily available for inspection upon request, both in the shop and in the field.

6) Use E70 or E71T, 70 ksi strength electrodes appropriate for the process selected.

7) Prior to the start of work, Special Inspectior or, if "AISC Certified" or otherwise "Approved" Shop, a shop Certified Weld Inspector (CWI) certified in accordance with provisions of AWS QC1, shall inspect and document compliance with the following:
   - Confirm welder qualifications prior to the start of work.
   - Review all WPS prior to the start of work.
   - Confirm materials in fabrications conform to the specifications.
   - Periodically observe joint preparation, fit-up and welder techniques.
   - Identify on plans all multi-pass fillet welds, single pass fillet welds greater than 5/16", and Complete- and Partial- Joint Penetration (CJP or PJP) groove welded butt joints that require Continuous (Special) Inspection.
   - Visually inspect all welds per Special Inspection Requirements for Steel and AWS Section 6.5 and Table 6.1.

8) Welding of SHEAR STUDS on STEEL BEAMS for COMPOSITE CONSTRUCTION: Headed Shear Studs welded to tops of Wide Flange Beams, shall be welded in accordance with AWS D1.1 Chapter 7 "Stud Welding".

9) Welding of Headed Studs on EMBEDDED STEEL PLATES for Anchorage to Concrete: Headed studs welded to steel embedment plates cast monolithic with concrete and shall be welded in accordance with AWS D1.1 Chapter 7 "Stud Welding", unless noted otherwise on plans.

HIGH-STRENGTH BOLTING:

1) High Strength bolts shall be of the ASTM Grade and Type specified in the Materials section. Unless noted otherwise, install bolts in joints in accordance with the RCSC Specification as Joint Type ST, "**Snug Tight**" - per RCSC Specification Table 4.1 and Section 8.1. Inspection is per RCSC Section 9.1. Bolts have been designed as **ASTM A325-N** A490-N bolts – "threads included in the shear plane".

ANCHORAGE to CONCRETE:

1) SHEAR STUDS on STEEL BEAMS for COMPOSITE CONSTRUCTION: Headed Shear Studs welded to tops of Wide Flange Beams, shall be 3/4" diameter WHS with nominal stud lengths as indicated. Unless noted otherwise, provide minimum shear stud height equal to the (metal deck depth + 1 ½") and a maximum shear stud height that allows for ½" of concrete cover over the stud.

2) EMBEDDED STEEL PLATES for Anchorage to Concrete: Plates (PL) embedded in concrete shall be as indicated on the plans with minimum 1/2" dia. WHS x 6" long but provide not less than ¾" interior cover or 1 ½" exterior cover to the opposite face of concrete, unless noted otherwise.

3) COLUMN ANCHOR RODS and BASE PLATES:. All columns (vertical member assemblies weighing over 300 pounds) shall be provided with a **minimum of four ¾" diameter anchor rods**. Column base plates shall be at least ¾" thick, unless noted otherwise. Cast-in-place anchor rods shall be provided unless otherwise approved by the Engineer. Unless noted otherwise, embedment of cast-in-place anchor rods shall be 12 times the anchor diameter (12D).

FABRICATION:

- Conform to AISC 303, Section 8 and AISC 360 Section M2 and M5.
- Structural Welding and qualifications shall conform to the AWS D1.1.
- The fabricator shall maintain detailed fabrication & erection quality control procedures per IBC Section 1704.2.1 that provides the basis for inspection control of the workmanship and ensures that the work is performed in accordance with Code of Standard Practice, the AISC Specification, and the Contract Documents. Fabricators certified by the AISC Quality Certification Program with the following level of certification: Sbd – Conventional Steel Building Structures are deemed to comply with this provision.

VERIFICATION INSPECTION:

- Structural Welding inspections and qualifications shall conform to the AWS D1.1. See WELDING notes and SPECIAL INSPECTIONS for Structural Steel.
- Special Inspector shall review the procedures for completeness and adequacy relative the Code and the Work. Further shop Special Inspections may be waived if the Fabricator is "AISC Certified" or otherwise "Approved" by the Authority Having Jurisdiction per IBC Section 1704.2.2. See SPECIAL INSPECTIONS for Structural Steel.
- Periodic Inspections shall include the initial quality verification inspection, an inspection during the fabrication of the first 20 tons of steel and one shop visit for every one hundred tons or fraction thereafter and a final inspection at the completion of framing.

ERECTION:

1) Conform to AISC 303, Section 7 "Erection", Section 8 "Quality Assurance." and AISC 360, Section M4.

2) The Erector shall maintain detailed fabrication & erection quality control procedures that ensure that the work is performed in accordance with AISC 360 Section M, AISC 303, and the Contract Documents.

3) Steel work shall be carried up true and plumb within the limits defined in AISC 303 Section 7.11.

4) Structural Welding to conform to the AWS D1.1 and applicable WELDING notes above.

5) Special Inspector shall inspect the steel framing to verify compliance with the details shown on the Contract Documents including member size, location, bracing and the application of proper joint details at each connection.

6) High strength bolting shall be periodically inspected by the Special Inspector per IBC Section 1704.3.3.

BRACING and SAFETY PROTECTION: The contractor shall provide temporary bracing and safety protection required by AISC 360 Section M4.2 and AISC 303 Section 7.10 and 7.11.

PROTECTIVE COATING REQUIREMENTS:

1) SHOP PAINTING: Conform to AISC 360 Section M3 and AISC 303 Section 6.5 unless a multi-coat system is required per the project specifications.

2) INTERIOR STEEL:
   a. Unless noted otherwise, ***do not paint*** steel surfaces to be,
      - Concealed by the interior building finishes,
      - Fireproofed,
      - Embedded in concrete,
      - Specially prepared as a "faying surface" for Type-SC "slip-critical" bolted connections, unless the coating conforms to requirements of the RCSC Bolt Specification and is approved by the Engineer.
      - Welded; if area requires painting, do not paint until after weld inspections and Non-destructive testing requirement, if any, are satisfied.

   b. Interior steel, exposed to view, shall be painted with one coat of shop primer unless otherwise indicated in the project specifications. Field touch-ups to match the finish coat or as otherwise indicated in the project specifications

3) EXTERIOR STEEL: Exposed exterior steel shall be:
   a. Painted with an exterior multi-coat system as per the project specifications. Field touch-up painting shall be to match top coat.

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SCALE:

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DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
CRANE RAIL FOUNDATION
GENERAL NOTES

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
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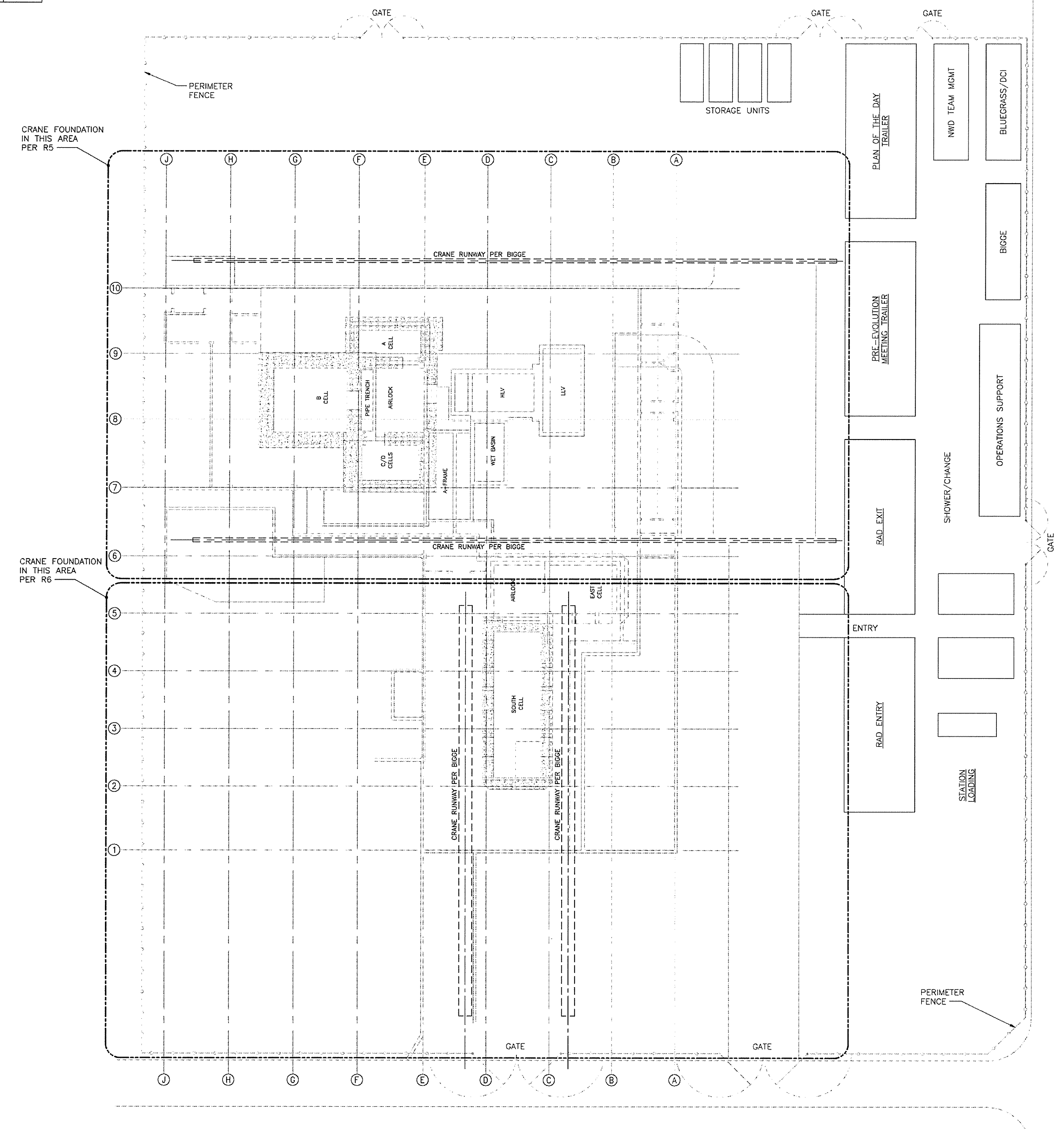

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X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

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RIVER CORRIDOR CLOSURE CONTRACT

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BLDG. 324 HOT CELLS
CRANE RAIL FOUNDATION
SITE PLAN

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
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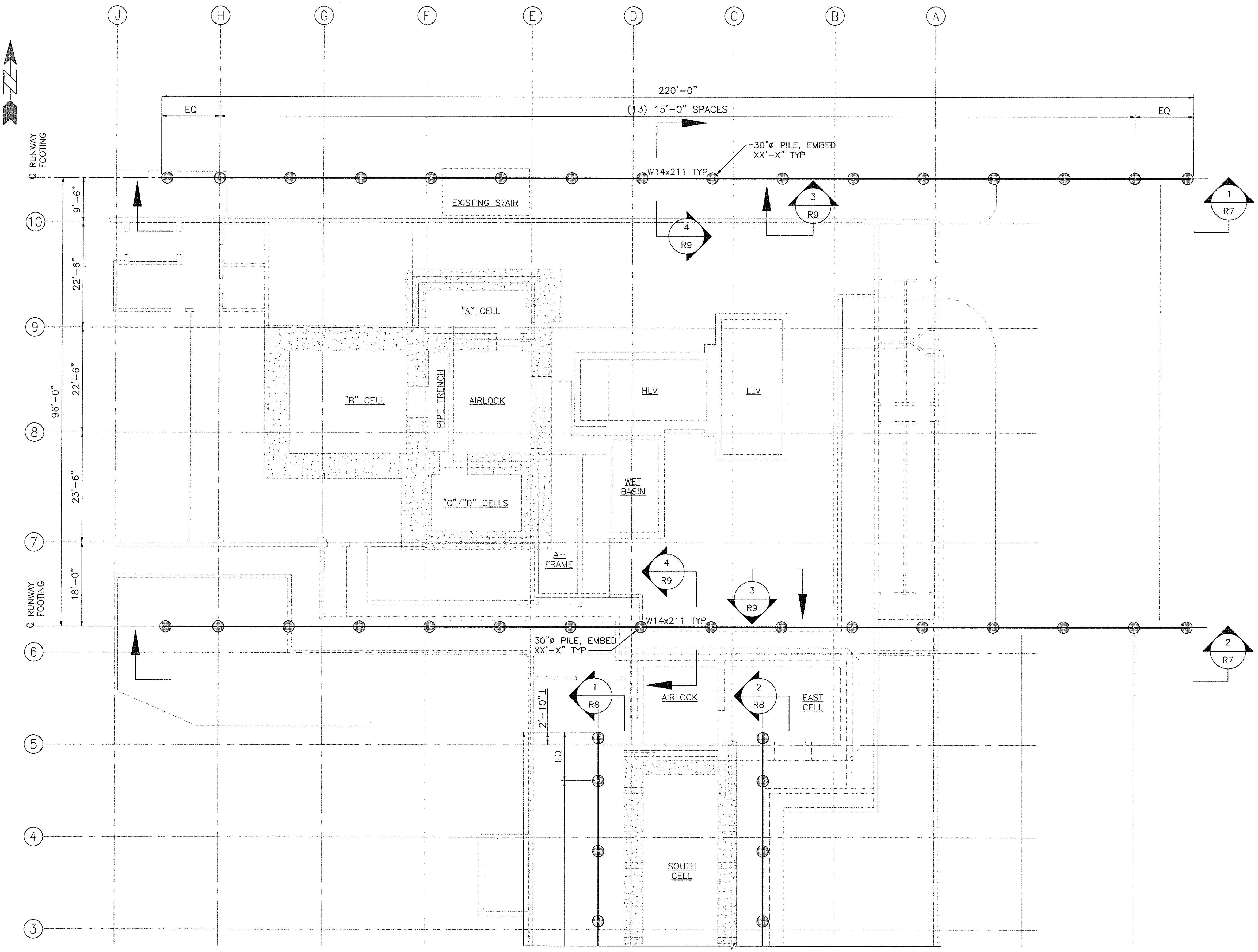

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X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

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U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

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400 SW 6TH AVE
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BLDG. 324 HOT CELLS
CRANE RAIL FOUNDATION GENERAL ARRANGEMENT
REC MONOLITHS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

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River Corridor Closure Contract
Dedicated to Safety and Excellence
WCH

DRAWING NO.	REV. NO.
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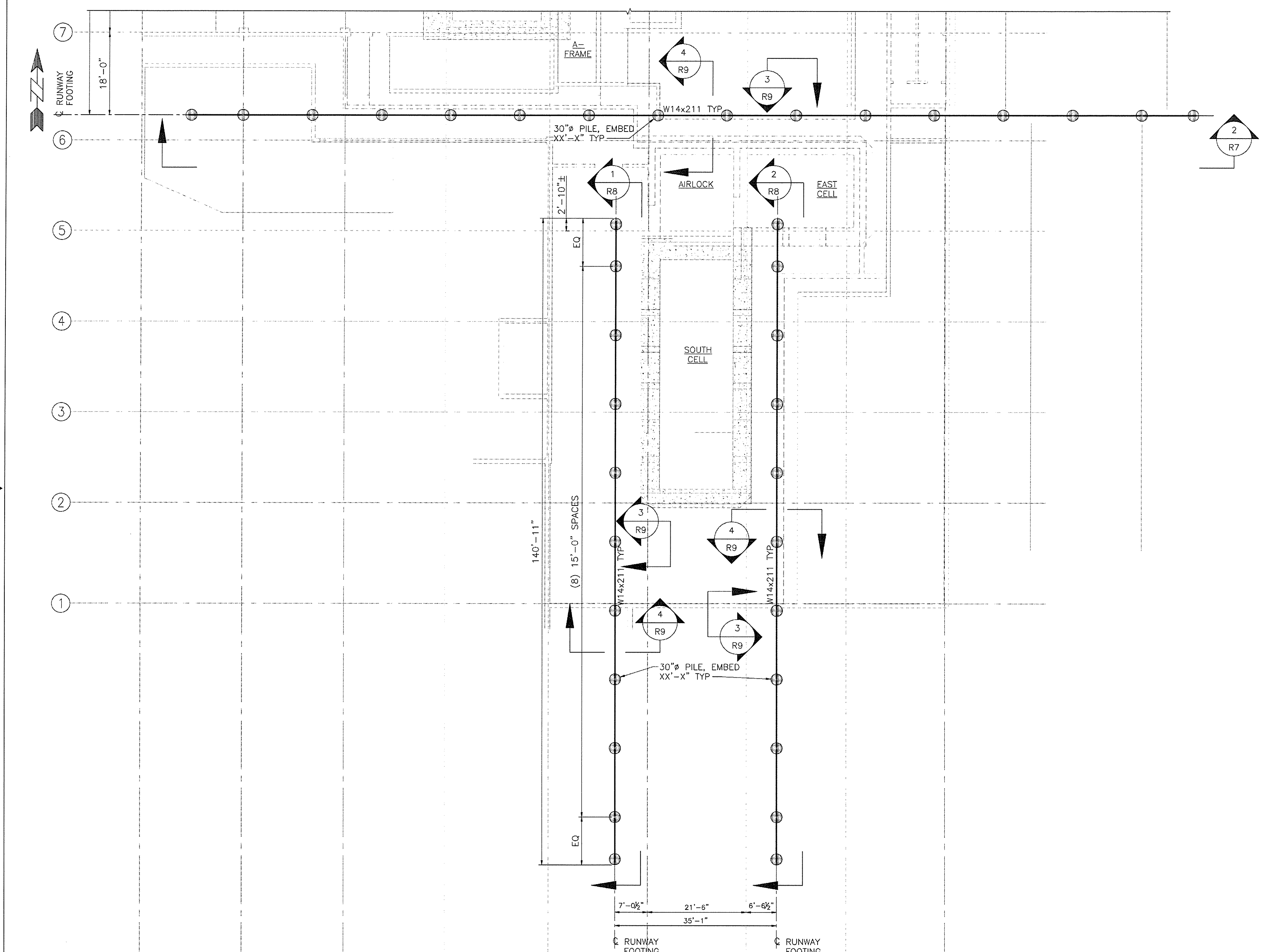

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NOTES

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RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
CRANE RAIL FOUNDATION GENERAL ARRANGEMENT
SMF MONOLITHS

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TASK	DRAWING NO.	REV. NO.
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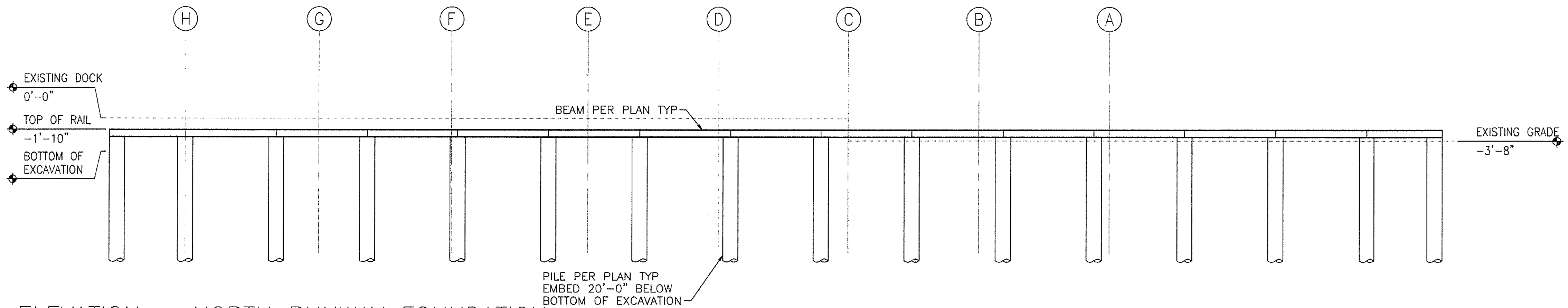
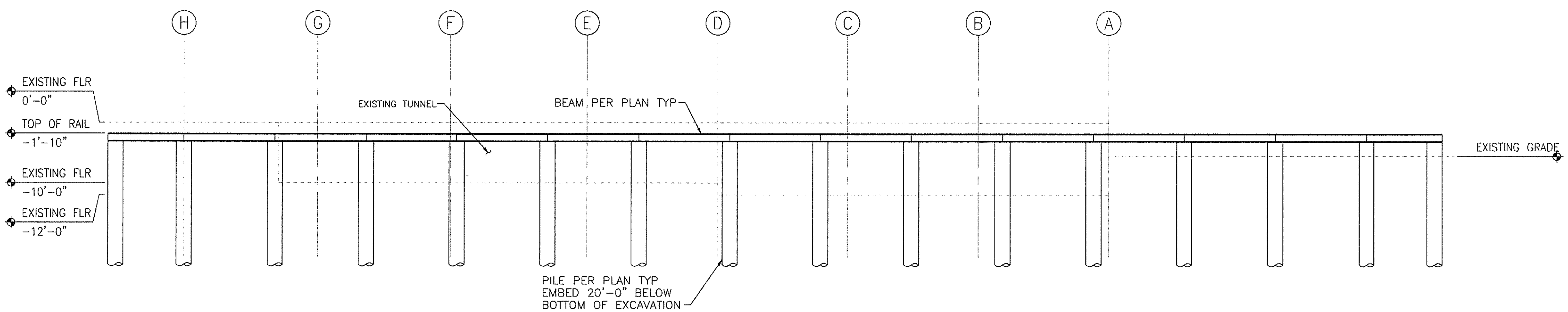


1 / R7 ELEVATION — NORTH RUNWAY FOUNDATION

SCALE: 3/32"=1'-0"



2 / R7 ELEVATION — SOUTH RUNWAY FOUNDATION

SCALE: 3/32"=1'-0"

NOTES

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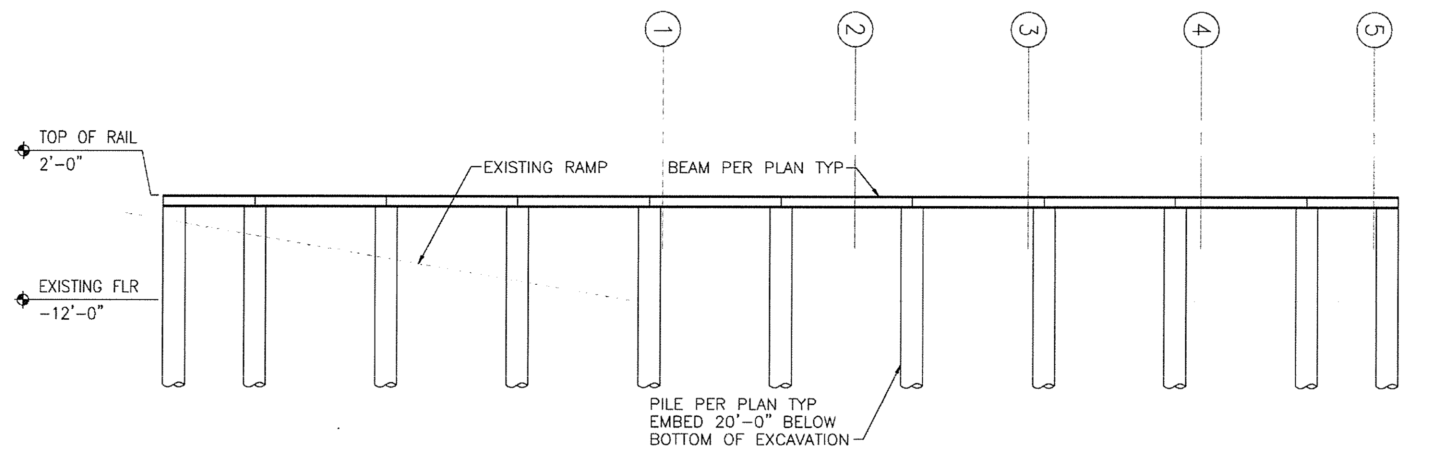
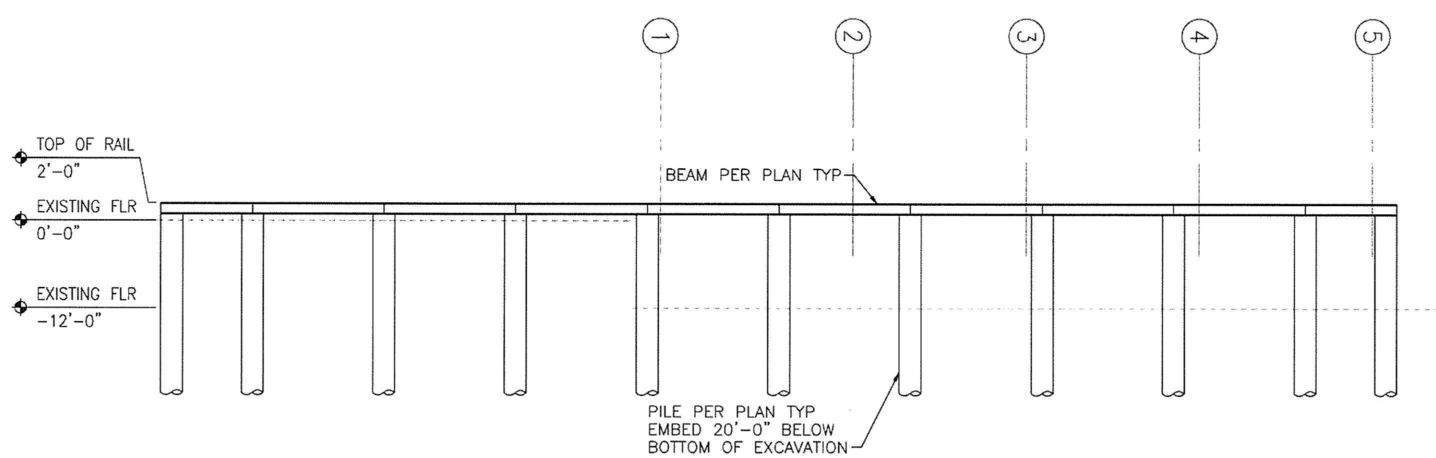


1 / R8 ELEVATION – EAST RUNWAY FOUNDATION

SCALE: 3/32"=1'-0"



2 / R8 ELEVATION – WEST RUNWAY FOUNDATION

SCALE: 3/32"=1'-0"

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TASK	DRAWING NO.	REV. NO.
–	R8	A

DRAWING NO.	REV. NO.
	A

f'c = 4000psi					
BAR SIZE	MISC BARS		TOP BARS (see note #3)		HOOKED BARS
	Ld	Splice	Ld	Splice	Ldh
#3	15	20	19	25	8
#4	19	25	25	33	10
#5	24	32	31	41	12
#6	29	38	37	49	15
#7	42	55	54	71	17
#8	48	63	62	81	19
#9	54	71	70	91	22
#10	61	80	79	103	25
#11	67	88	87	114	27

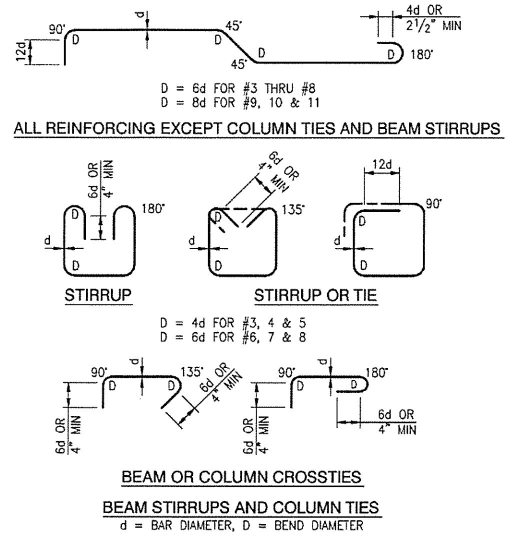
f'c = 5000psi					
BAR SIZE	MISC BARS		TOP BARS (see note #3)		HOOKED BARS
	Ld	Splice	Ld	Splice	Ldh
#3	13	17	17	23	7
#4	17	23	23	30	9
#5	22	29	28	37	11
#6	26	34	34	45	13
#7	38	50	49	64	15
#8	43	56	56	73	17
#9	48	63	63	82	20
#10	54	71	71	93	22
#11	60	78	78	102	24

NOTES:

1. VALUES FOR UNCOATED REINFORCING AND NORMAL WEIGHT CONCRETE WITH CLEAR SPACING > db, CLEAR COVER > db AND MINIMUM STIRRUPS OR TIES THROUGHOUT Ld OR CLEAR SPACING > 2db AND CLEAR COVER > db.
2. DEVELOP ALL REINFORCING IN STRUCTURAL SLABS WITH MINIMUM DEVELOPMENT LENGTH Ld.
3. TOP BAR = HORIZONTAL BAR WITH MORE THAN 12" OF FRESH CONCRETE BELOW (EXCLUDING WALL HORIZONTAL REINFORCING) OR AS NOTED ON DOCUMENTS AS "TOP BAR".
4. ALL TABULATED VALUES ARE IN INCHES.

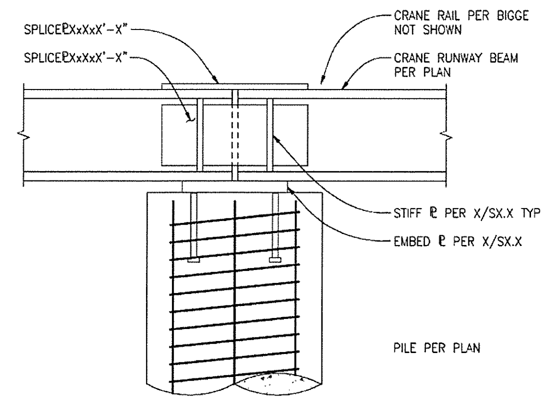
1 / R9 LAP SPLICE & DEVELOPMENT SCHEDULES

SCALE: NONE



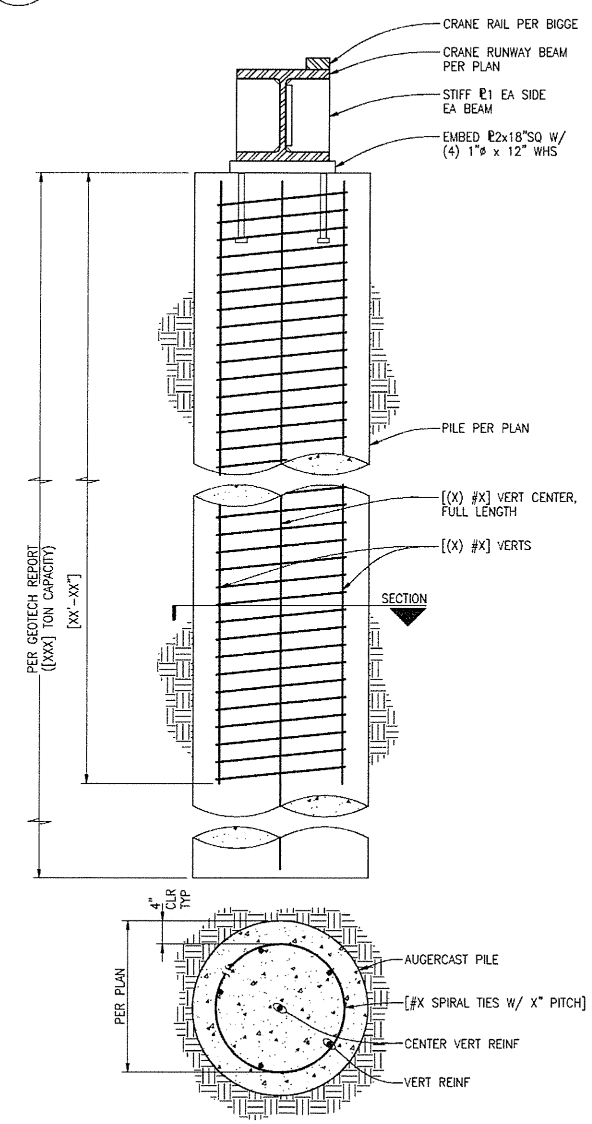
2 / R9 STANDARD REINFORCING HOOKS & BENDS

SCALE: NONE



3 / R9 TYPICAL BEAM SPLICE AT PILE

SCALE: 3/4"=1'-0"



4 / R9 TYPICAL PILE

SCALE: 3/4"=1'-0"

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CUTTING GENERAL NOTES

DRILLING

1. Wire access and rigging holes to be drilled using diamond tipped core bits.
2. Core drilling to be done using water for cooling drill and bit and to flush cuttings from drill hole.
3. Drilling fluids to be captured using a vacuum ring which surrounds the diamond bit.
4. Vacuum to be HEPA equipped as manufactured by Norclean or equal.
5. Wire access holes to be drilled between 3 and 6 inches in diameter.
6. Rigging holes to be drilled per approved design documents.
7. Wire access holes to be drilled using either hydraulically driven or heavy duty 480 volt electric motors.
8. Drills for holes over 2 feet in thickness shall have an auto feed attachment for remote operation.
9. Drilled cores shall be staged periodically into containers specified by RCT.
10. Drilled cores to be disposed by others.

WIRE CUTTING

1. Wire cutting to be done using wet method.
2. Wire paths on any external surface shall be covered for slurry spray control and industrial safety for moving parts. Covers shall be ported for vacuum attachments.
3. For cutting in potentially contaminated environments the wire saw shall be encapsulated in a containment structure.
4. Cutting fluids collected in the containment structure shall be transferred to a holding structure by using vacuums or direct pumping.
5. Containment structure(s) shall have HEPA equipped ventilation to create negative air effect inside the structure.
6. Containment structure to have view ports on each side and one door of access into the structure.
7. Hydraulic pump(s) to be located in area of low dose up to 150 feet away from cut location.
8. Hydraulic pump will have remote start/stop capabilities from the hydraulic control cart.
9. Hydraulic control cart to be located within sight of the cut location where possible in a low dose area.
10. All wire saw equipment is designed to operated in open air environments.
11. Horizontal cuts separating structures above shall have supports to prevent wire pinching per design documents.
12. Diamond wire shall be inspected continuously for signs of wear. Damaged or excessively worn wire shall be removed from service.
13. Diamond wires shall vary from 10 to 15 mm in diameter.
14. Guide pulleys shall be periodically inspected for wear, flat spots and bearing integrity. Pulleys shall be replaced as necessary.

WATER CONTROL

1. All water and slurry shall be treated as if contaminated.
2. Cutting fluids to be collected into containers ranging from 55 gallon drums to B-25 type boxes.
3. All vacuum operations will be HEPA equipped.
4. Filled containers of cutting waste shall be transported to a central location at the work area for processing as directed by RCT.
5. Separation of solids and reclamation of water shall be through the use of a filter press.
6. Separated solids shall be placed in approved containers for disposal by others.
7. Reclaimed water shall be reused for cutting operations as approved by RCT.
8. Reclaimed water not approved for reuse shall be set aside for disposal by others.

All handling of wastewater shall be in accordance with approved radiological controls

NOTES

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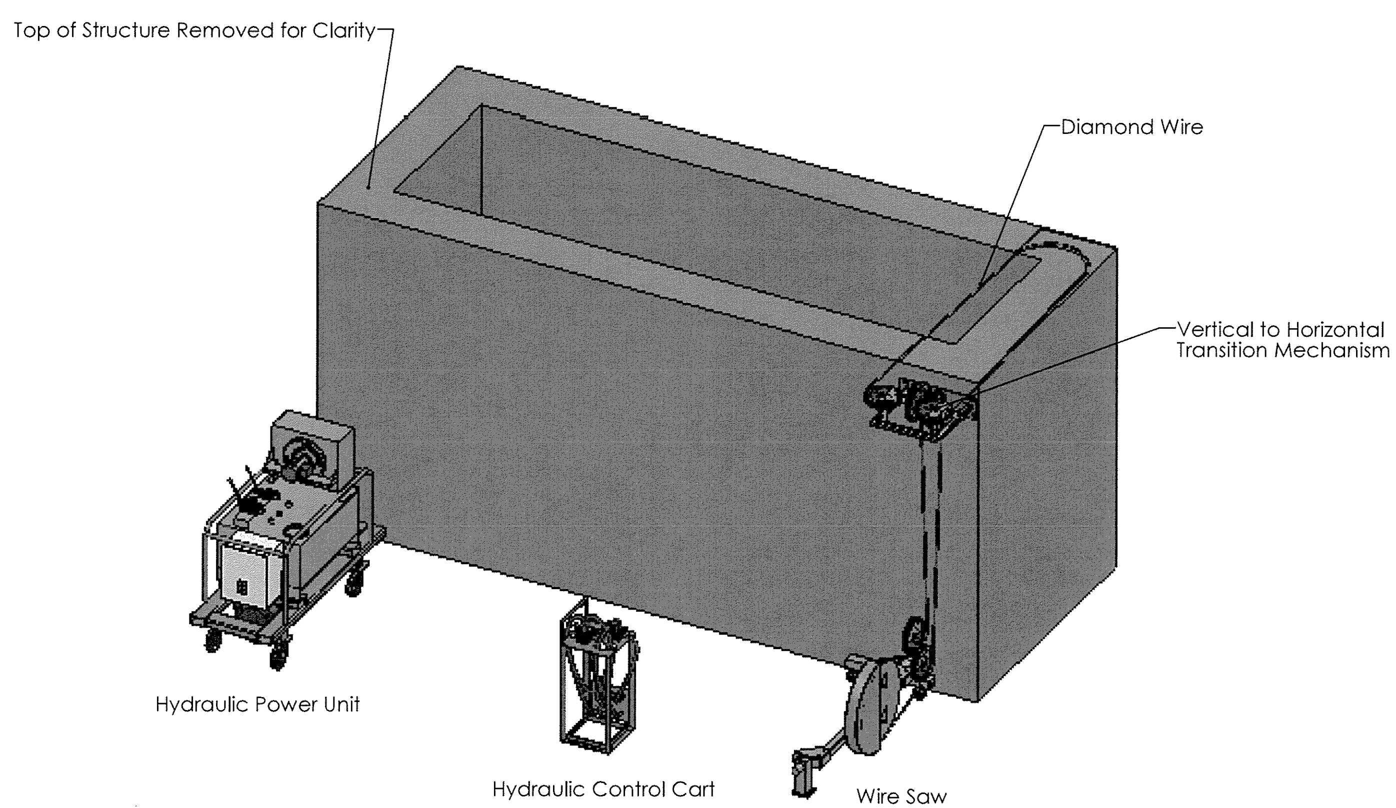
TYPICAL HORIZONTAL CUT



NOTES

1) HPU/Control Cart shown for Information Only

2) See DWG BG4 for Water Control Details

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TASK	DRAWING NO.	REV. NO.
X	BG2-1	0

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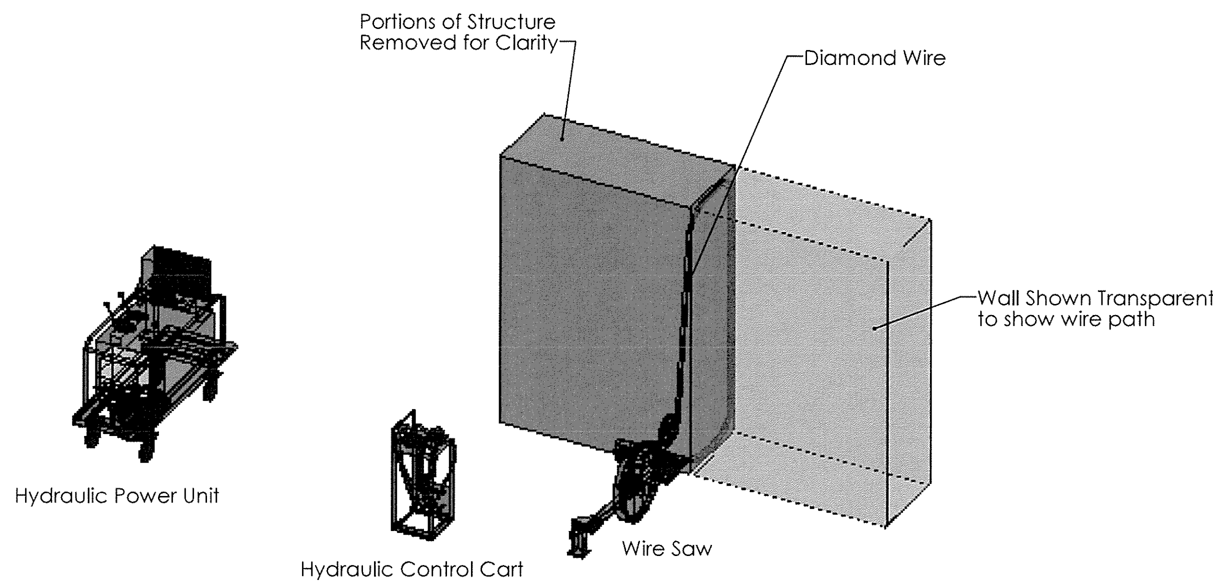
TYPICAL VERTICAL CUT



NOTES

1) HPU/Control Cart shown for Information Only

2) See DWG BG4 for Water Control Details

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X	BG2-2	0

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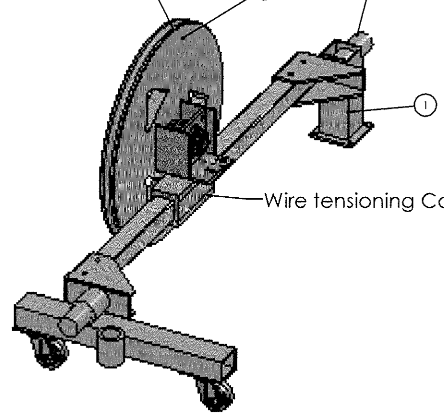
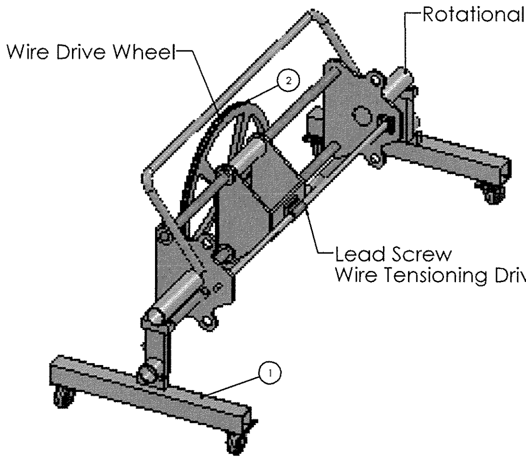
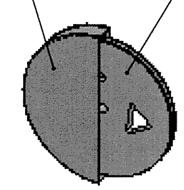
Portable Saw Arrangement



Heavy Duty Wire Saw





Drive Wheel Guard(TYP)

NOTES

1) Frame Materials A-36 Steel

2) Wire Drive Wheels Fabricated from 6061-T6 Aluminum

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RECORD INFORMATION

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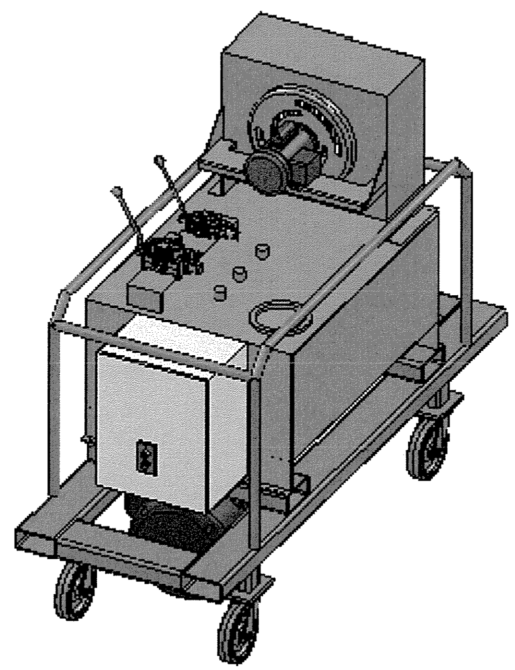
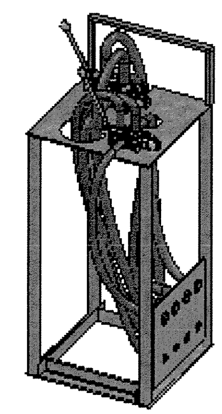
Hydraulic Power Unit



HPU Located Up to 150ft from Cut.
Remote start/stop located at Hydraulic Control Cart.

Hydraulic Control Cart



Hydraulic Controls with technicians located in LDWA established by RCT.

NOTES

1) Hydraulic Power Unit: 50HP 480v
3 Phase Electric Motor

2) 34GPM Main Pump
5GPM Secondary Pump

3) Hydraulic Power Unit is Air Cooled

4) Connections of Hydraulic Power Unit to Hydraulic Control Cart Via.
Qty 2-1" Dia. Hydraulic Hose
Qty 3-3/8" Dia Hydraulic Hose

5) All Hydraulic Hose is 2 Wire 3000PSI

6) All Electric Components UL Approved

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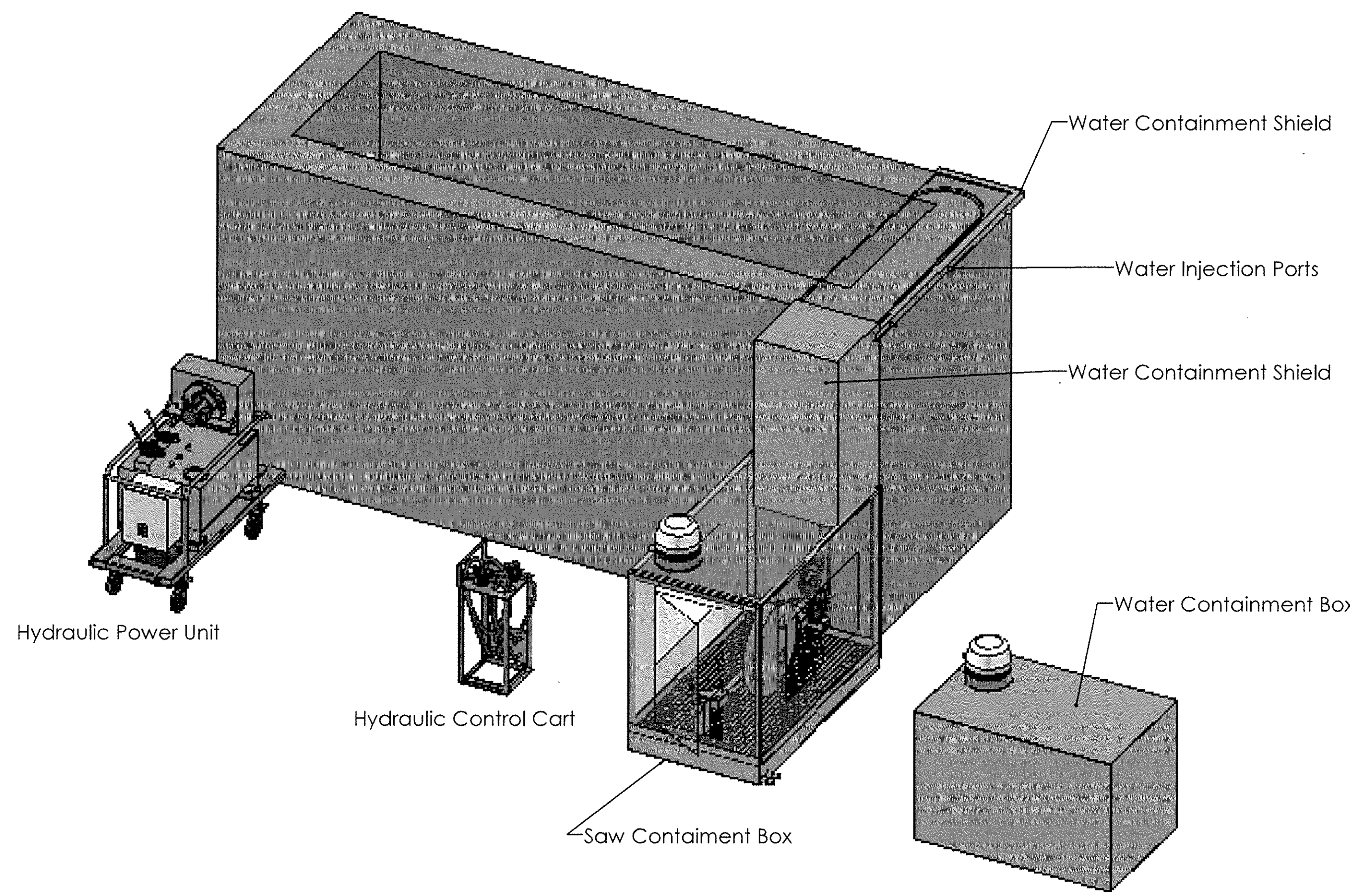

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TASK	DRAWING NO.	REV. NO.
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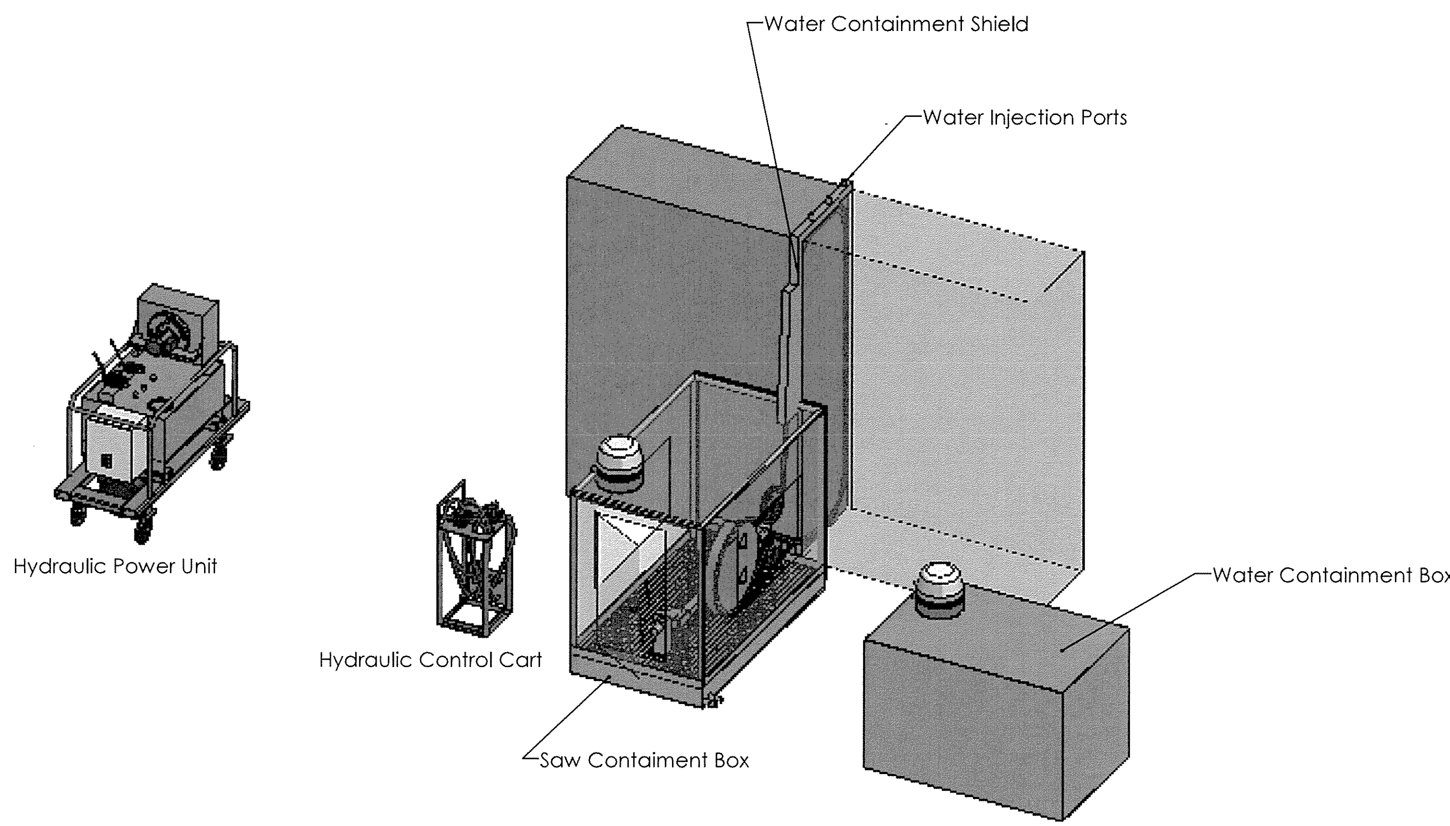

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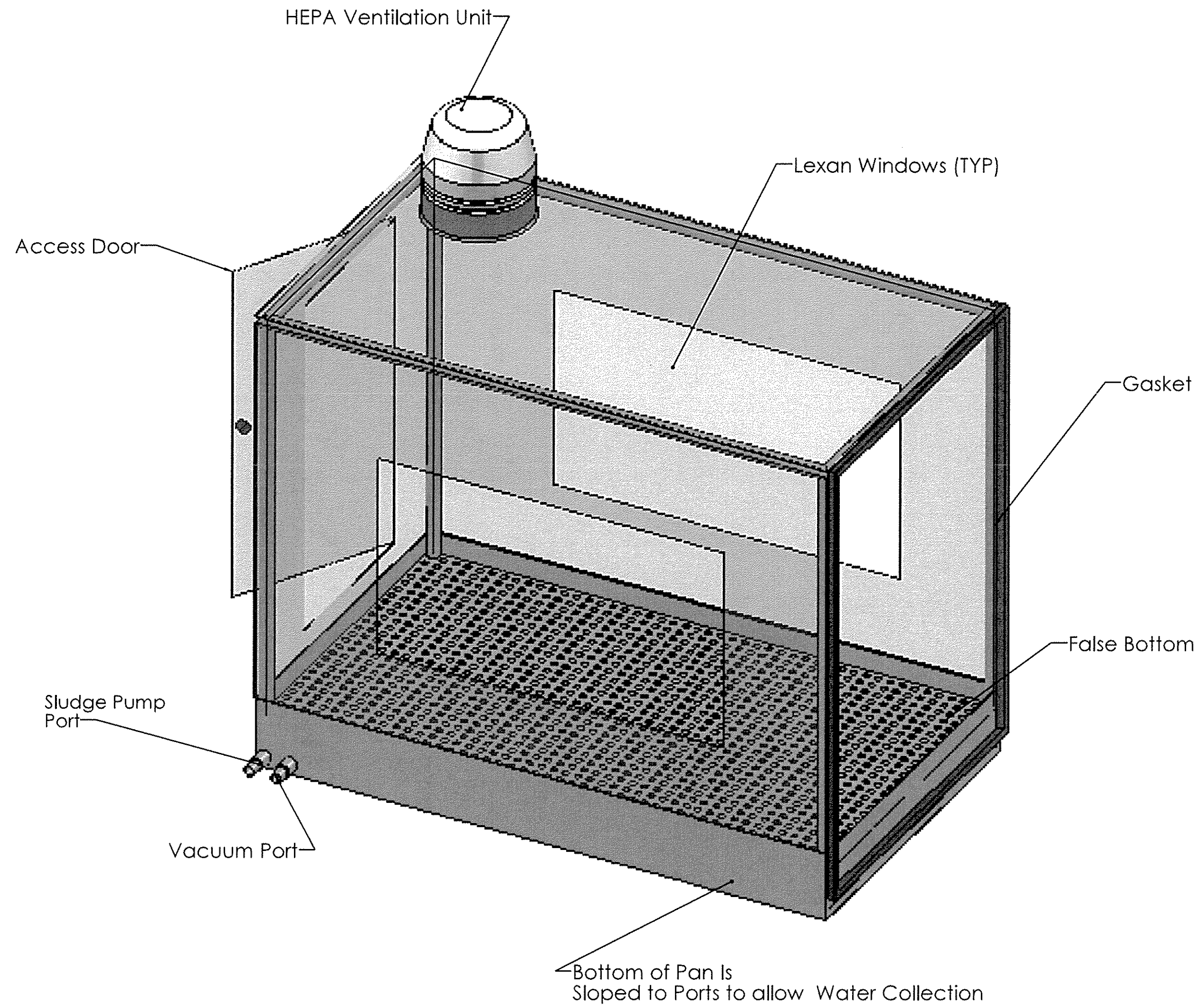

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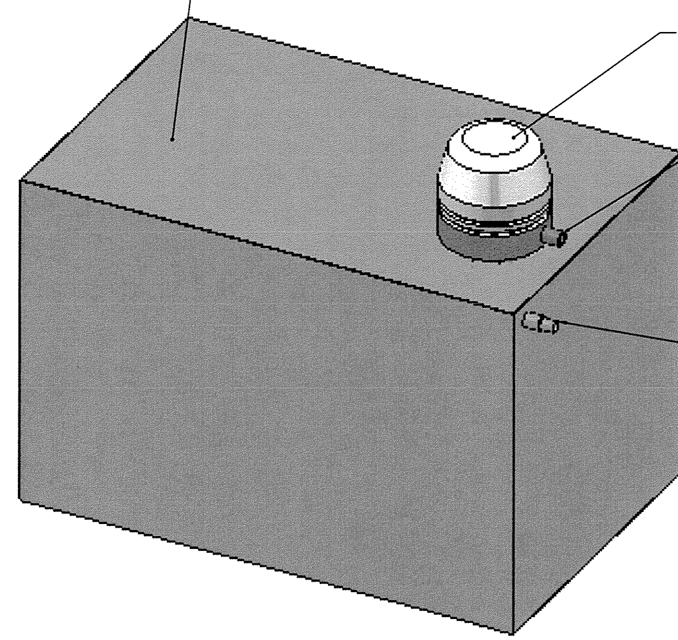
Water Control



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TASK	DRAWING NO.	REV. NO.
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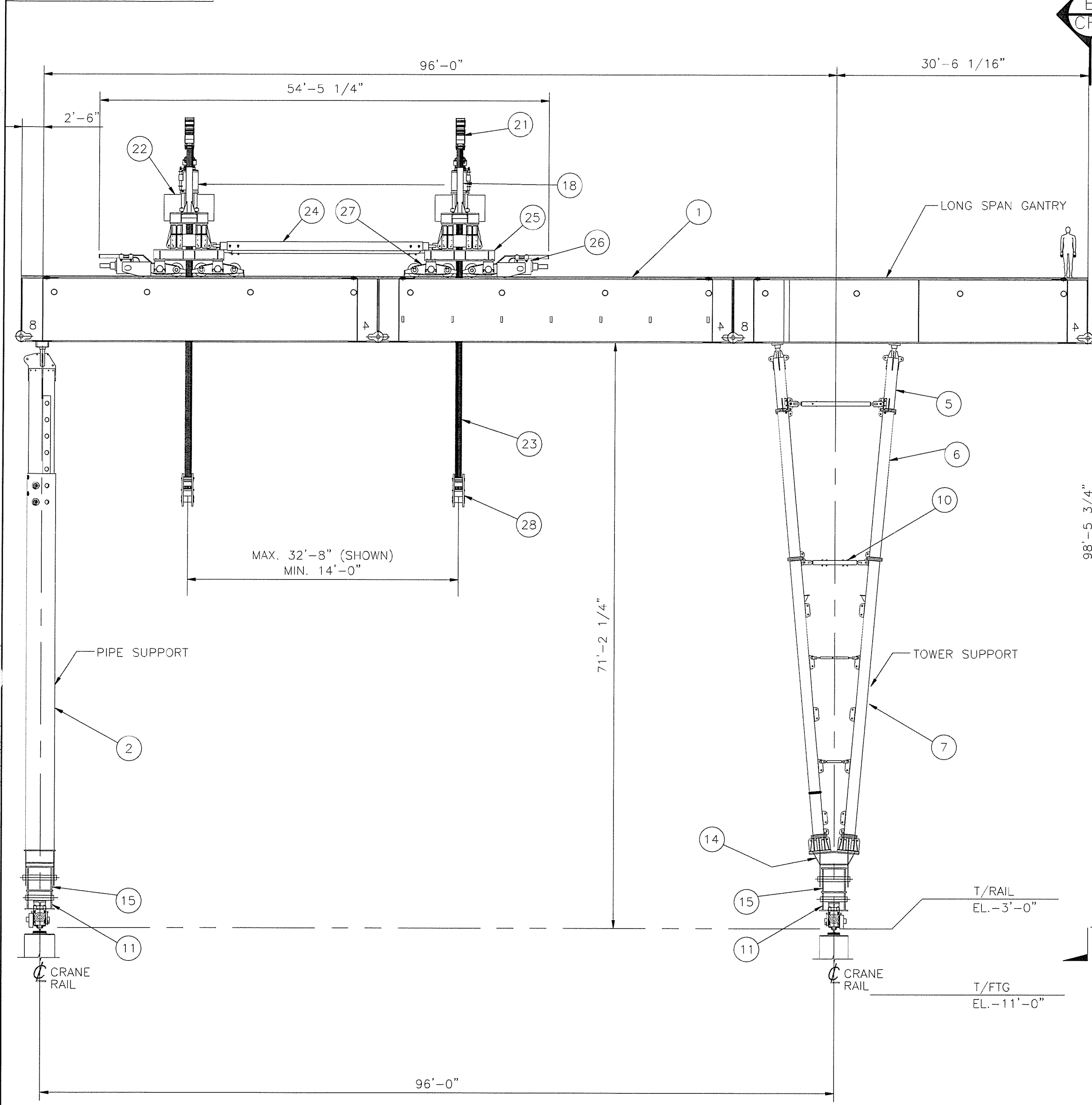
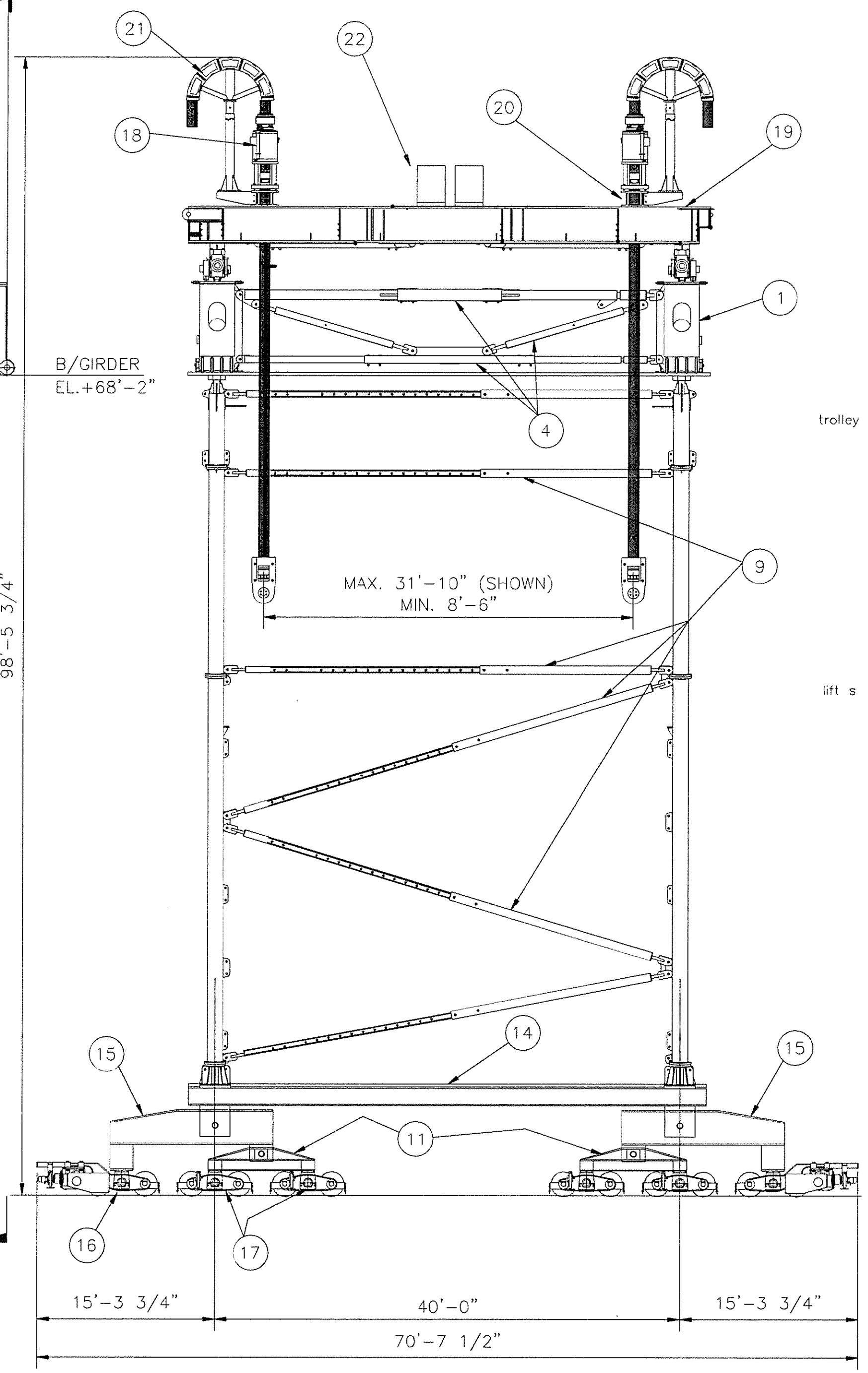


ELEVATION VIEW (A / CR1)

SCALE: 1/8"=1'-0"



END VIEW (B / CR1)

SCALE: 1/8"=1'-0"

NOTES

EQUIPMENT LIST

	MK.	QTY	DESCRIPTION / EQUIPMENT No.	WEIGHT EACH	TOTAL WEIGHT Lbs.
main m	1	6	SME GIRDER 40'	43,100	258,600
m	2	2	ADJUSTABLE TOWER TA402-1 & 2	23,150	46,300
m	3	1	ADJUSTABLE BRACE BA16-3-1	5,280	5,280
m	4	2	GIRDER BRACING FRAME	10,000	20,000
m	5	4	COLUMN TIP TS-COLTIP-8 (8'-0")	1,575	6,300
m	6	4	COLUMN BRACE LTS-3LBC (12'-0")	1,960	7,840
m	7	4	COLUMN LTS-COL-38 (38'-0")	5,295	21,180
m	8	10	ADJUSTABLE BRACE BA12	2,000	20,000
m	9	8	ADJUSTABLE BRACE BA8	1,380	11,040
m	10	8	COLUMN BASE LTS-BASE	1,750	14,000
m	11	4	SUB EQUALIZER	5,000	20,000
m	12	1	TA 402 CROSS BEAM BA18	4,000	4,000
m	13	1	V SILL BEAM	19,000	19,000
m	14	1	SILL BEAM	18,000	18,000
m	15	4	EQUALIZER	10,000	40,000
m	16	6	18" DRIVE TRUCK ASSEMBLY GWD	5,030	30,180
m	17	6	18" IDLER TRUCK ASSEMBLY GWI	2,850	17,100
trolley t	18	4	365 T STRAND JACK	6,400	25,600
t	19	2	HEADER BEAM HGR5	20,000	40,000
t	20	2	JACKING BEAM JB110	2,100	4,200
t	21	4	STRAND TREE	1,350	5,400
t	22	4	HYDRAULIC POWER PACK	1,800	7,200
t	23	240	STRAND 0.62" DIAMETER x 90'	93	22,320
t	24	4	TROLLEY BRACING	2,000	8,000
t	25	4	DRIVE TRUCK BRIDGE BEAM	4,000	16,000
t	26	4	24" DRIVE TRUCK ASSEMBLY GWD	5,030	20,120
t	27	4	24" IDLER TRUCK ASSEMBLY GWI	2,850	11,400
lift s ls	28	4	STRAND JEWELS	1,600	6,400
ls	29	2	SPREADER BEAM (HLV/LLV)	15,000	30,000
ls	30	4	LIFTING EARS	2,400	9,600
			MISCELLANEOUS		50,000
				TOTAL	815,060

SUMMARY DEAD LOAD

MAIN	608,820 lbs	625,000 lbs
TL	160,240 lbs	165,000 lbs
LS	46,000 lbs	50,000 lbs
	815,060 lbs	840,000 lbs

DL	840,000 lbs
LL	2,000,000 lbs
TOTAL	2,840,000 lbs

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
GANTRY CRANE GENERAL ARRANGEMENT 1/3

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	CR1.DWG

TASK	DRAWING NO.	REV. NO.
	CR1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

River Corridor Closure Contract
Dedicated To Safety Excellence

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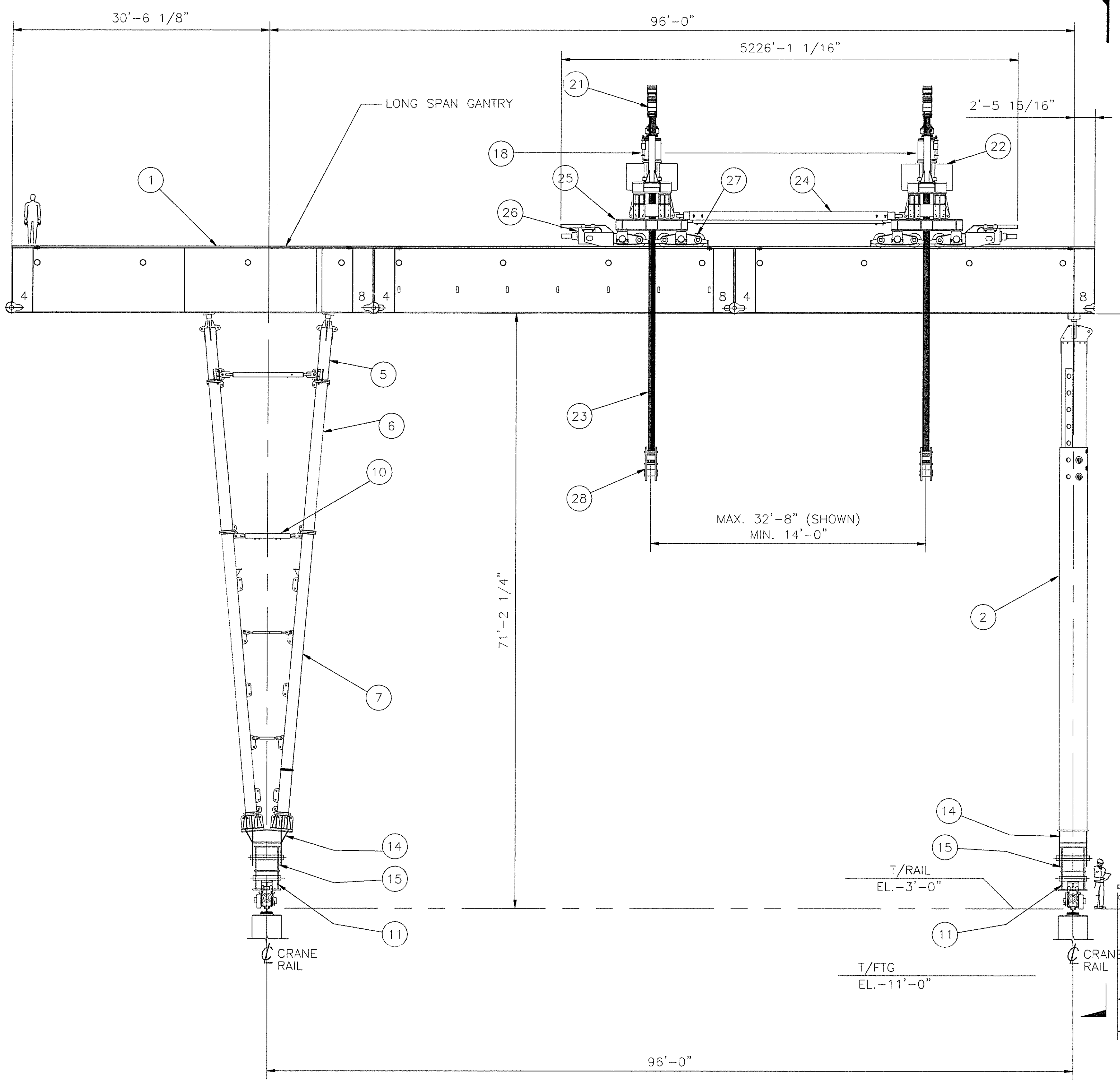
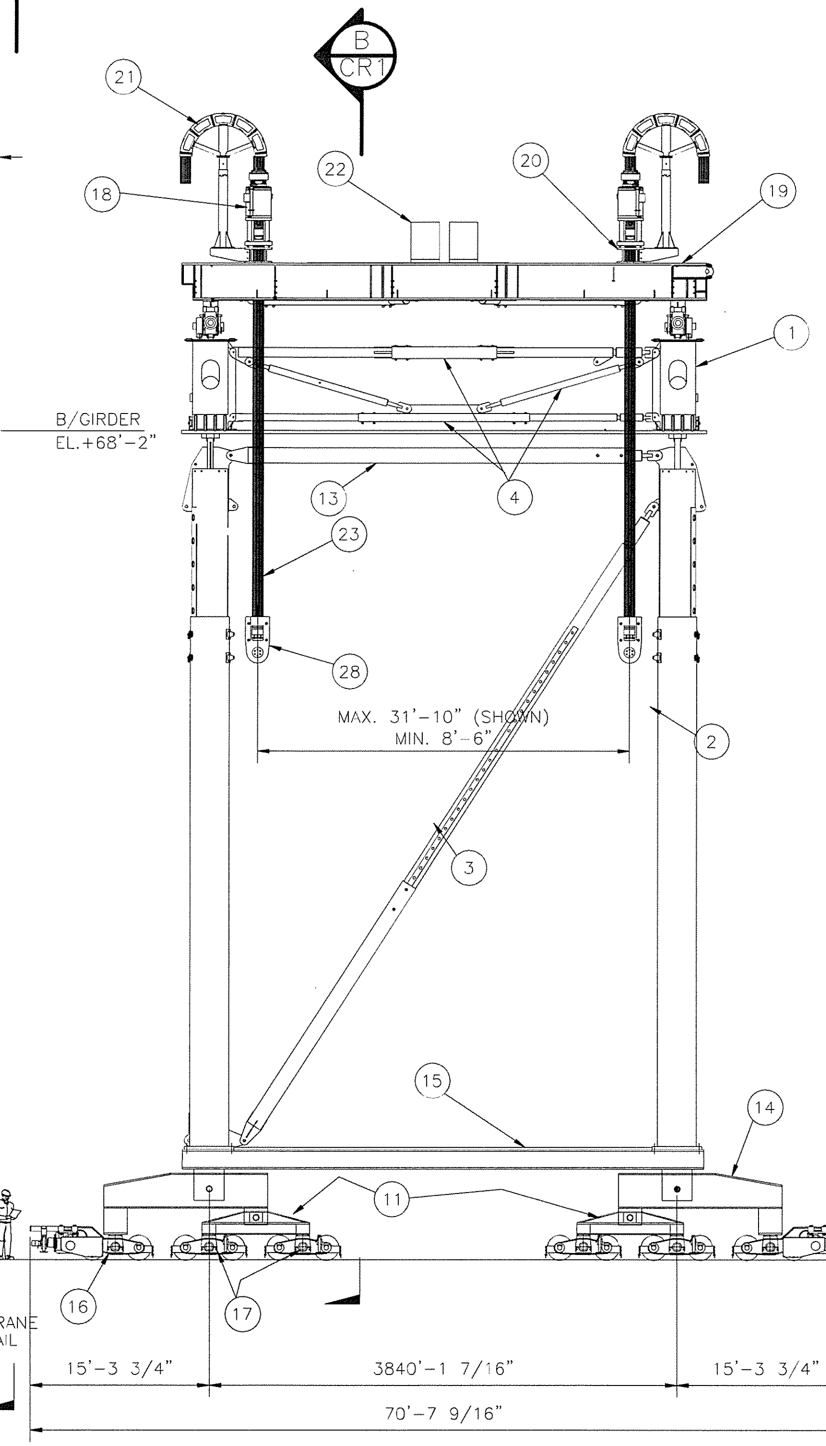
DRAWING NO.	REV. NO.
CR2	A



ELEVATION VIEW A/CR2
1/8" = 1'-0"



END VIEW B/CR2
1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ. ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
GANTRY CRANE GENERAL ARRANGEMENT 2/3

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	CR2.DWG

TASK	DRAWING NO.	REV. NO.
	CR2	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

River Corridor Closure Contract
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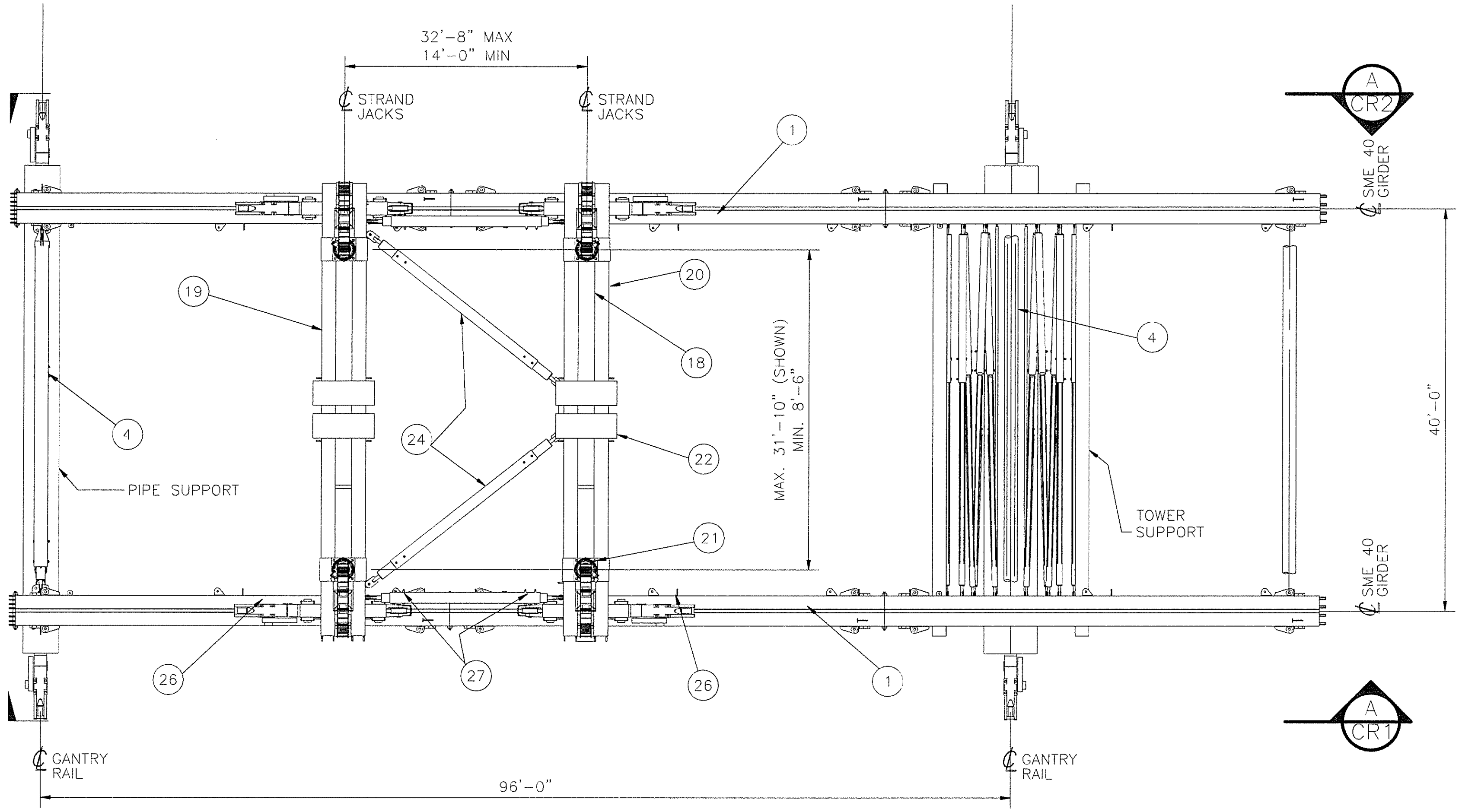
DRAWING NO.	REV. NO.
CR3	A



PLAN VIEW
SCALE: 1/8"=1'-0"
— CR3

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
GANTRY CRANE GENERAL ARRANGEMENT 3/3

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	CR3.DWG

TASK	DRAWING NO.	REV. NO.
	CR3	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

River Corridor Closure Contract
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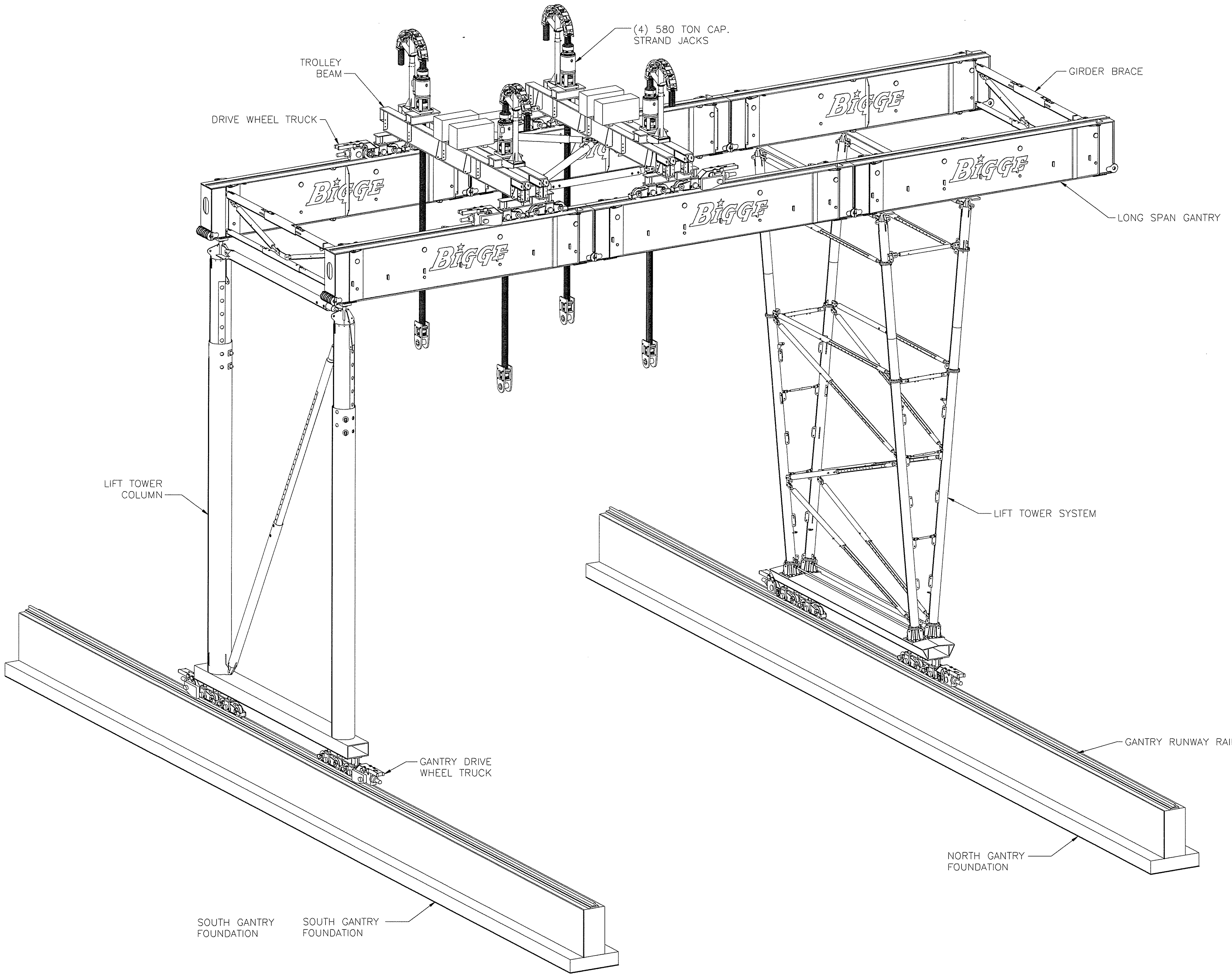
DRAWING NO.	REV. NO.
XX	A



NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC//HHV/LLV LONG SPAN GANTRY SYSTEM
3D ISOMETRIC VIEW

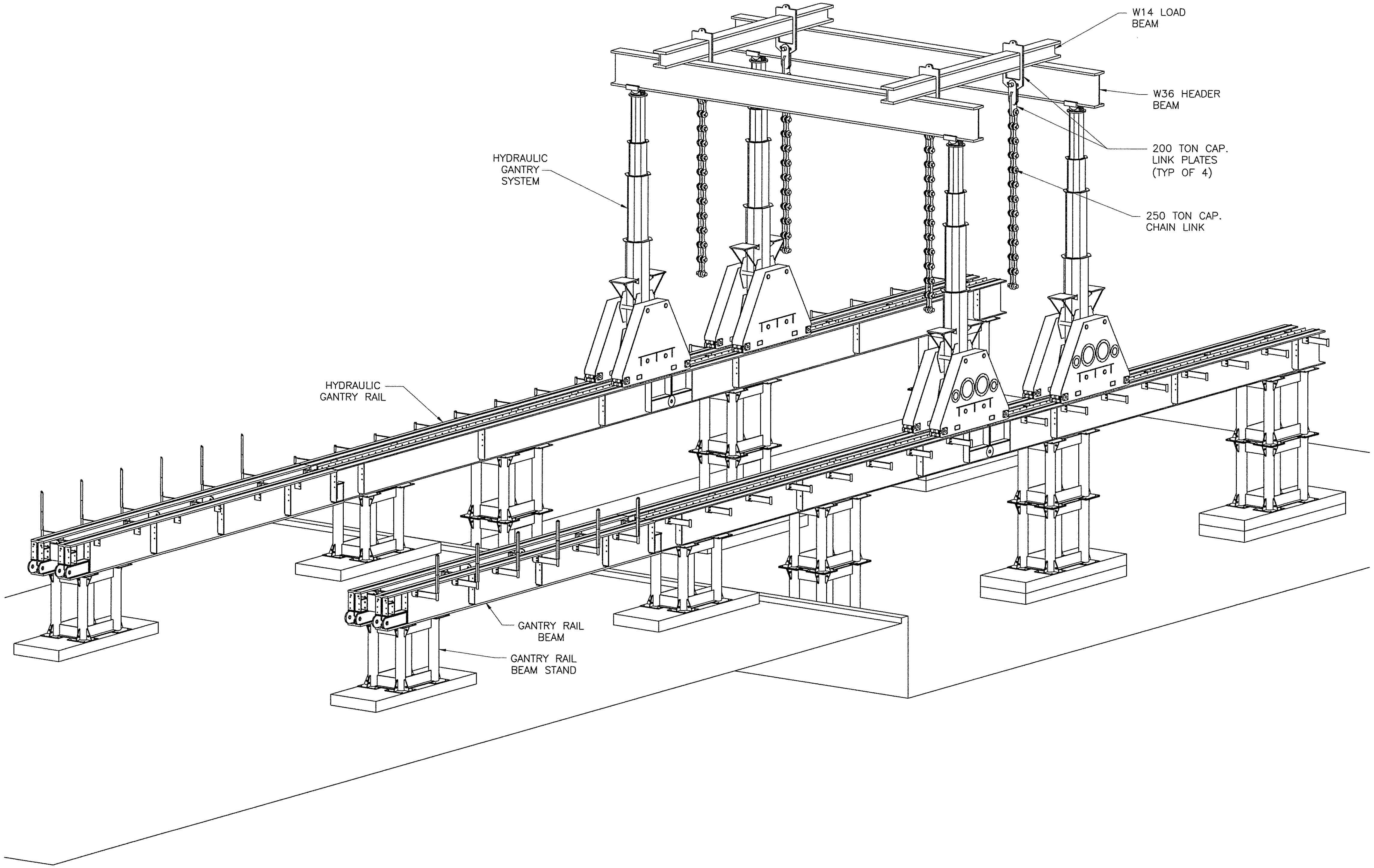
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	CR4	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
△								
△								
△								
△								
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF HYDRAULIC GANTRY SYSTEM
3D ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	HG3	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
TRANSPORT GENERAL
TRANSPORT AND ERDF SET DOWN GENERAL

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	TG1	A

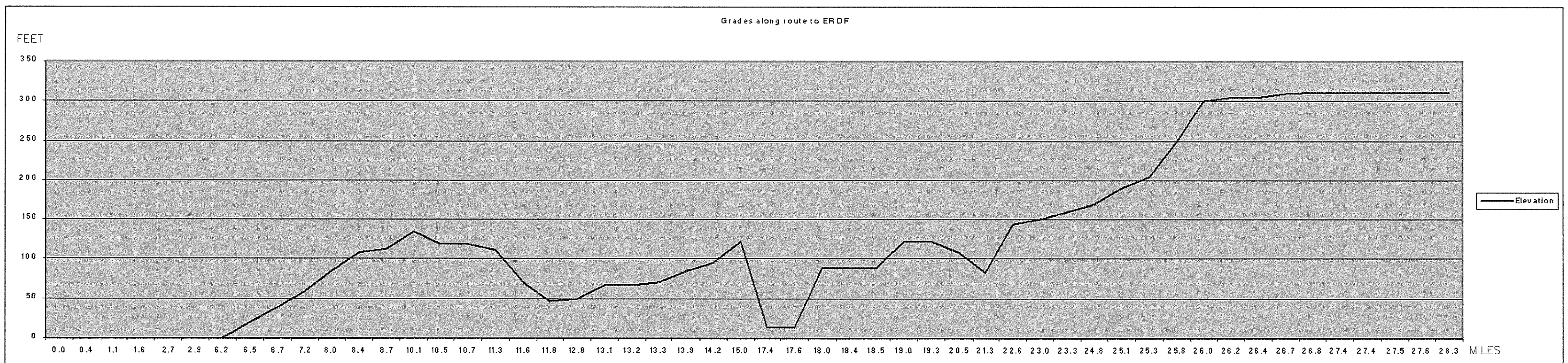
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A

WIRES	MILE	NOTE
O	0.4	CYPRESS STREET TO STEVENS. 4 WIRES AND COMMUNICATION CABLE
X	STEVENS DRIVE AT THE NORTH QUE (EMPTY RO/RO CAN LOT)	
O		3 HV PRIMARY AND 2 LV WIRES
X		
O	6.7	3 HV AND 2 LV WIRES (POST 44A)
X		
O	8.4	ON STEVENS HIGH VOLTAGE LINES FROM CNGS
O		
	10.0	WYE BARRICADE BYPASS FOR SUBS TO ROUTE 2 SOUTH
	11.2	DOWNGRADE ON ROUTE 2 S
O	13.0	12 HV AND 4 OTHER WIRES, HIGH OFF THE ROAD
X		
O	14.8	9 HV WIRES AND 1 OTHER WIRE, HIGH OFF THE ROAD
	17.5	RUN INTO ROUTE 11

X		
O	18.3	9 HV WIRES AND 1 WIRE., HIGH OFF THE ROAD
O	19.1	5 HV WIRES (HIGH OFF THE ROAD)
O	20.3	9 HV WIRES, HIGH OFF THE ROAD
O	21.1	6 HV WIRES AND 4 LV WIRES, HIGH OFF THE ROAD
	22.5	START OF SEVERE GRADE UPWARDS
	22.9	TOP OF GRADE AT RR TRACK
O	24.6	6 WIRES
	24.8	CROSS ROADS, TURN LEFT ON TO ROUTE 4 S
O	25.0	1 COMMO LINE AND START OF UP GRADE
X		
O		
O	26.7	3 LV WIRES. TURN RIGHT ON TO ROUTE 3
	27.2	TURN LEFT ON TO ERDF CONSTRUCTION ROAD. 2 COMMON LINES
	27.3	UNDERGROUND PIPING
	27.5	UNDERGROUND PIPING
	27.9	UNDERGROUND PIPING
	28.2	ERDF GATE
O WIRE CROSSING COUNT: 15		
X RAIL CROSSING COUNT: 4		



RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

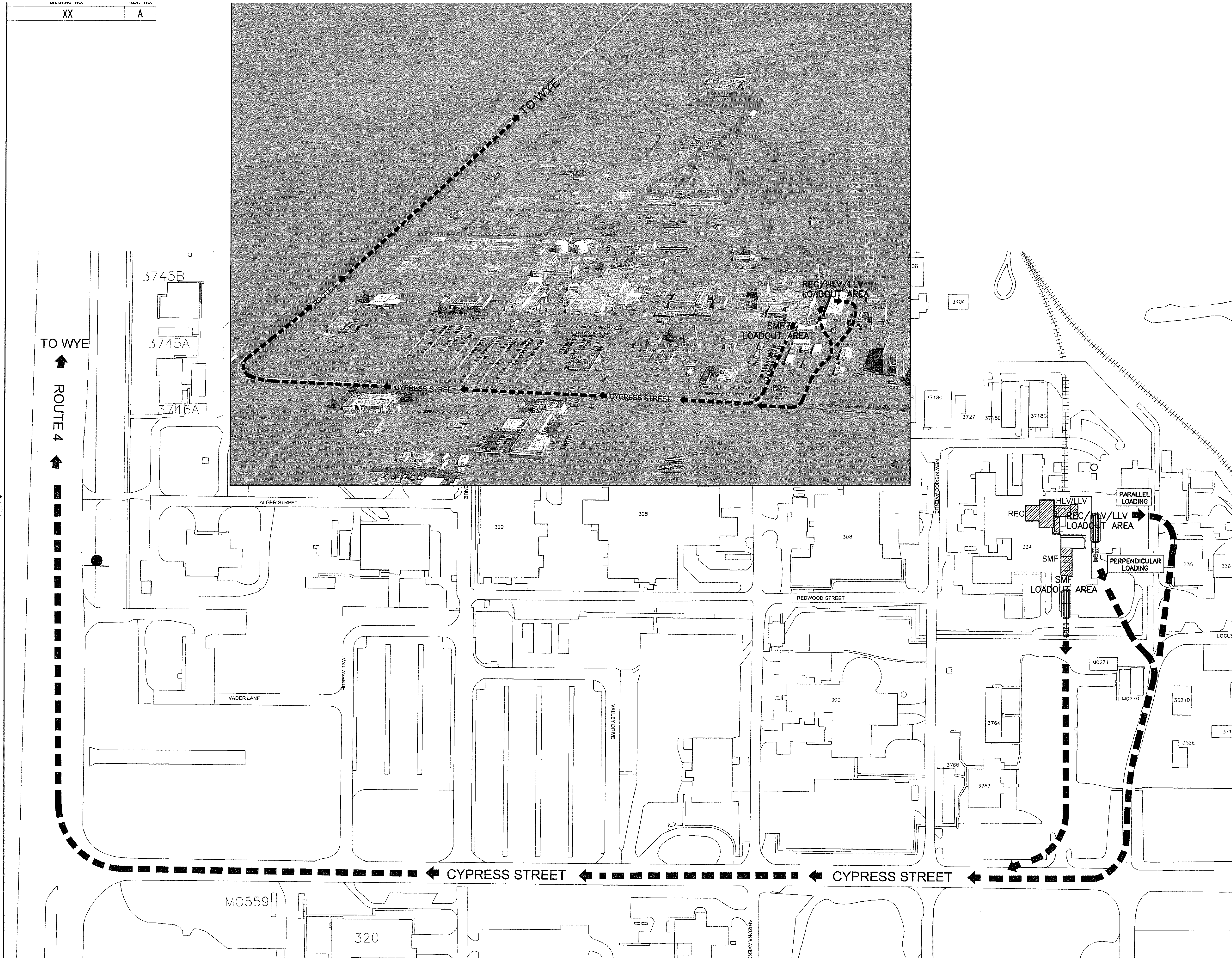
NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
TRANSPORT ROUTE AND NOTES
TRANSPORT NOTES/ELEVATION ANALYSIS CHART

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	TG2	A

DRAWING NO.	REV. NO.
XX	A



NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	DRIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	XX		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

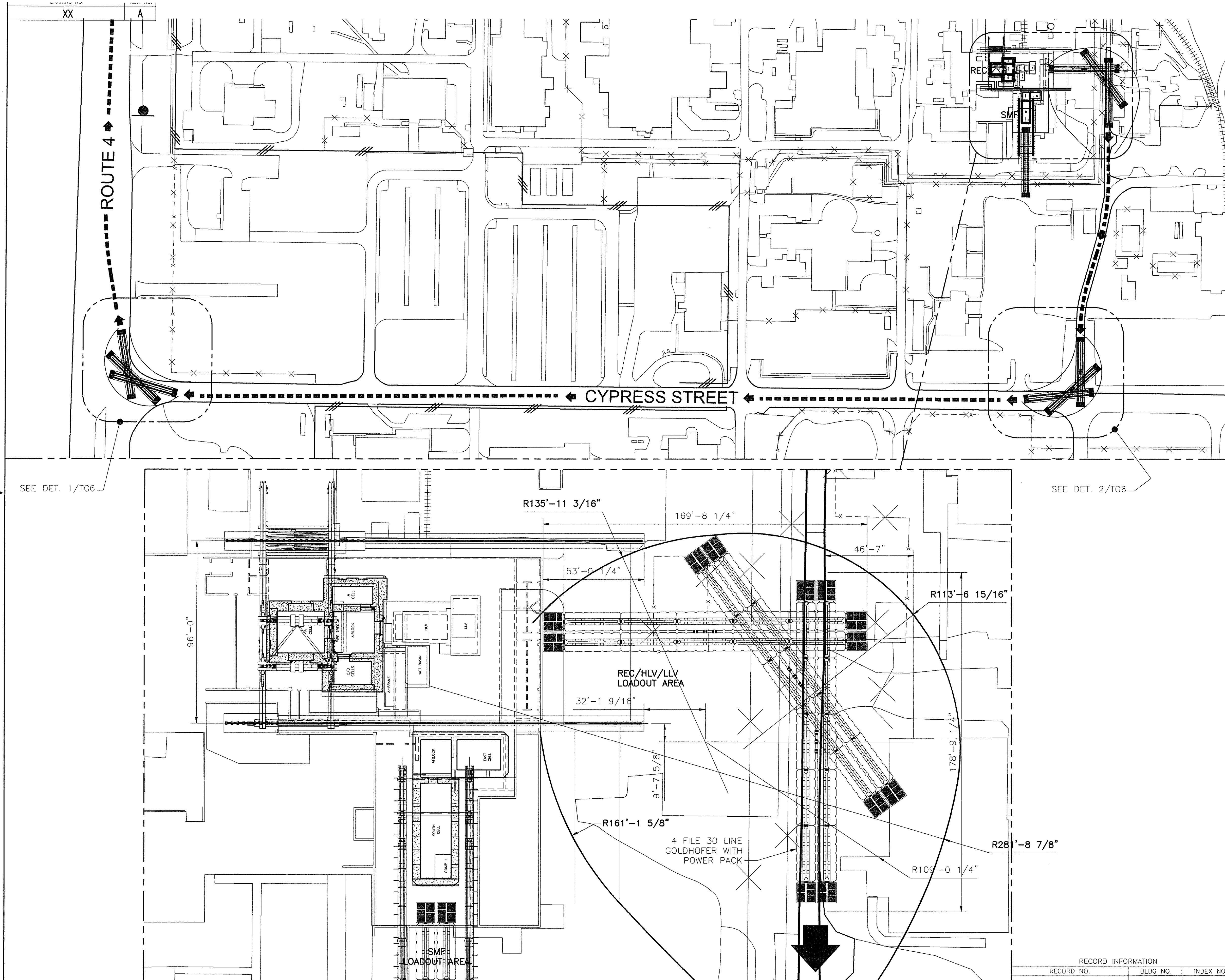
BLDG. 324 HOT CELLS
TRANSPORT DETAILS 1
324 EXIT TRANSPORT DETAIL

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	TG3	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.



NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	XX		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
TRANSPORT DETAILS 2
PERPENDICULAR EXIT FROM REC TO CYPRESS

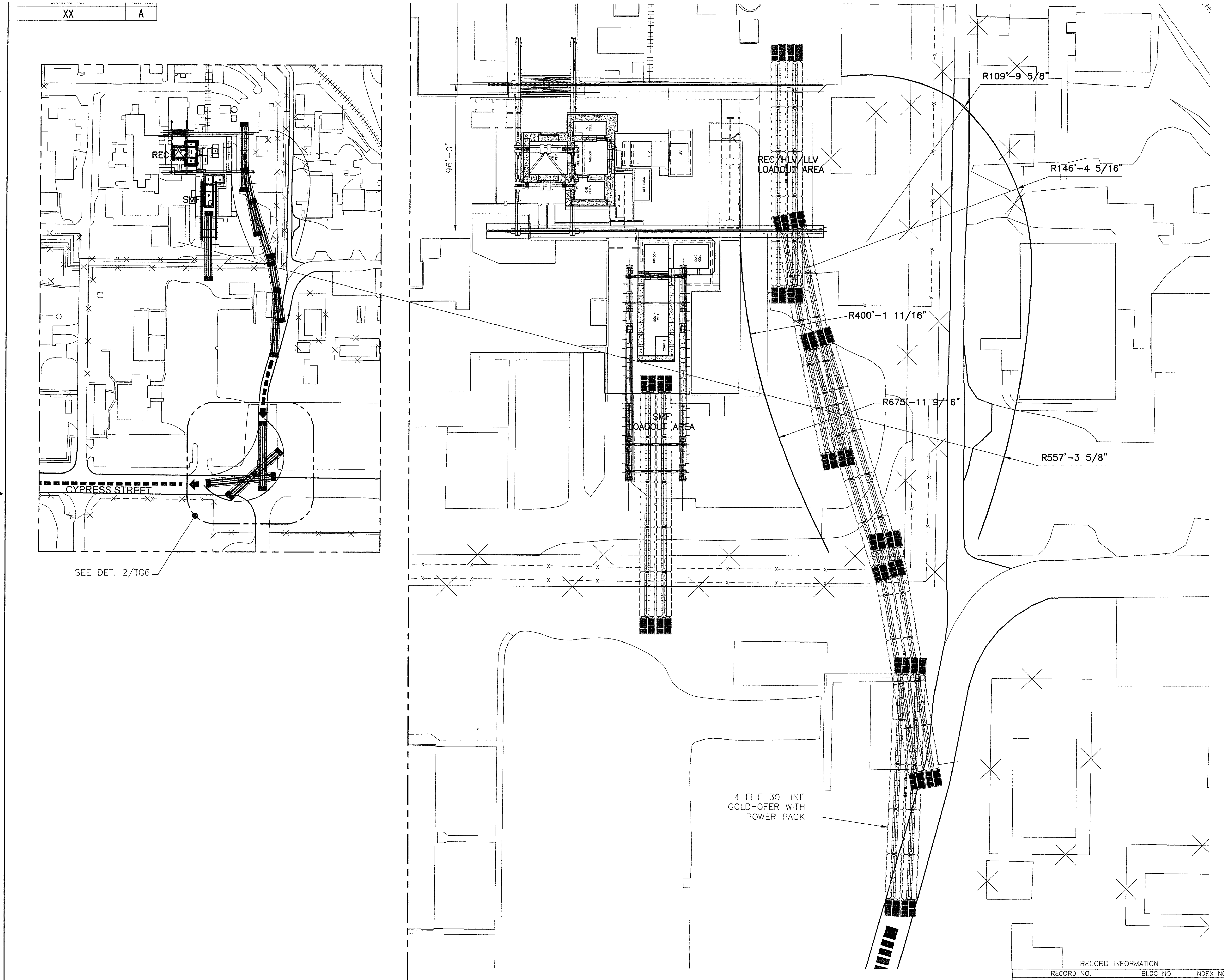
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	TG4	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	XX		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
TRANSPORT DETAILS 3
PARALLEL EXIT FROM REC TO CYPRESS

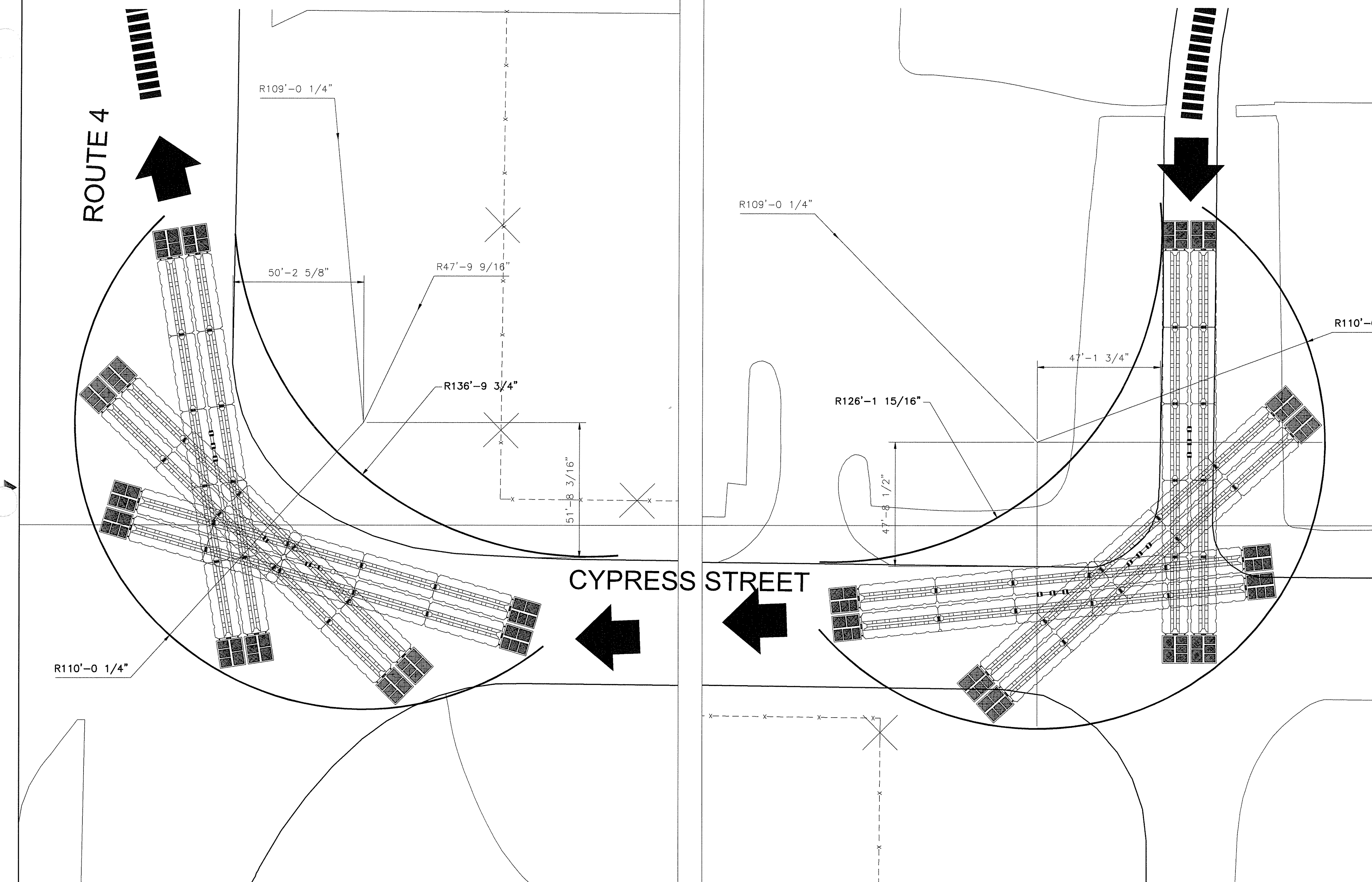
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	TG5	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



DETAIL 1/TG6

DETAIL 2/TG6

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
TRANPORT DETAILS 4
CYPRESS STREET TURNING

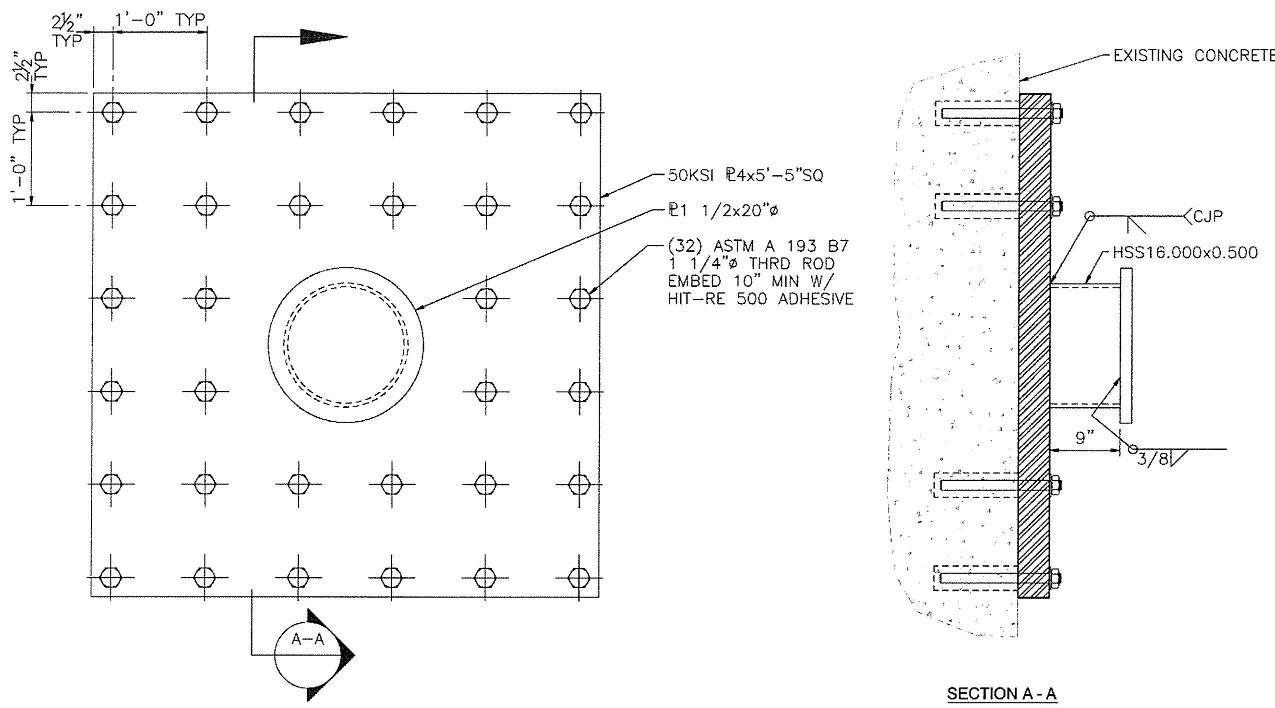
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	TG6	A

RECORD INFORMATION

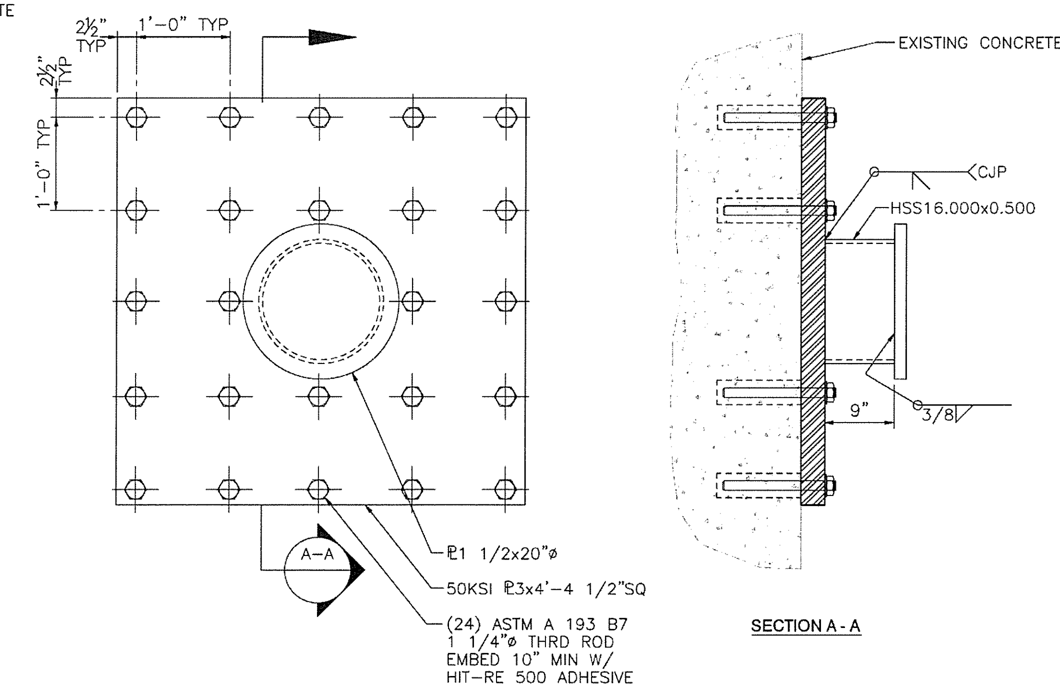
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
____-__-____	A



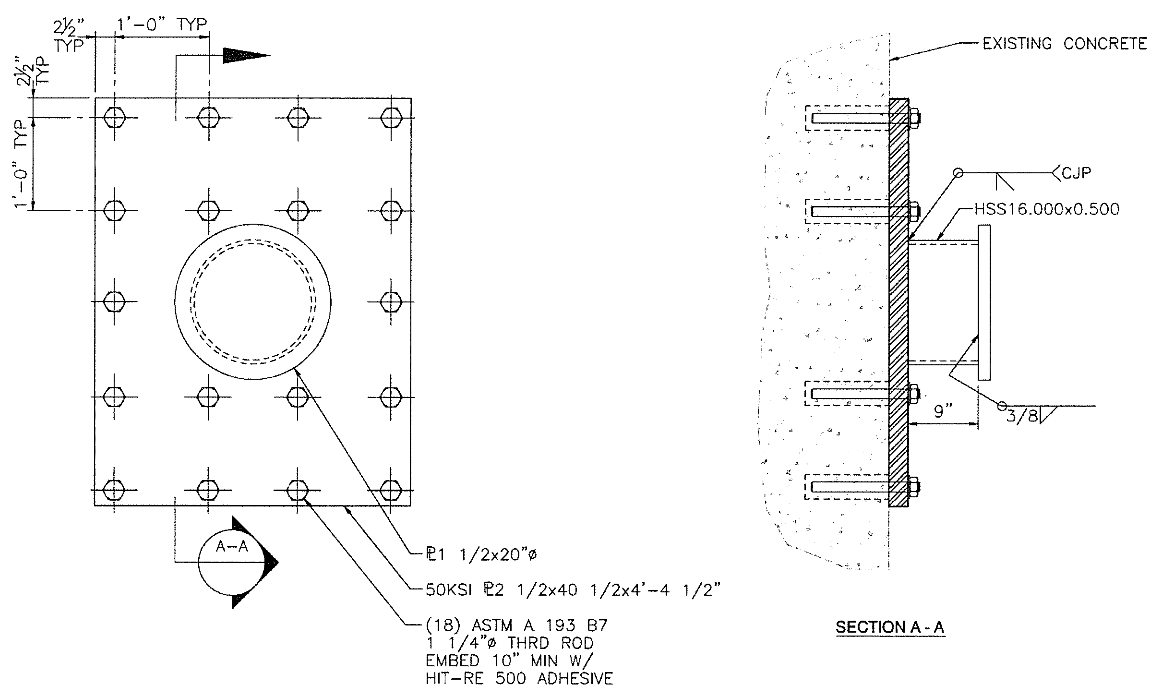
1 / REC2 LIFTING EMBED PLATE 660K

SCALE: 1"=1'-0"



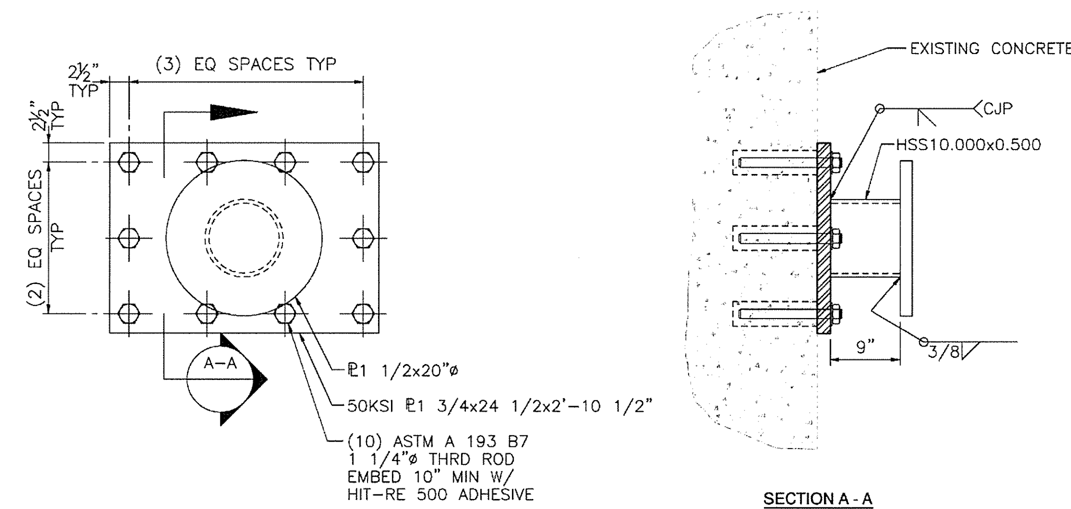
2 / REC2 LIFTING EMBED PLATE 450K

SCALE: 1"=1'-0"



3 / REC2 LIFTING EMBED PLATE 300K

SCALE: 1"=1'-0"



4 / REC2 LIFTING EMBED PLATE 150K

SCALE: 1"=1'-0"

River Corridor Closure Contract — Dedicated WCH Excellence

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

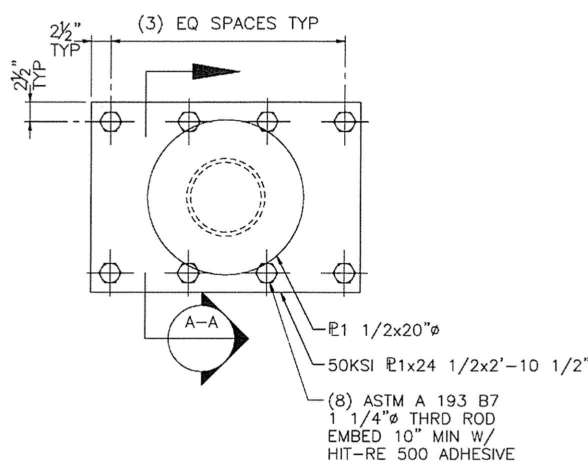
DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

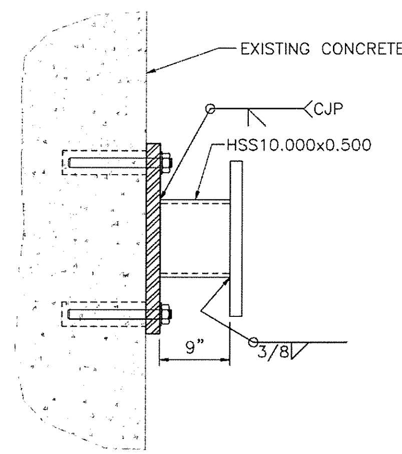
BLDG. 324 HOT CELLS
REC/HLV/LLV LIFTING EMBED PLATE DETAILS
PLATES 660K, 450K, 300K AND 150K

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

TASK	DRAWING NO.	REV. NO.
_	REC2	A

DRAWING NO.	REV. NO.
_____-__-_____	A





SECTION A - A

4 / REC3 — LIFTING EMBED PLATE – MONOLITH 12 ONLY

SCALE: 1

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC/HLV/LLV LIFTING EMBED PLATE DETAILS
PLATES 660K, 450K, 300K AND 150K

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

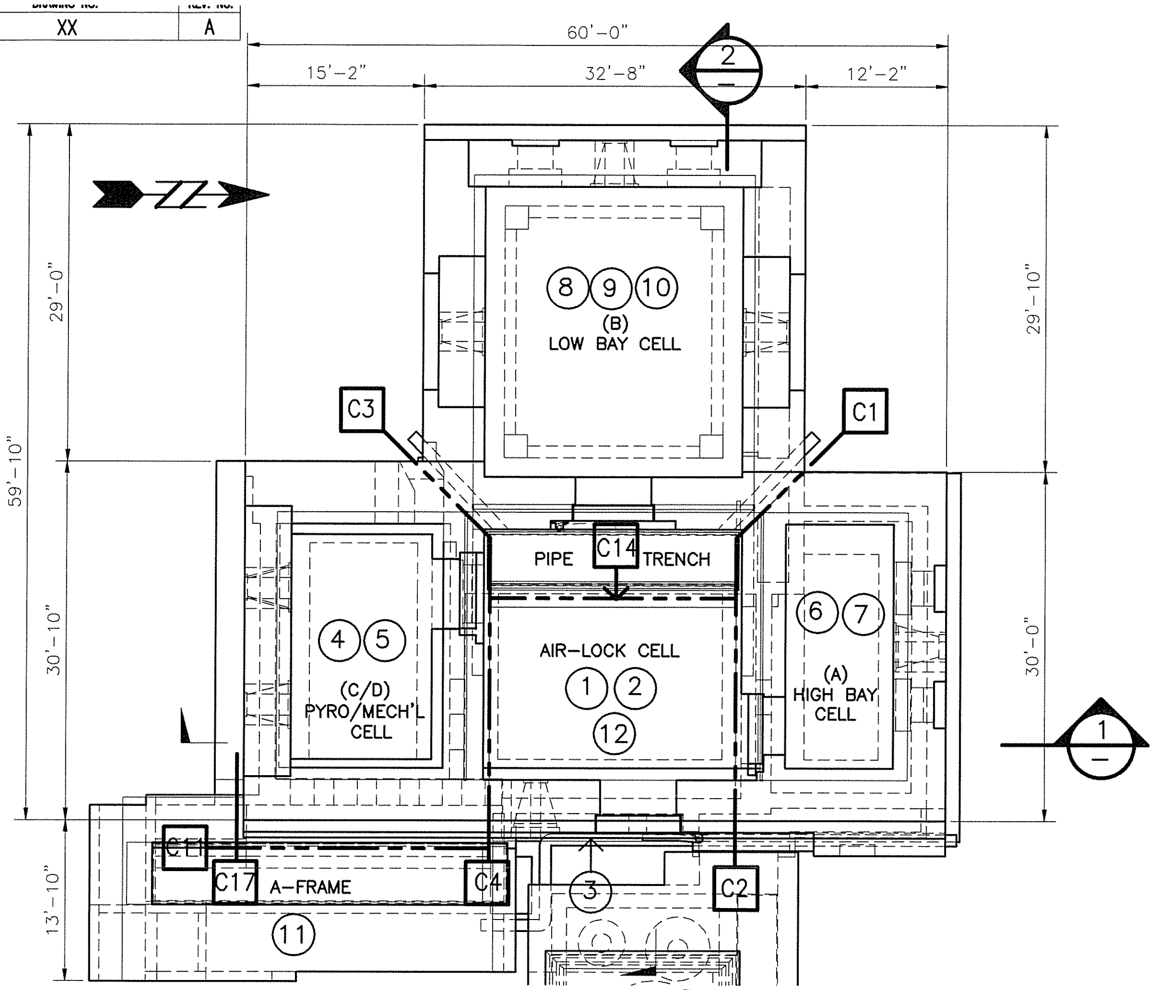
TASK	DRAWING NO.	REV. NO.
–	REC2	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

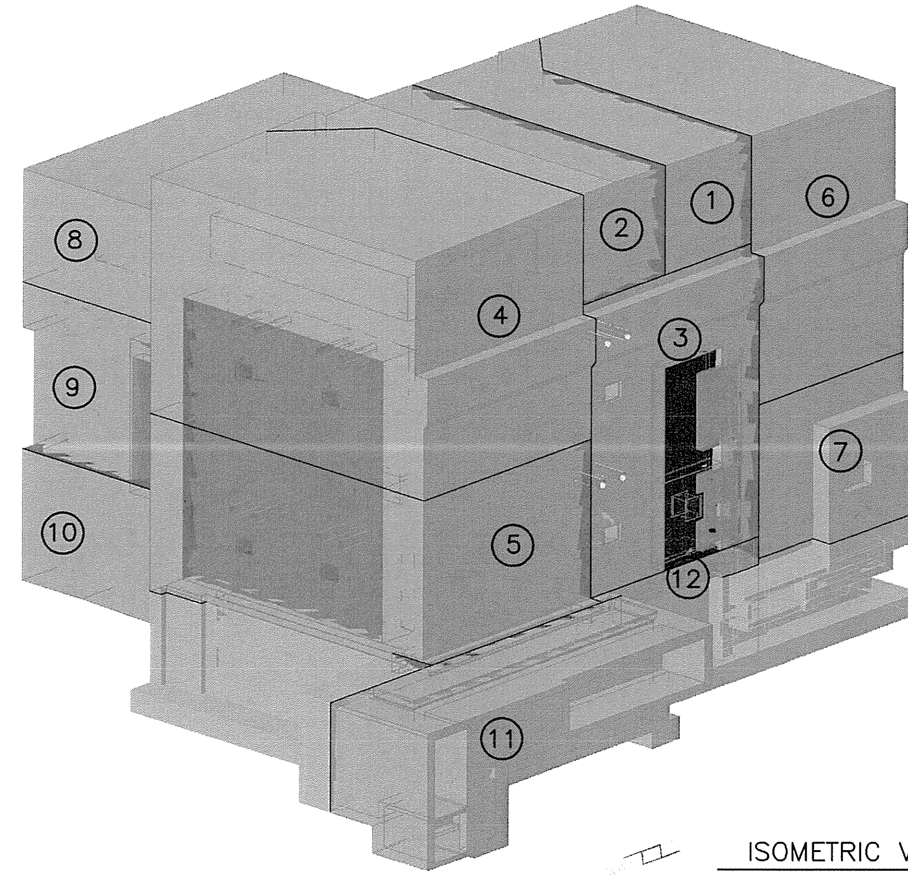
River Corridor Closure Contract — Dedicated to Safety and Excellence

DRAWING NO.	REV. NO.
XX	A



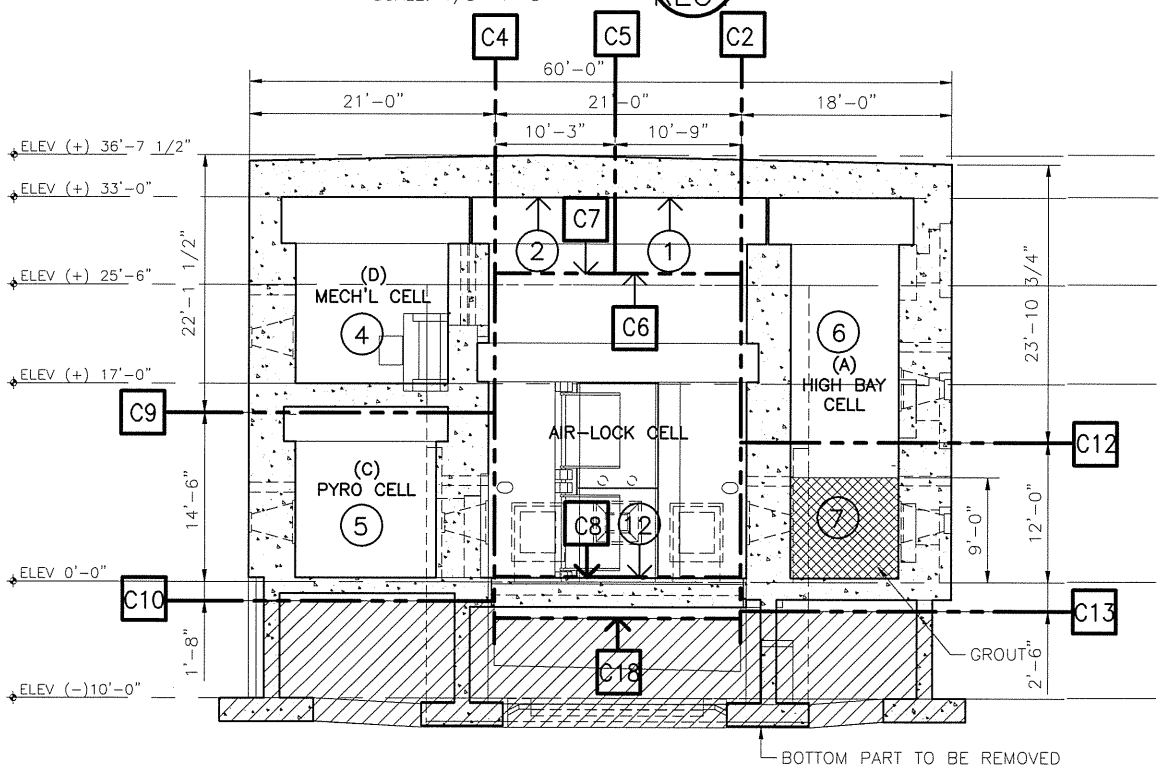
PLAN VIEW (A / REC4)

SCALE: 1/8"=1'-0"



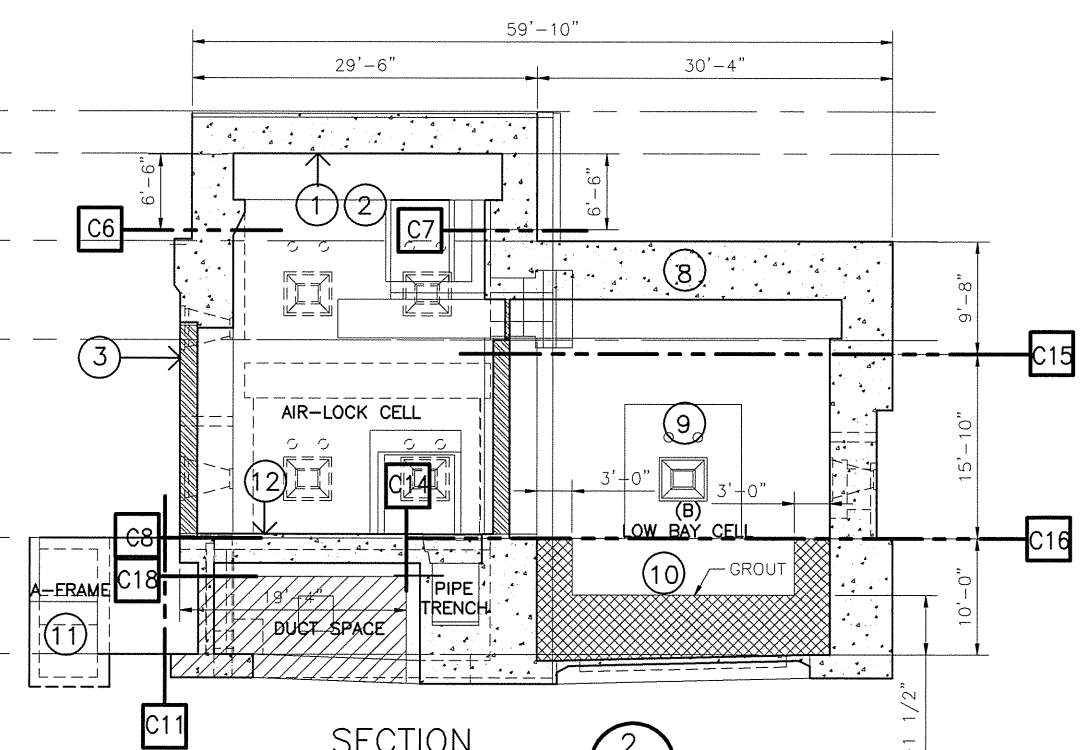
ISOMETRIC VIEW

NOT TO SCALE



SECTION (1 / REC4)

SCALE: 1/8"=1'-0"



SECTION (2 / REC4)

SCALE: 1/8"=1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC CUTTING PLAN
PLAN VIEW/SECTIONAL ELEVATIONS, ISOMETRIC

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

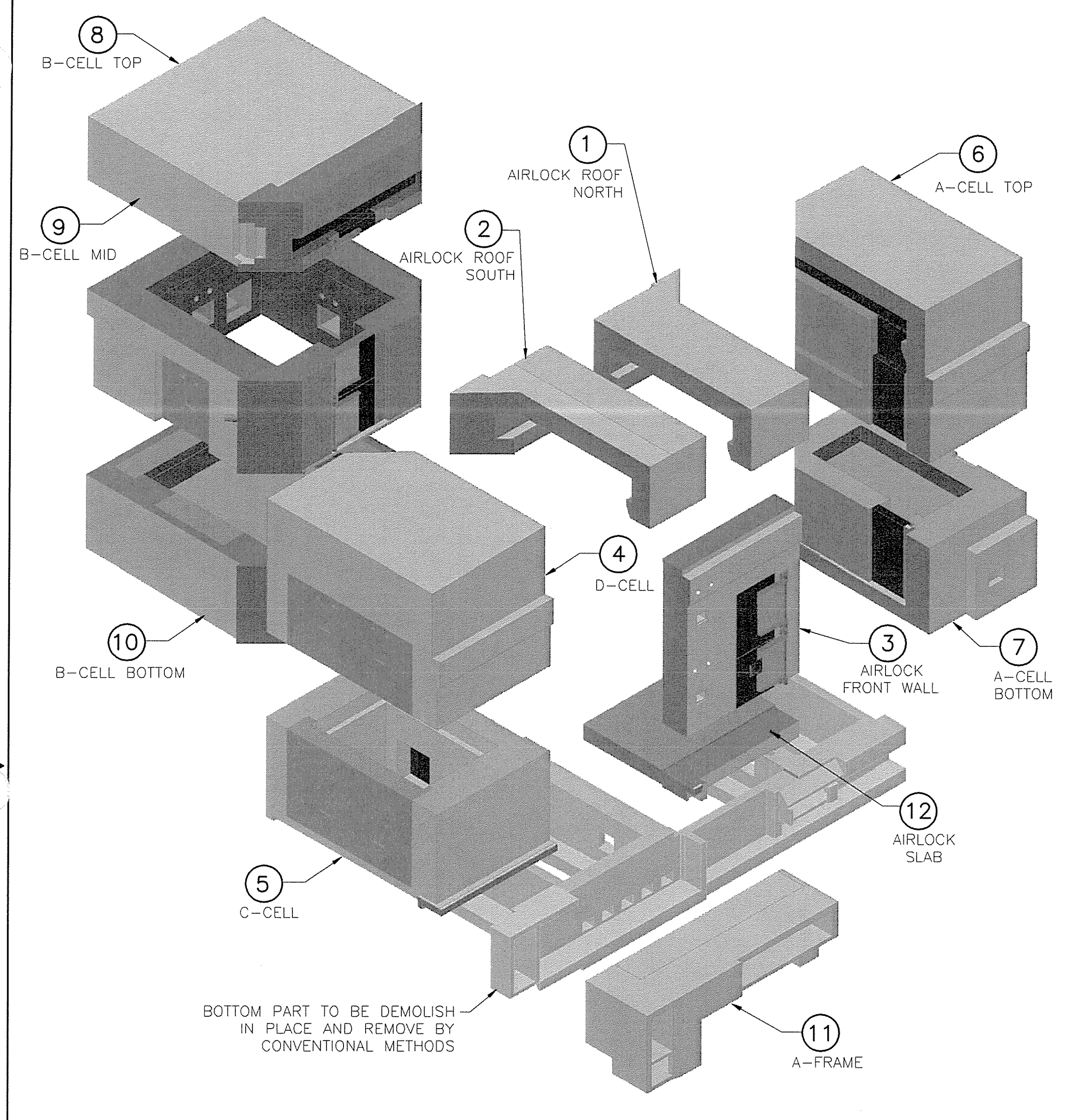
TASK	DRAWING NO.	REV. NO.
	REC4	A

RECORD INFORMATION

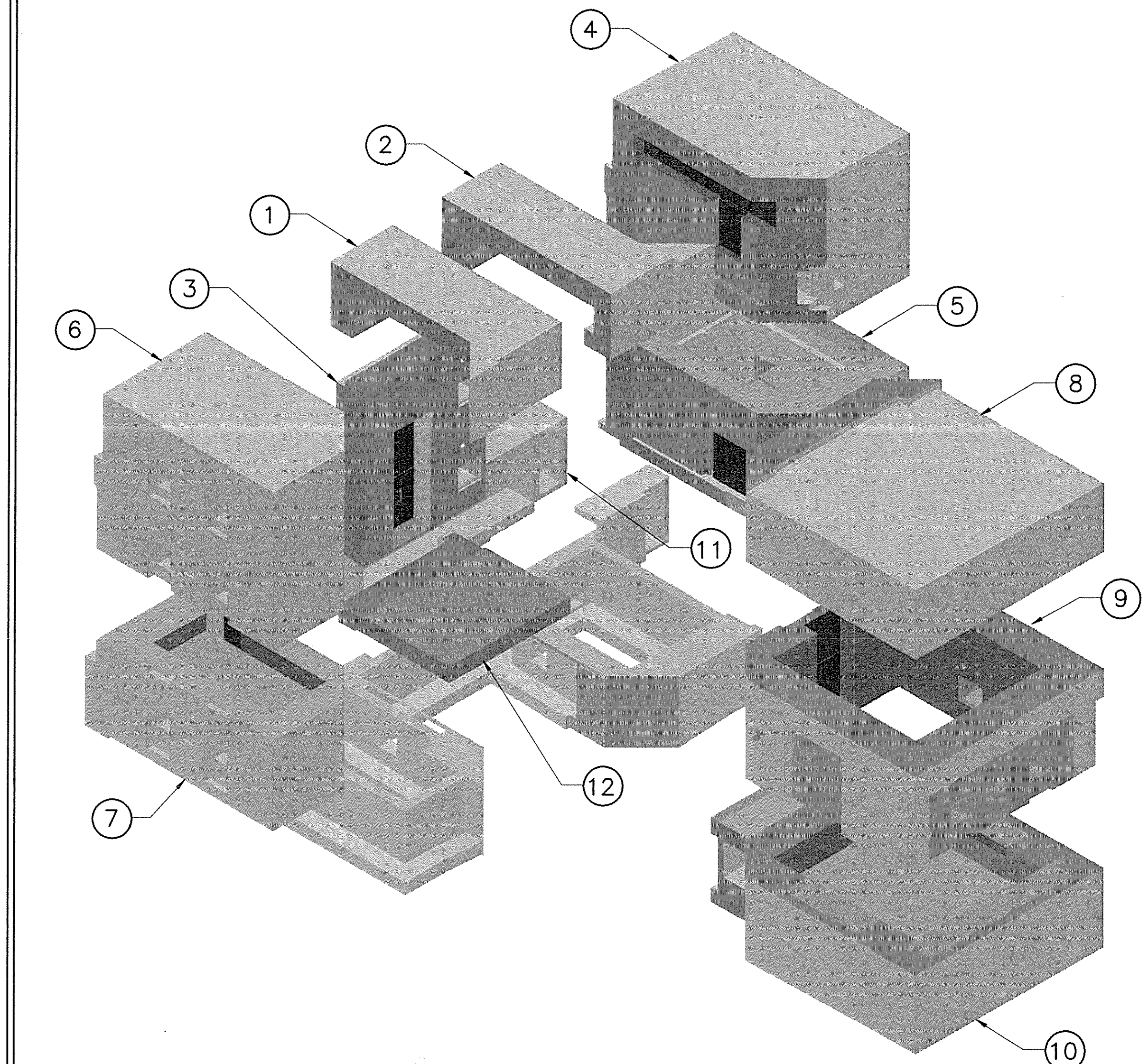
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A

NOTES



EXPLODED ISOMETRIC VIEW



EXPLODED ISOMETRIC VIEW

30% SUBMITTAL SET

COLOR LEGEND:

RED: < 1 MIN EXPOSURE PERMITTED

ORANGE: < 30 MIN EXPOSURE PERMITTED

YELLOW: < 5 HRS. EXPOSURE PERMITTED

DK. BLUE: STEEL

LT. BLUE: GROUT

PICK	MONOLITH	EST. LIFT WEIGHT (TON)
1	AIRLOCK ROOF NORTH	139
2	AIRLOCK ROOF SOUTH	142
3	AIRLOCK FRONT WALL	184
4	D-CELL	693
5	C-CELL	551
6	A-CELL TOP	596
7	A-CELL BOTTOM	505
8	B-CELL TOP	610
9	B-CELL MID	681
10	B-CELL BOTTOM	873
11	A-FRAME	340
12	AIRLOCK SLAB	131

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC CUTTING PLAN
REC MONOLITH EXPLODED ISOMETRIC VIEW

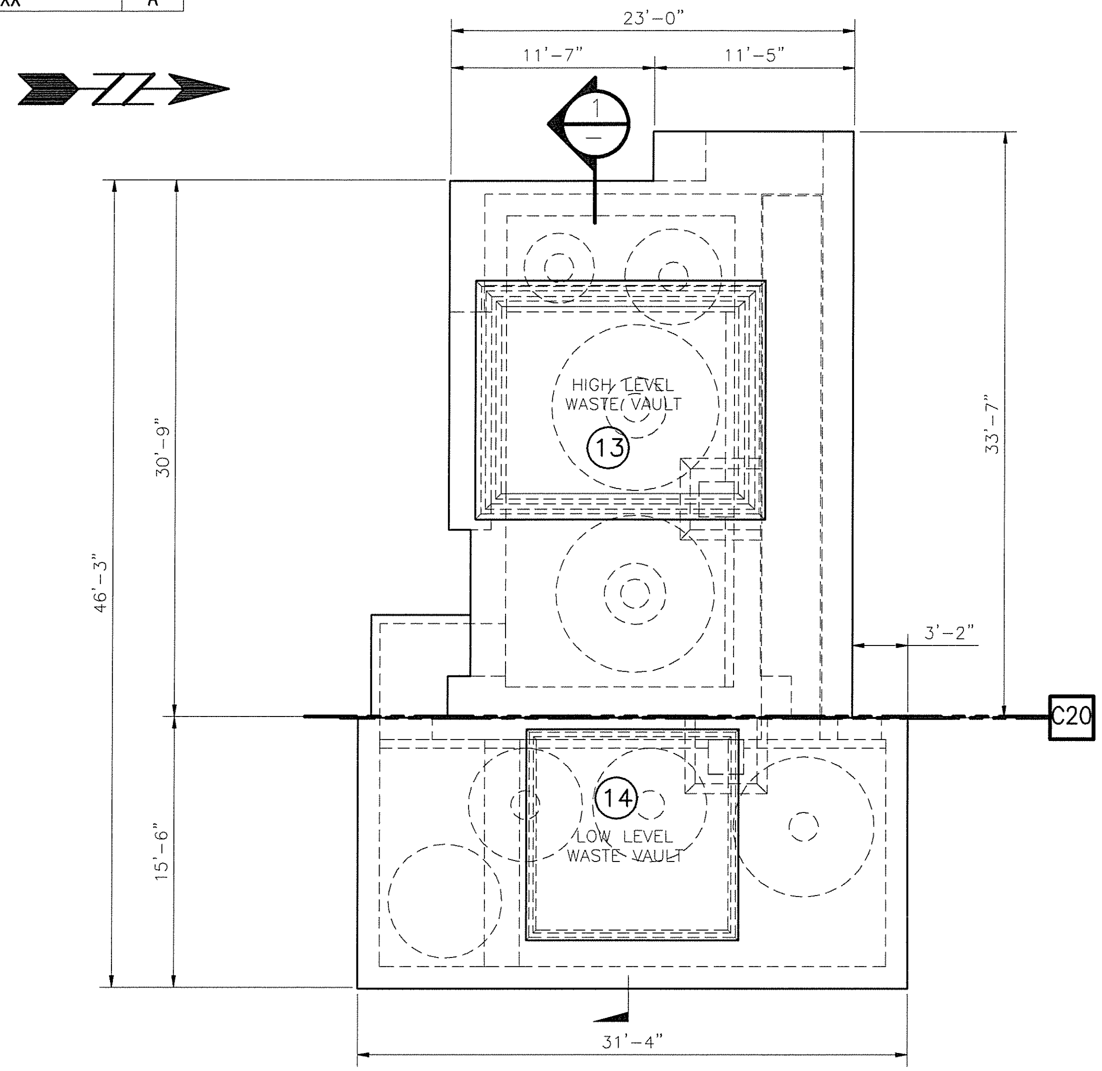
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	REC5	A

RECORD INFORMATION

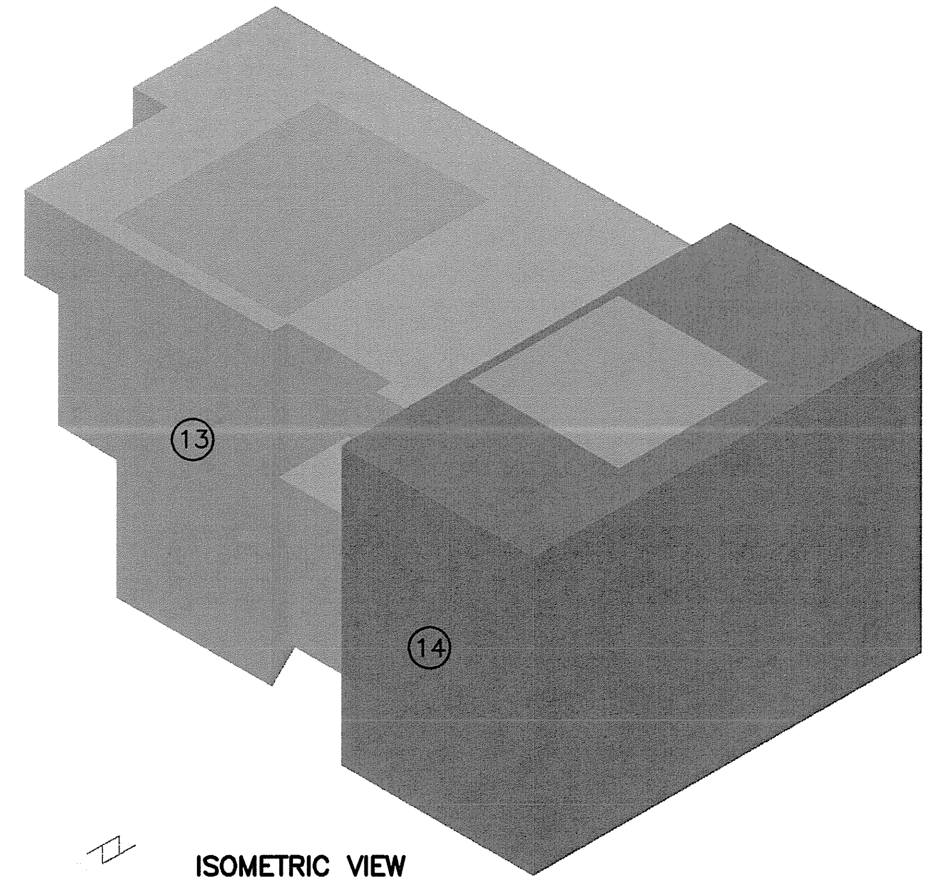
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



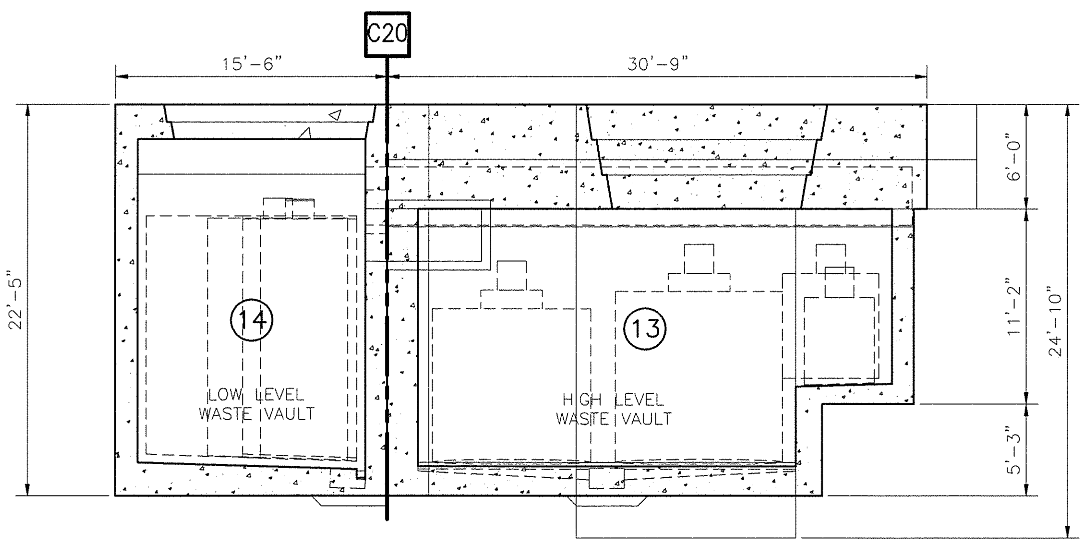
PLAN VIEW A/7

SCALE: 3/16"=1'-0"



ISOMETRIC VIEW

PICK	MONOLITH	EST. LIFT WEIGHT (TON)
1	HIGH LEVEL WASTE VAULT	933
2	LOW LEVEL WASTE VAULT	817



SECTION 1/REC6

SCALE: 3/16"=1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	XX		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
HHV/LLV CUTTING PLAN
PLAN/SECTIONAL ELEVATION, ISOMETRIC VIEW

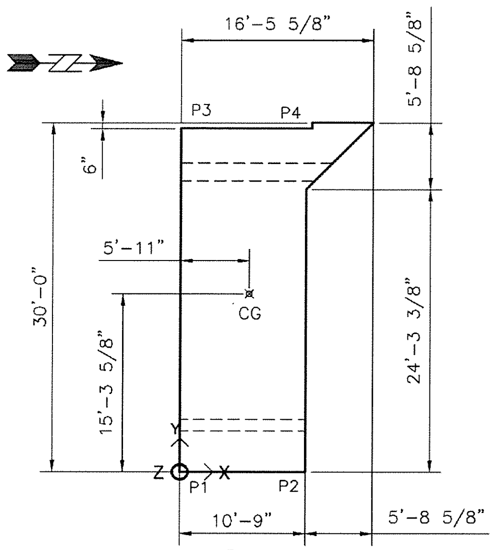
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	REC6	A

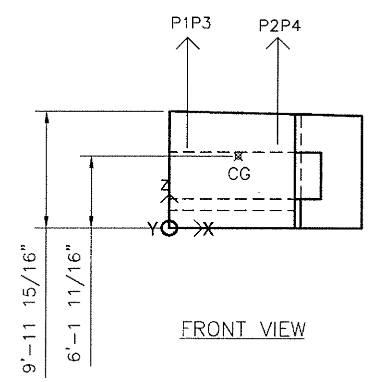
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

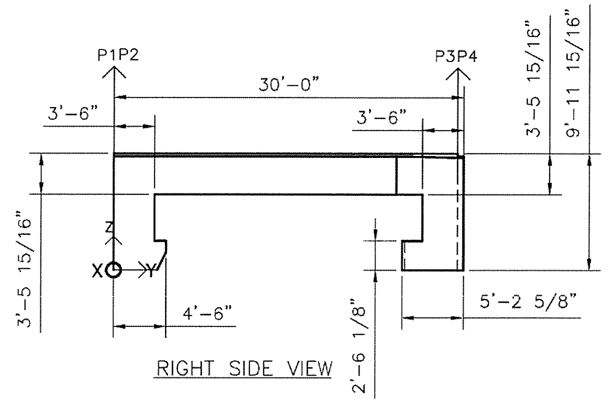
DRAWING NO.	REV. NO.
_____-__-_____	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

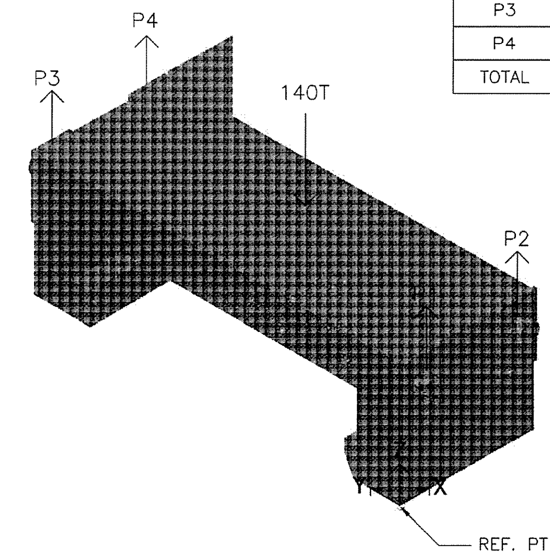
SCALE: 1/8" = 1'-0"

AIRLOCK ROOF NORTH
MONOLITH NO. 1

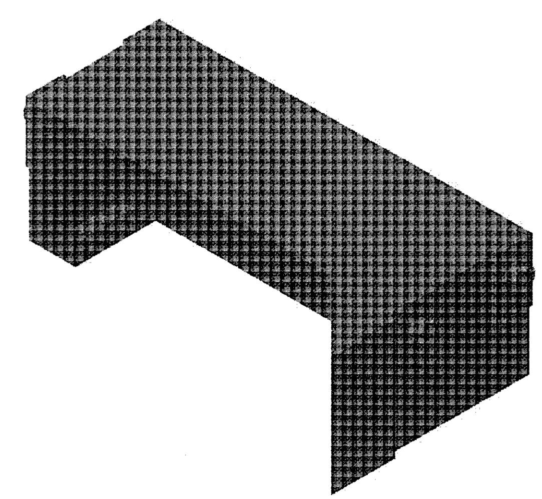
EST. WEIGHT: 140 TON

CENTROID: X: 71.5 IN
Y: 189.4 IN
Z: 76.5 IN

P1	29.2
P2	39.2
P3	30.3
P4	41
TOTAL	140 T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
AIRLOCK ROOF NORTH DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

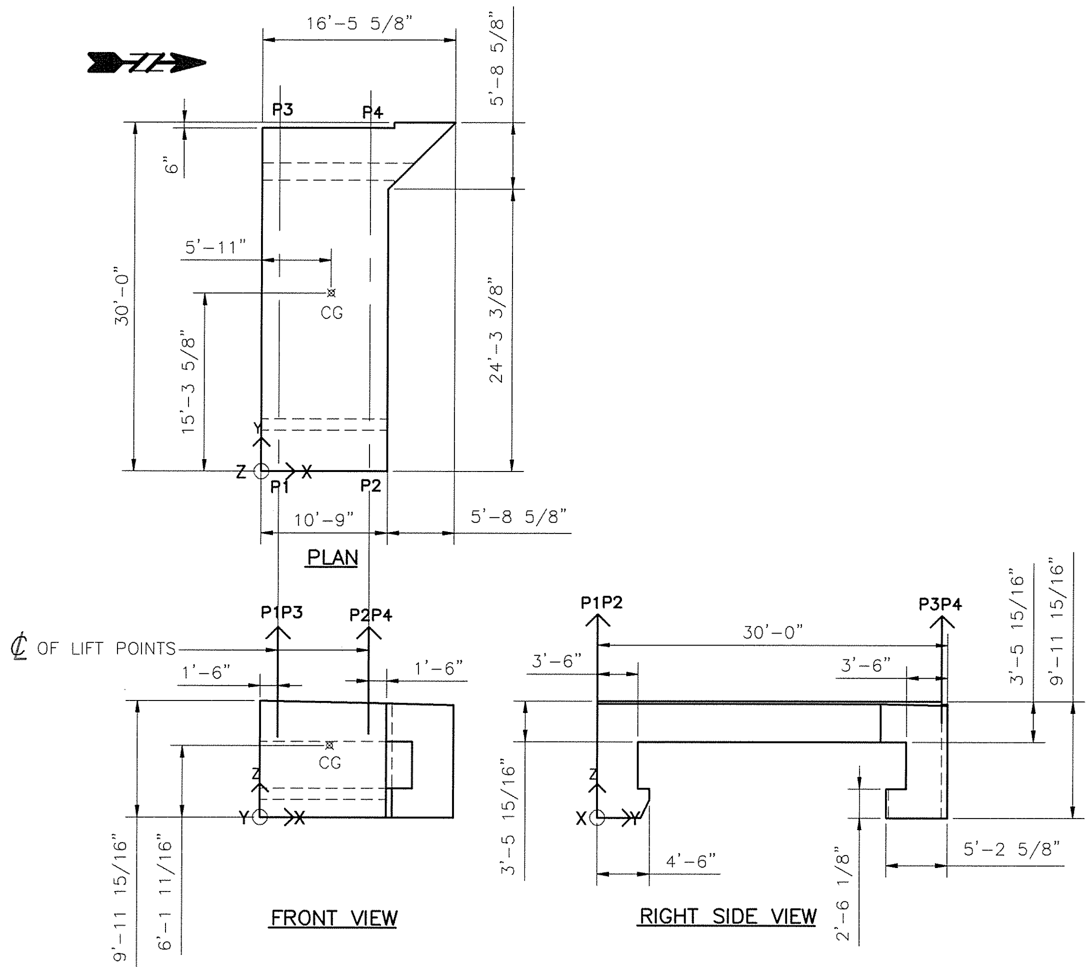
TASK	DRAWING NO.	REV. NO.
_	M1A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_______	324	___

River Corridor Closure Contract
Dedicated to Excellence
WCH

DRAWING NO.	REV. NO.
XX	A



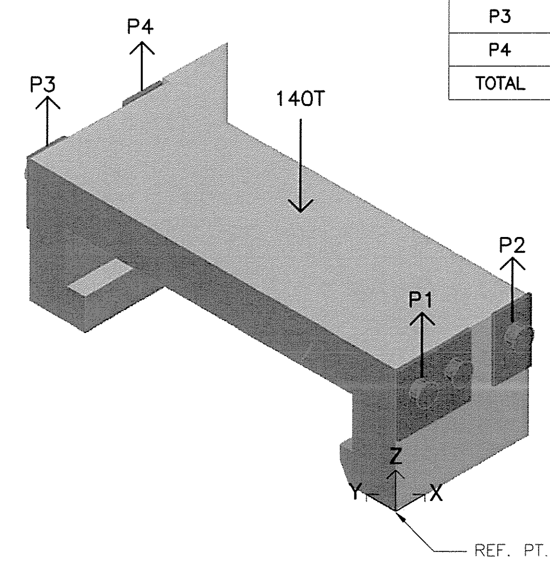
SCALE: 1/8" = 1'-0"

AIRLOCK ROOF NORTH
MONOLITH NO. 1

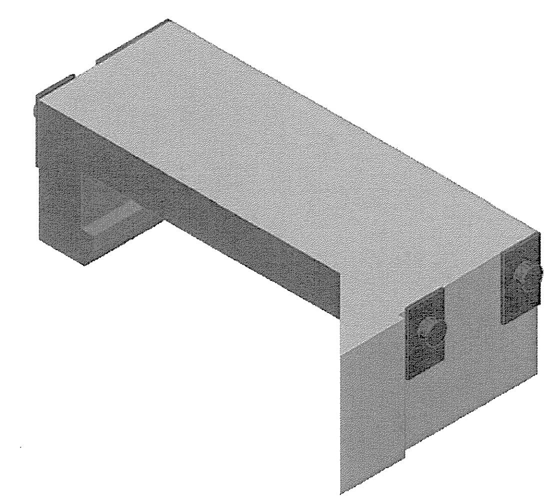
EST. WEIGHT: 140 TON

CENTROID: X: 71.5 IN
Y: 189.4 IN
Z: 76.5 IN

P1	29.2
P2	39.2
P3	30.3
P4	41
TOTAL	140 T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARRAGEMENT
AIRLOCK ROOF NORTH DETAIL PLAN/ISOMETRIC VIEW

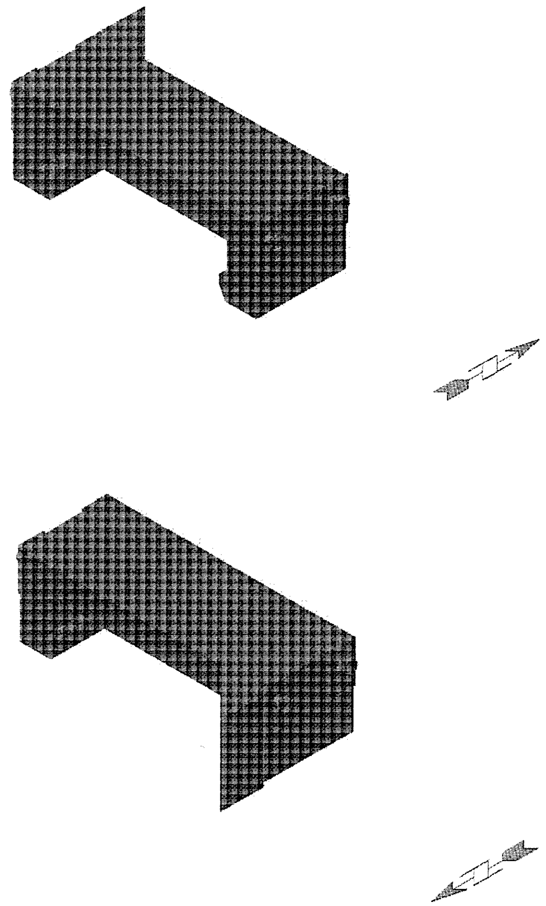
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

TASK	DRAWING NO.	REV. NO.
	M1B	A

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M1C ISOMETRIC VIEWS – MONOLITH 1

SCALE: NONE

2 / M1C PLAN – MONOLITH 1

SCALE: 1/2"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK ROOF NORTH – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M1C	A

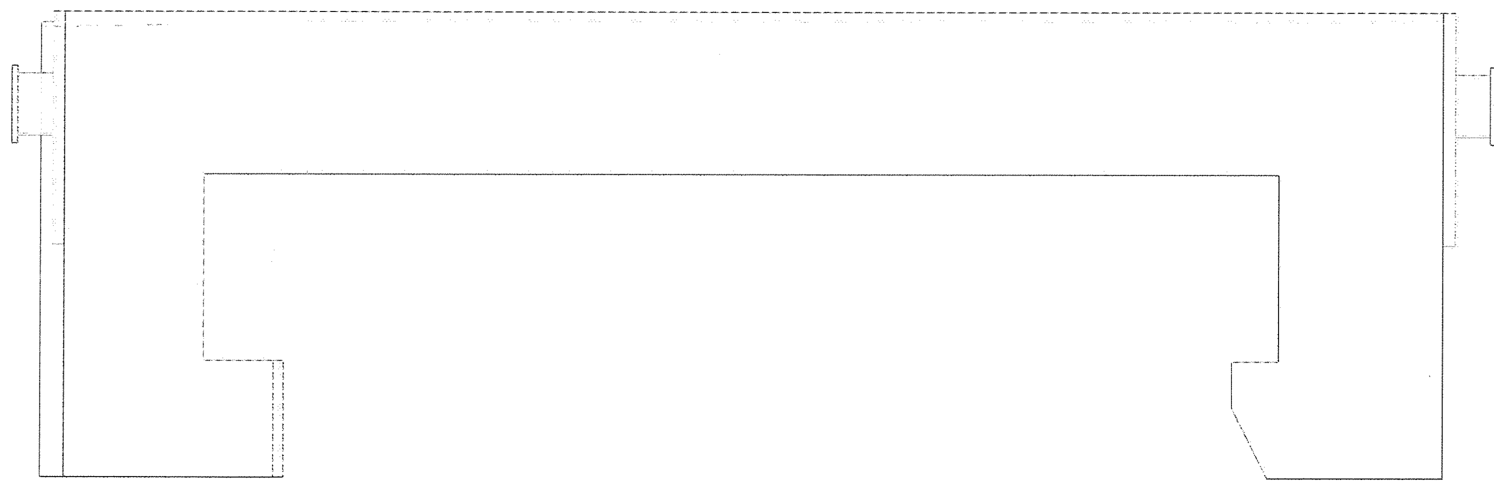
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract — Dedicated to Safety, Performance, Excellence — WCH

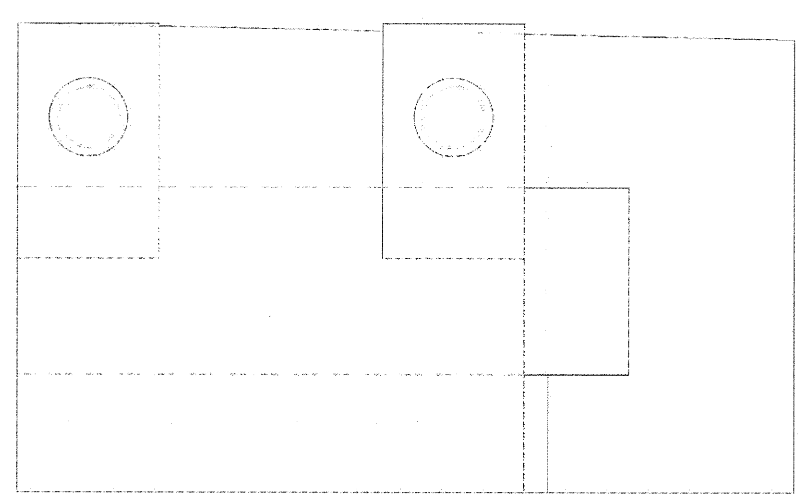
DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 / M1C1 SOUTH ELEVATION – MONOLITH 1

SCALE: 1/2"=1'-0"



2 / M1C1 EAST ELEVATION – MONOLITH 1

SCALE: 1/2"=1'-0"

River Corridor Closure Contract — Dedicated to Excellence

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_______	324	___

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

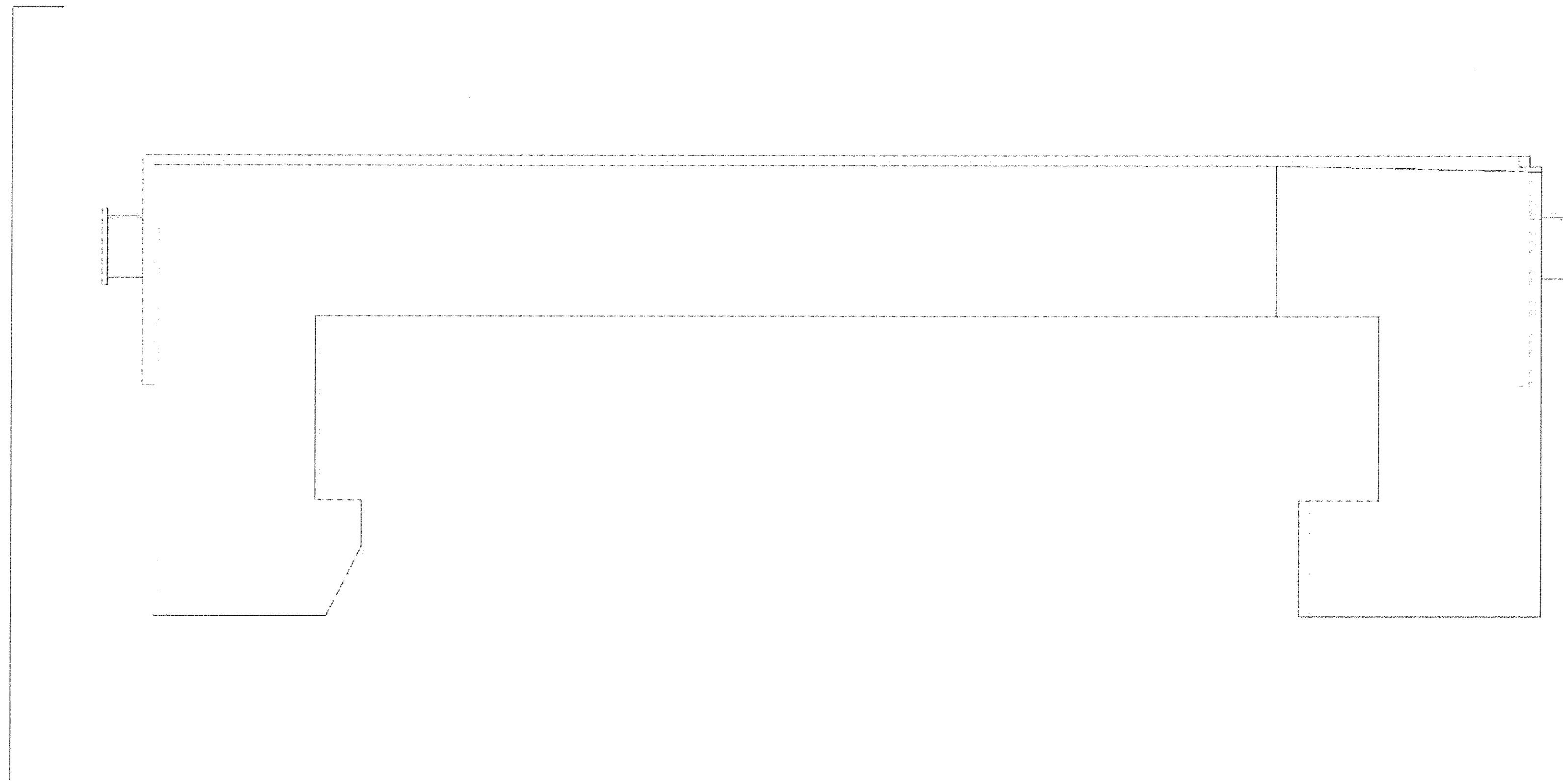
BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK ROOF NORTH – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M1C1	A

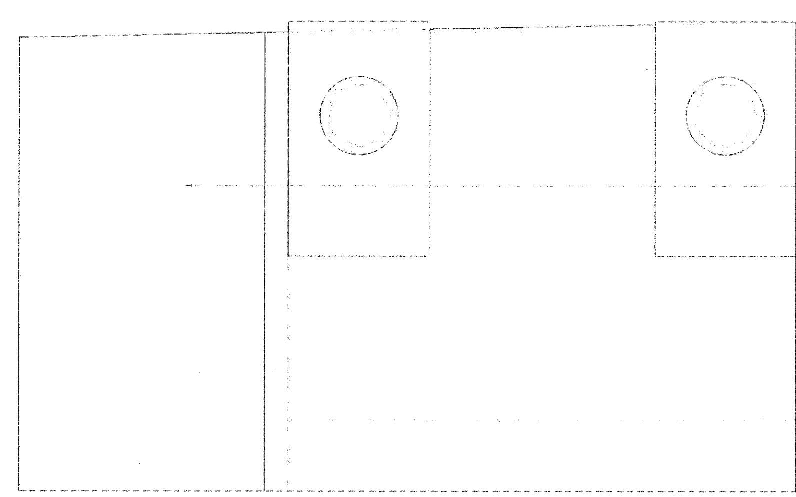
2234_WCH-SUB.DWG 09/05

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M1C2 NORTH ELEVATION – MONOLITH 1

SCALE: 1/2"=1'-0"



2 / M1C2 WEST ELEVATION – MONOLITH 1

SCALE: 1/2"=1'-0"

River Corridor Closure Contract — Dedicated to Safety & Excellence — WCH

RECORD INFORMATION		
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_______	324	___

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

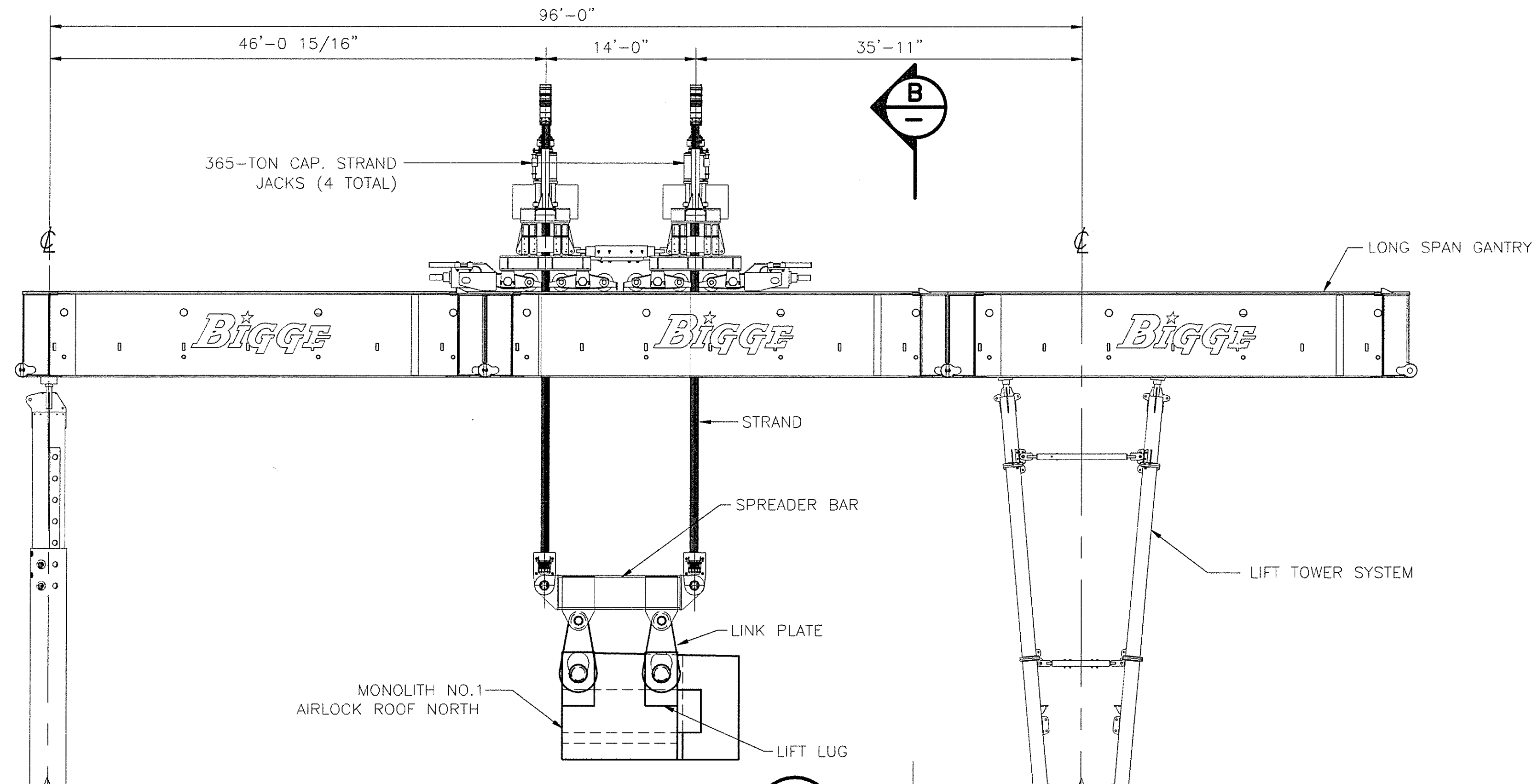
DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK ROOF NORTH – ELEVATION VIEWS

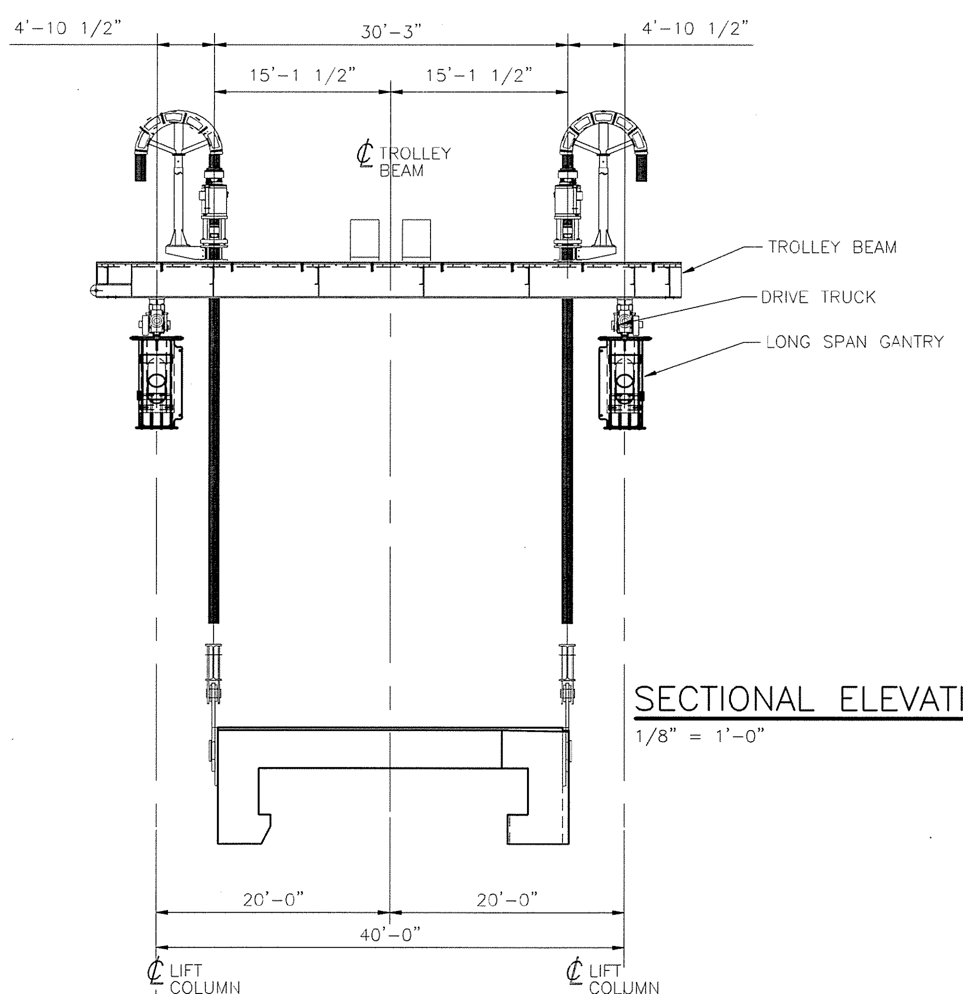
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M1C2	A

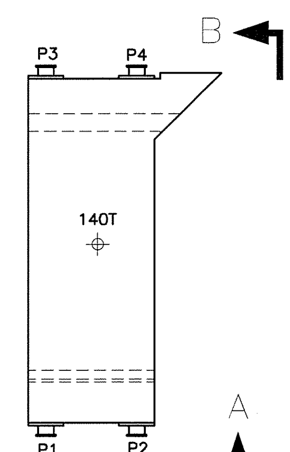
DRAWING NO.	REV. NO.
XX	A



SECTIONAL ELEVATION (A / M1D)
1/8" = 1'-0"



SECTIONAL ELEVATION (B / M1D)
1/8" = 1'-0"



PLAN
MONOLITH NO.1
AIRLOCK ROOF NORTH

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
AIRLOCK ROOF NORTH SECTIONAL ELEVATIONS

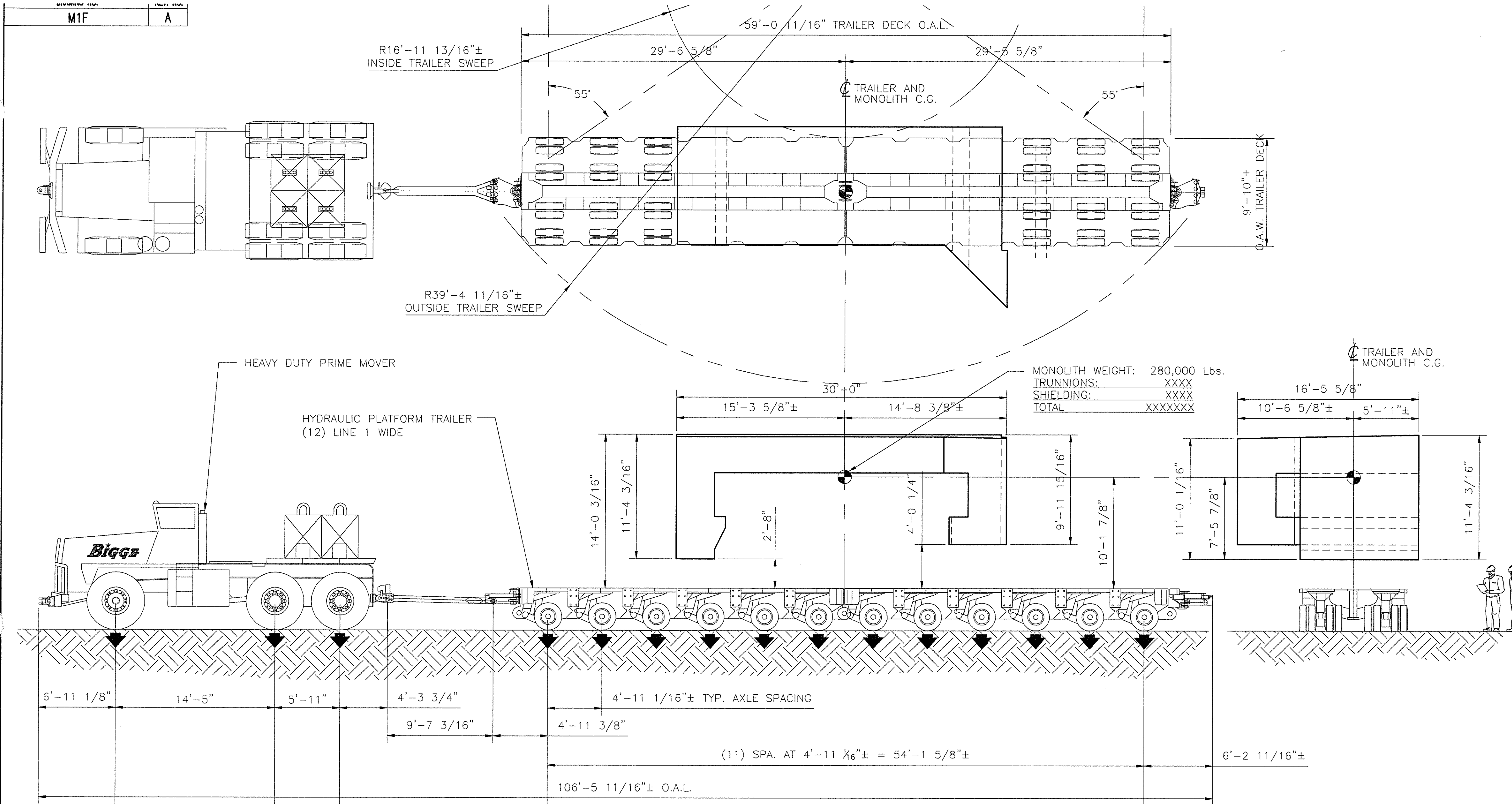
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M1D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M1F	A



AXLE No.	1	2	3	4 – 15
No. TIRES/AXLE	2	4	4	8
WIDTH	11'-9"	12'-7"	12-7"	9'-10"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 96)

AIR LOCK ROOF NORTH
MONOLITH 1

ELEVATION VIEW (– / M1F)

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	145,400 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/16" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

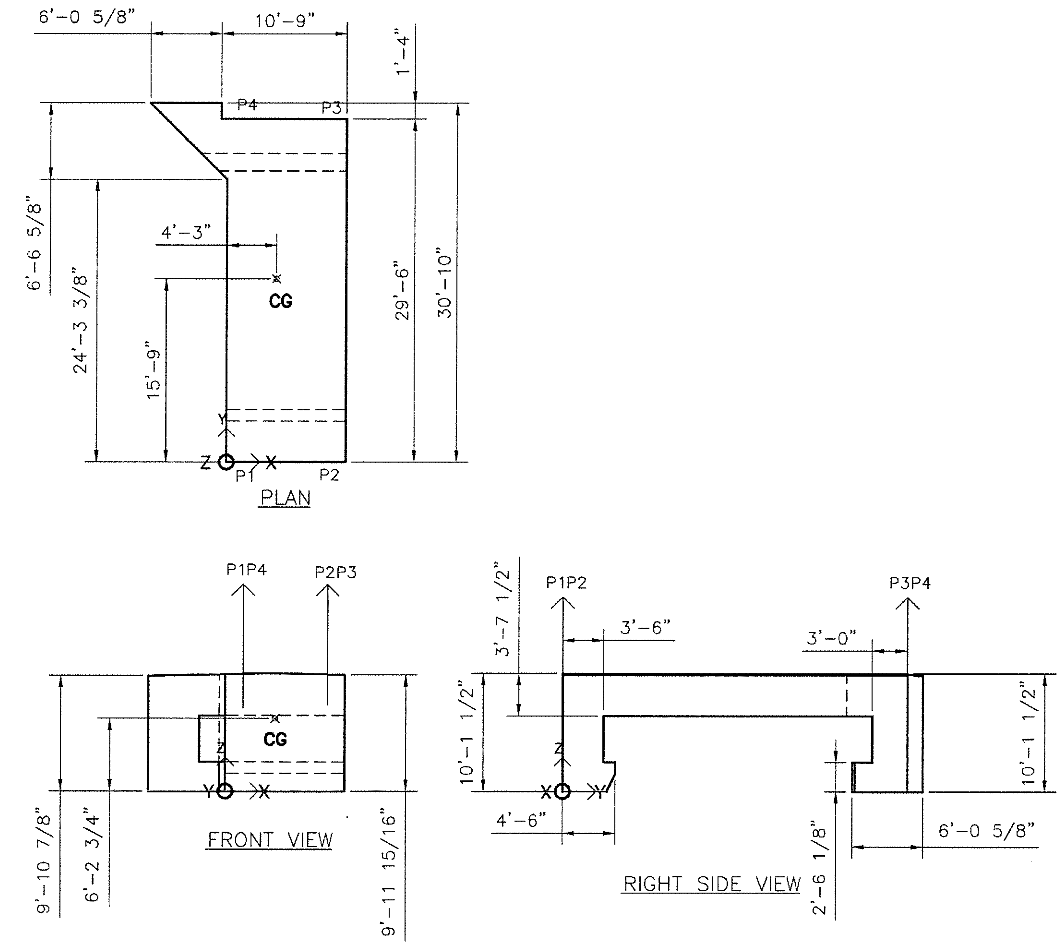
BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
AIR LOCK ROOF NORTH TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M1F.DWG

TASK	DRAWING NO.	REV. NO.
	M1F	A

G:\Engineering\Jobs\2009\09E37 – 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F–30% Submit.dwg

DRAWING NO.	REV. NO.
_____-__-_____	A



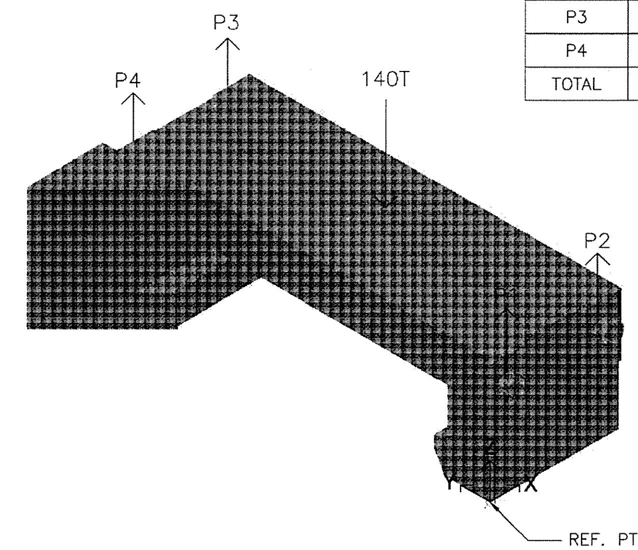
SCALE: 1/8" = 1'-0"

AIRLOCK ROOF SOUTH
MONOLITH NO. 2

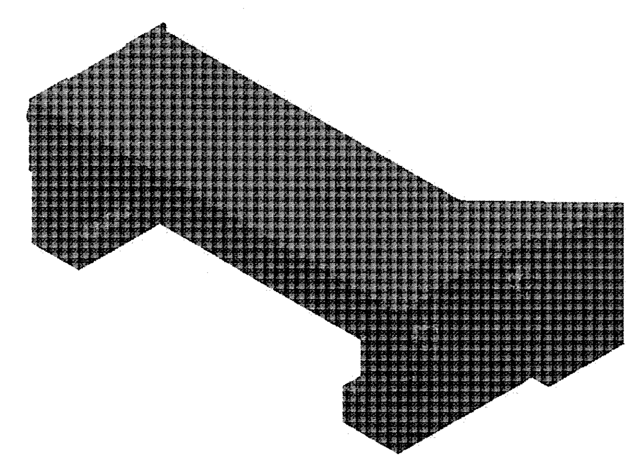
EST. WEIGHT: 140 TON

CENTROID: **X: 51.3 IN**
Y: 194.5 IN
Z: 77.5 IN

P1	42.8
P2	24
P3	46.9
P4	26.3
TOTAL	140 T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
AIRLOCK ROOF SOUTH DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

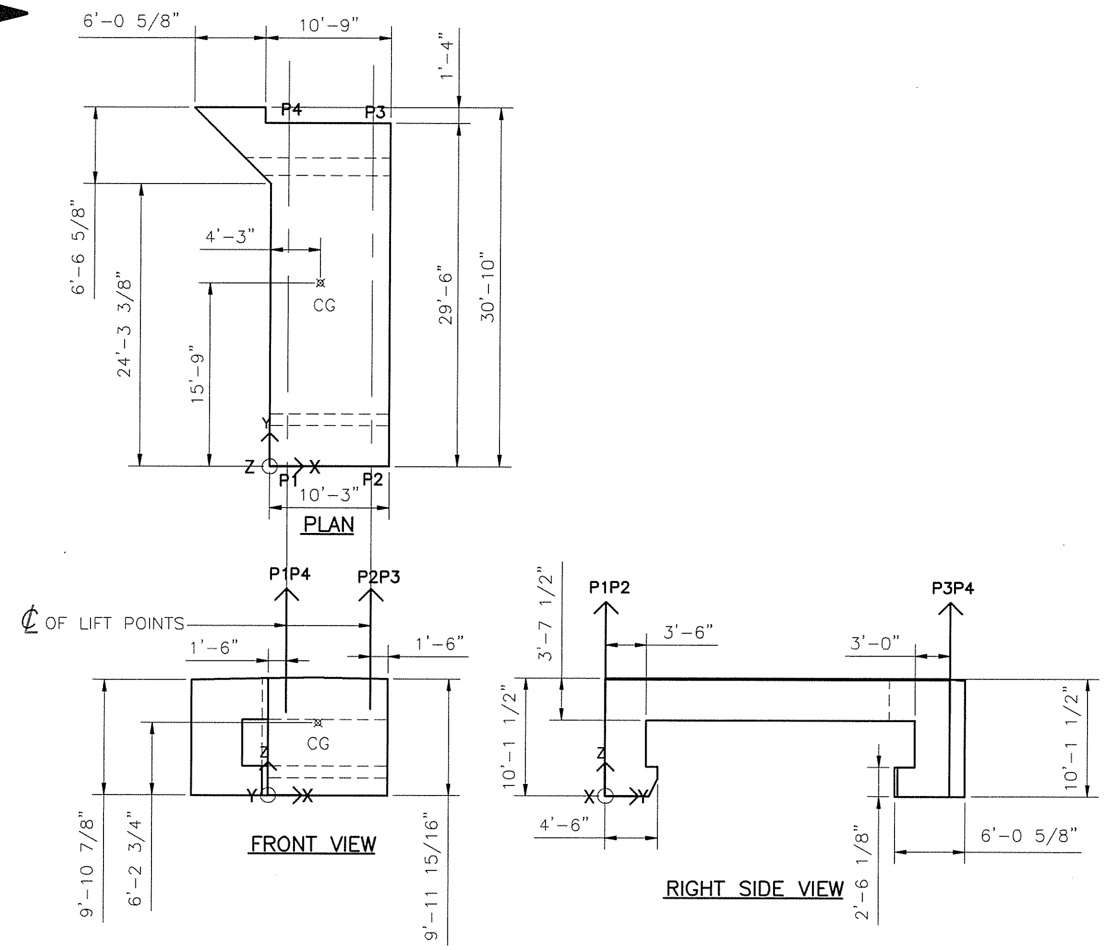
TASK	DRAWING NO.	REV. NO.
_	M2A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated WCH Excellence

DRAWING NO.	REV. NO.
XX	A



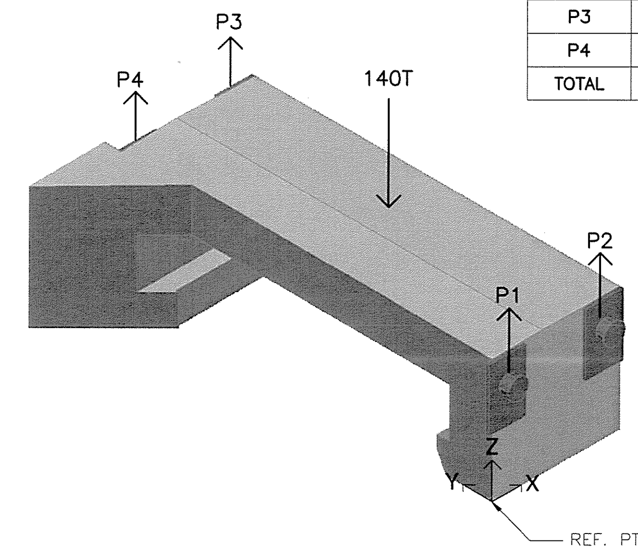
SCALE: 1/8" = 1'-0"

AIRLOCK ROOF SOUTH
MONOLITH NO. 2

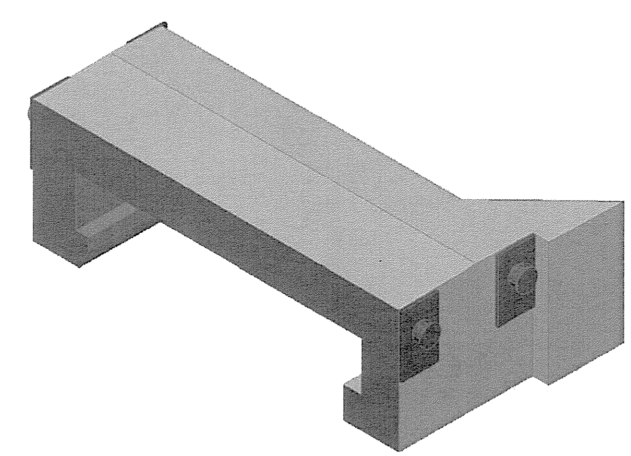
EST. WEIGHT: 140 TON

CENTROID: X: 51.3 IN
Y: 194.5 IN
Z: 77.5 IN

P1	42.8
P2	24
P3	46.9
P4	26.3
TOTAL	140 T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARAGEMENT
AIRLOCK ROOF SOUTH DETAIL PLAN/ISOMETRIC VIEW

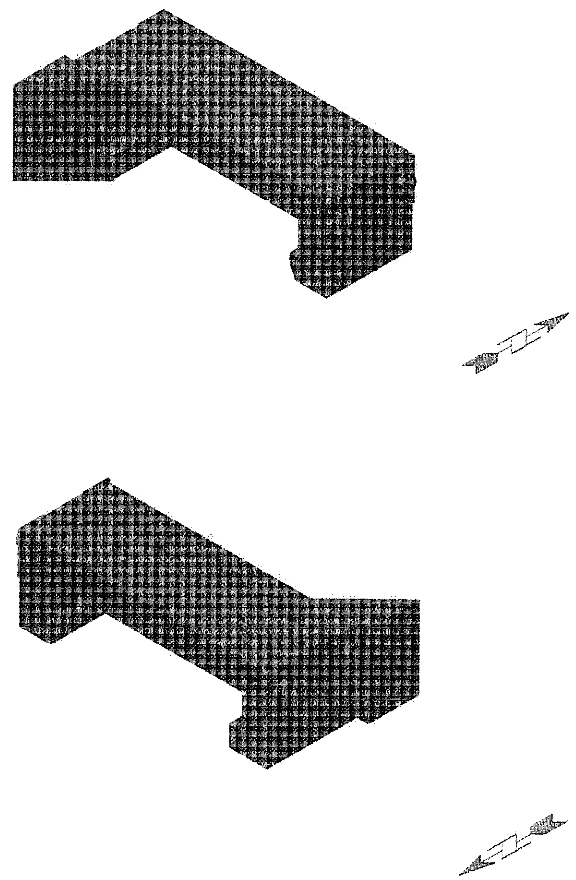
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M2B	A

RECORD INFORMATION

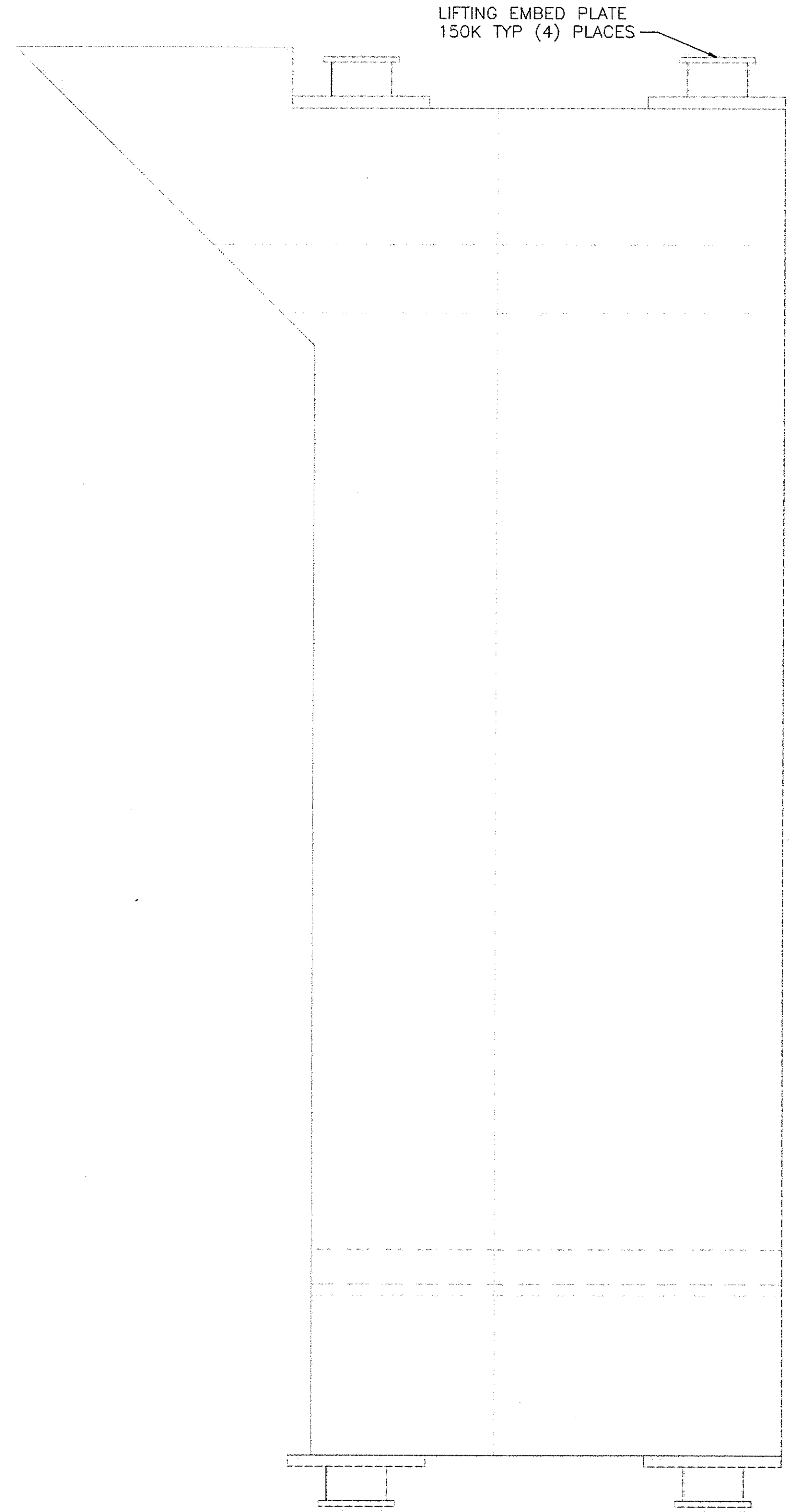
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M2C ISOMETRIC VIEWS – MONOLITH 2

SCALE: NONE



2 / M2C PLAN – MONOLITH 2

SCALE: 1/2"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK ROOF SOUTH – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M2C	A

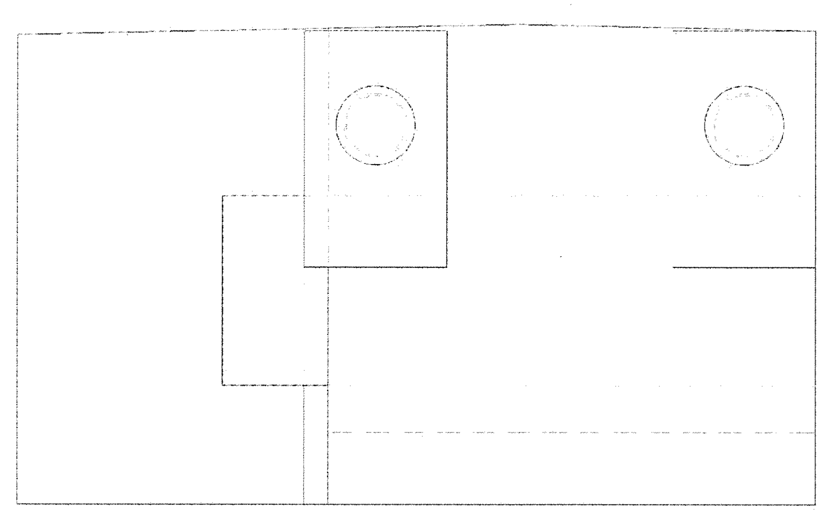
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_______	324	___

River Corridor Closure Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

1 / M2C1 — SOUTH ELEVATION – MONOLITH 2
SCALE: 1/2"=1'-0"



2 / M2C1 — EAST ELEVATION – MONOLITH 2
SCALE: 1/2"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK ROOF SOUTH – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M2C1	A

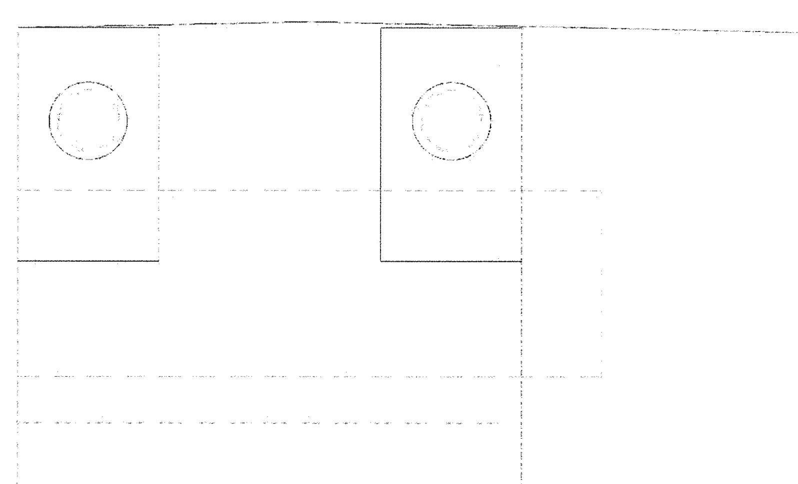
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

1 / M2C2 NORTH ELEVATION – MONOLITH 2

SCALE: 1/2"=1'-0"



2 / M2C2 WEST ELEVATION – MONOLITH 2

SCALE: 1/2"=1'-0"

River Corridor Closure Contract — Dedicated to Excellence — WCH

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK ROOF SOUTH – ELEVATION VIEWS

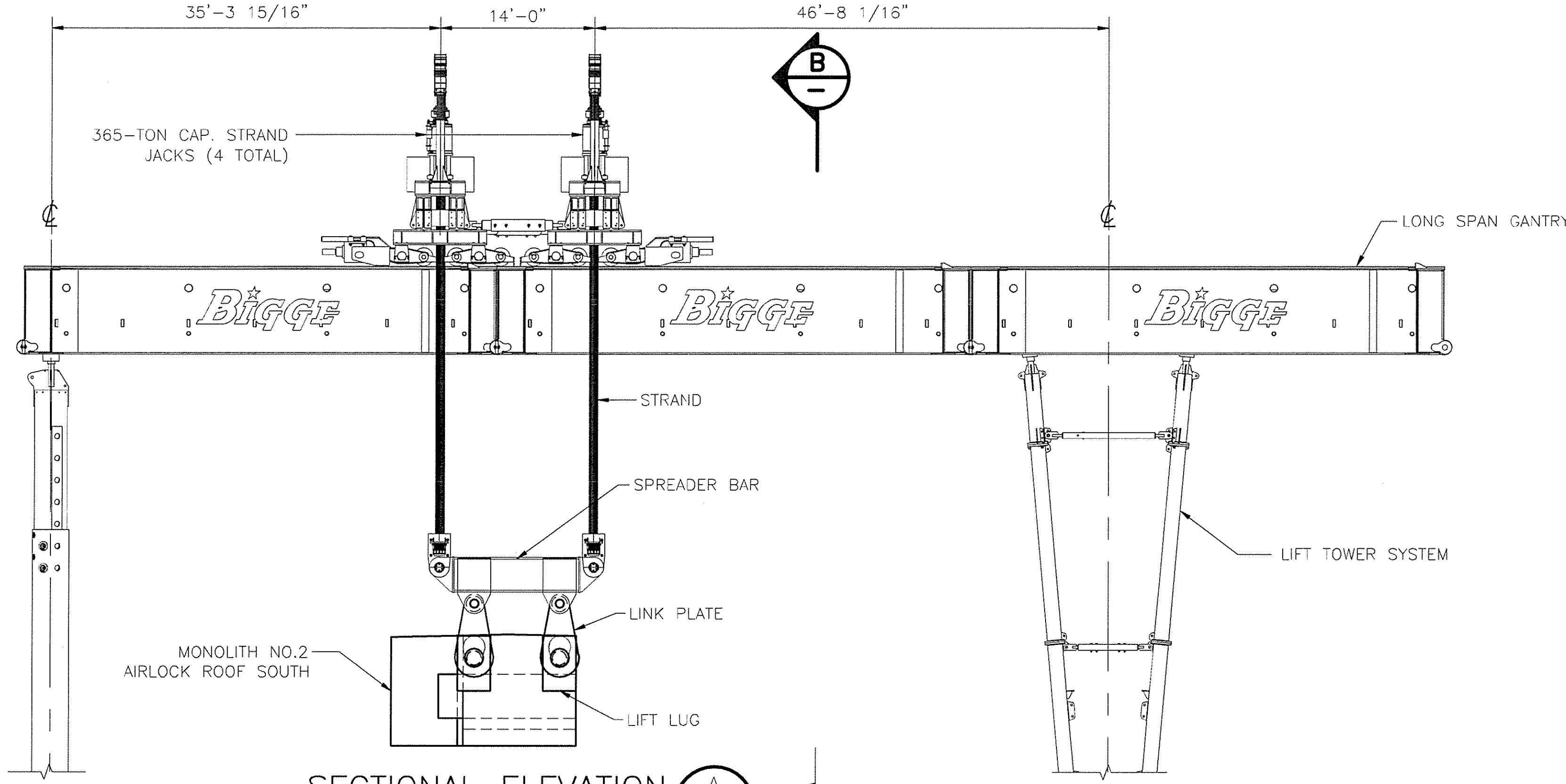
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M2C2	A

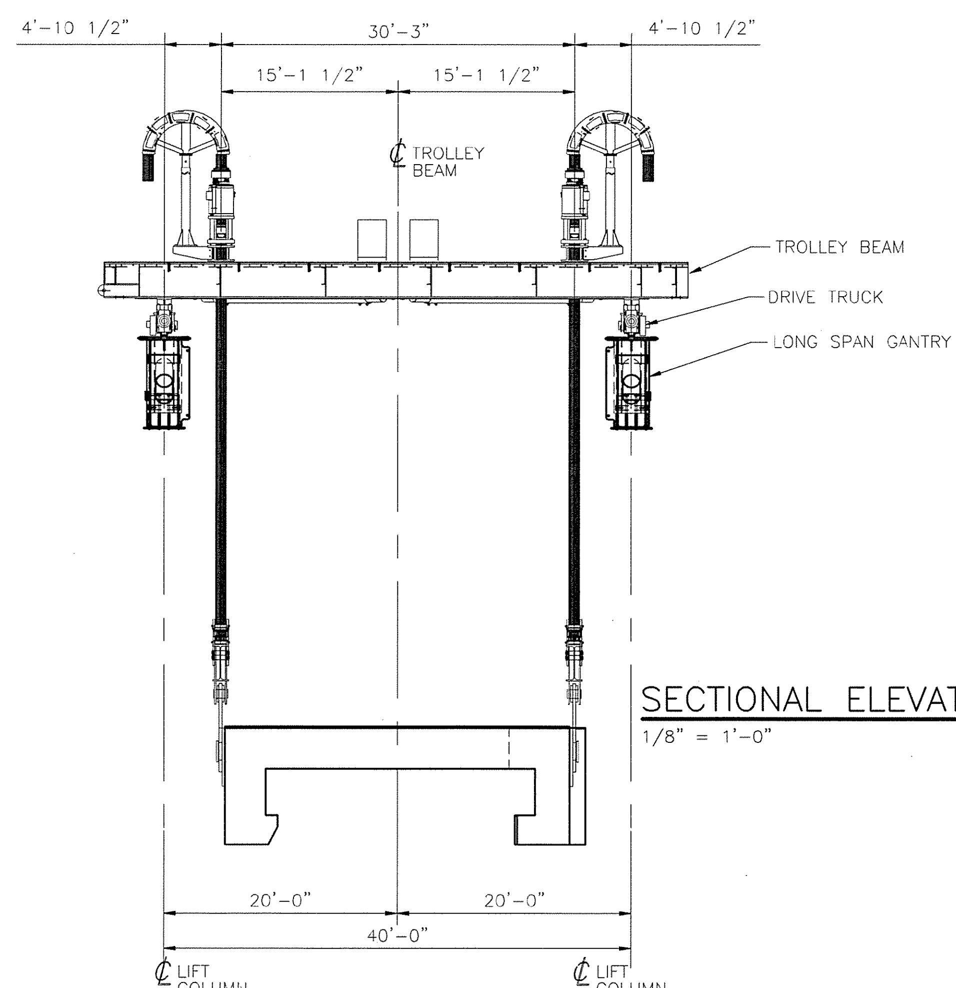
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

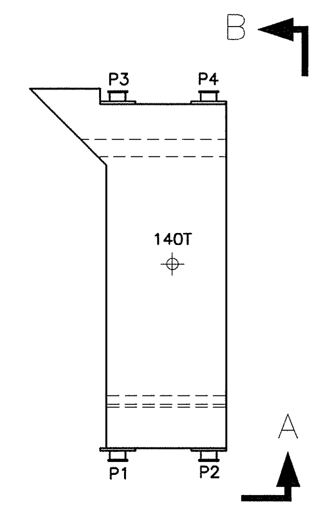
DRAWING NO.	REV. NO.
XX	A



SECTIONAL ELEVATION (A / M2D)
1/8" = 1'-0"



SECTIONAL ELEVATION (B / M2D)
1/8" = 1'-0"



PLAN
MONOLITH NO.2
AIRLOCK ROOF SOUTH

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

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10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
AIRLOCK ROOF SOUTH SECTIONAL ELEVATIONS

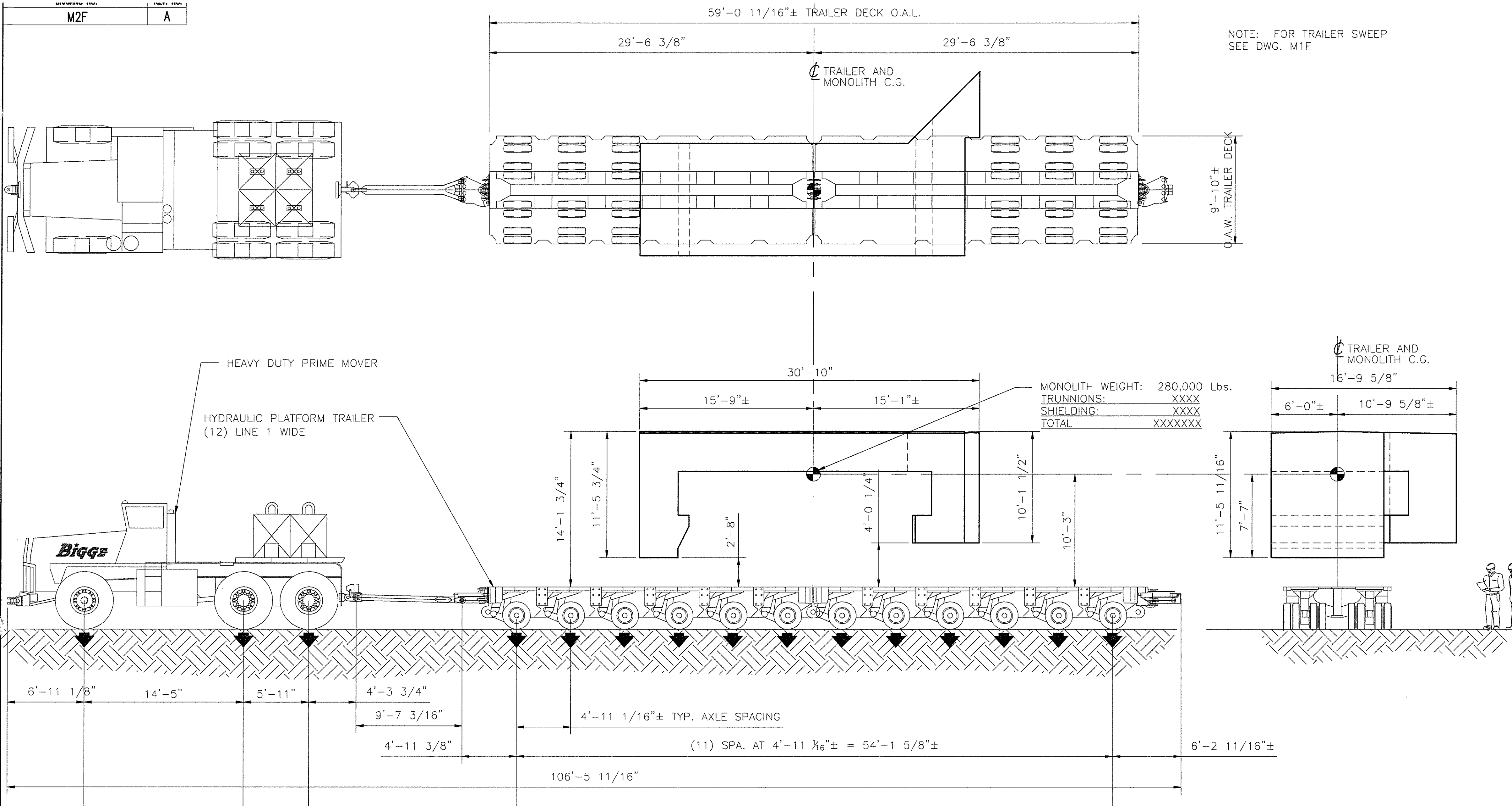
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M2D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M2F	A



AXLE No.	1	2	3	4 - 15
No. TIRES/AXLE	2	4	4	8
WIDTH	11'-9"	12'-7"	12-7"	9'-10"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 96)

AIR LOCK ROOF SOUTH
MONOLITH 2
ELEVATION VIEW (– / M2F)

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	145,400 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/16" = 1'-0"

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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
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10700 BIGGE AVE. SAN LEANDRO, CA. 94577

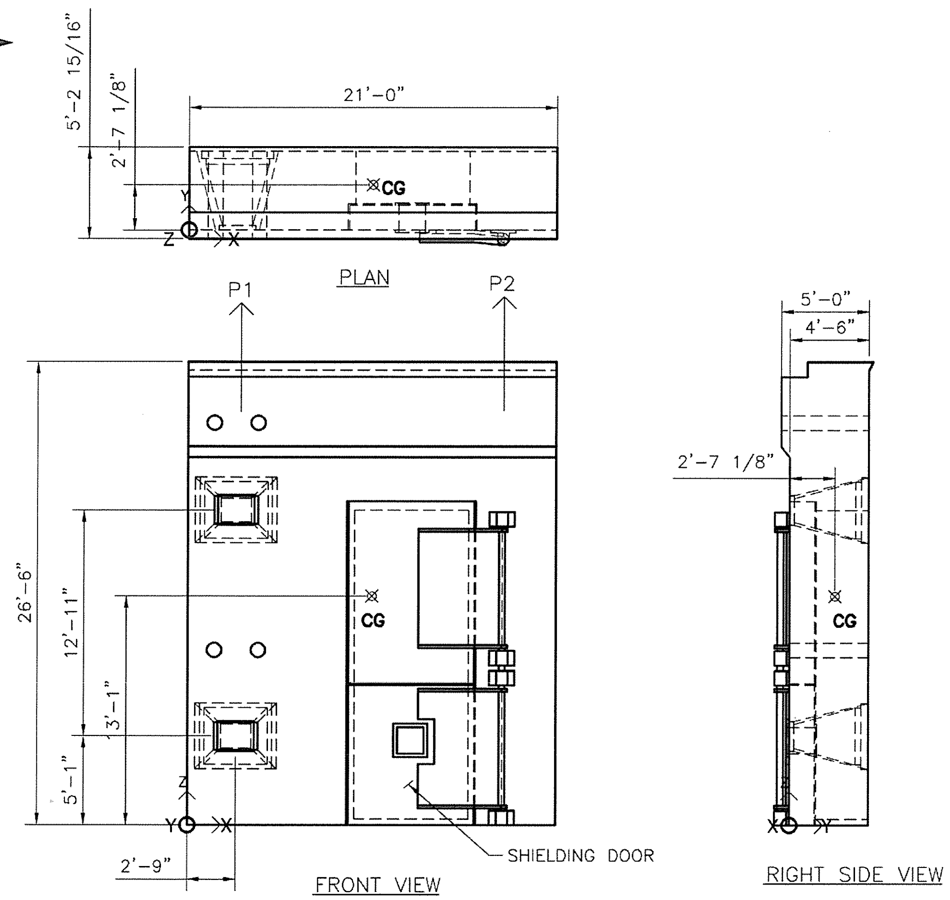
BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
AIR LOCK ROOF SOUTH TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M2F.DWG

TASK	DRAWING NO.	REV. NO.
	M2F	A

G:\Engineer...obs\2009\09E37 – 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F–...30% Submit.dwg

DRAWING NO.	REV. NO.
_____-__-_____	A



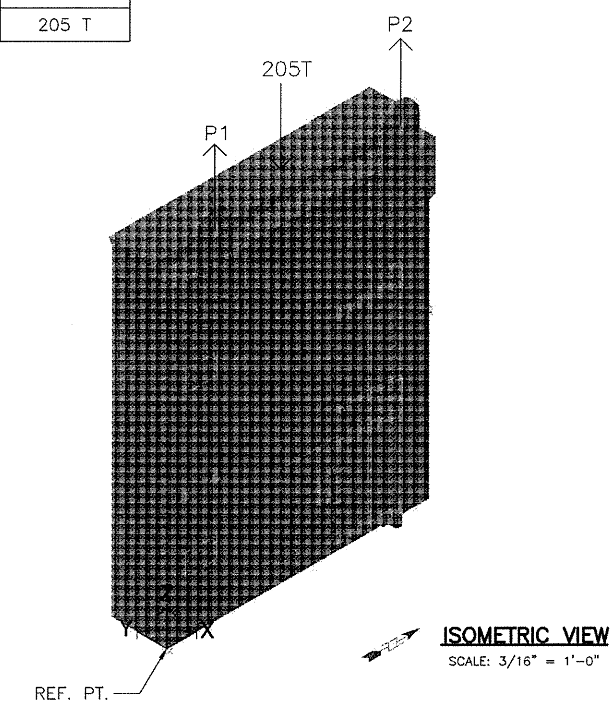
SCALE: 3/16" = 1'-0"

AIRLOCK FRONT WALL
MONOLITH NO. 3

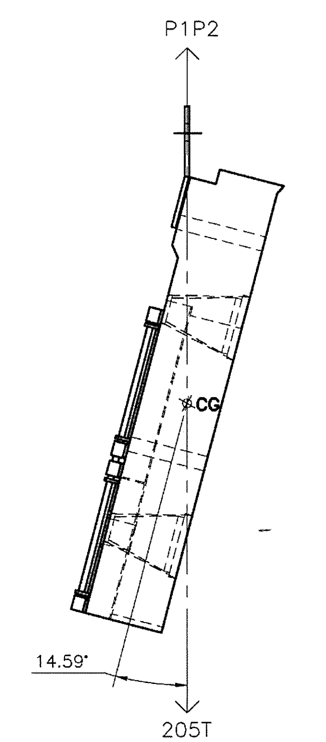
EST. WEIGHT: 205 TON

CENTROID: **X: 126 IN**
Y: 31.1 IN
Z: 157.7 IN

P1	102.5
P2	102.5
TOTAL	205 T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



SIDE VIEW
SCALE: 3/16" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
AIRLOCK FRONT WALL DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

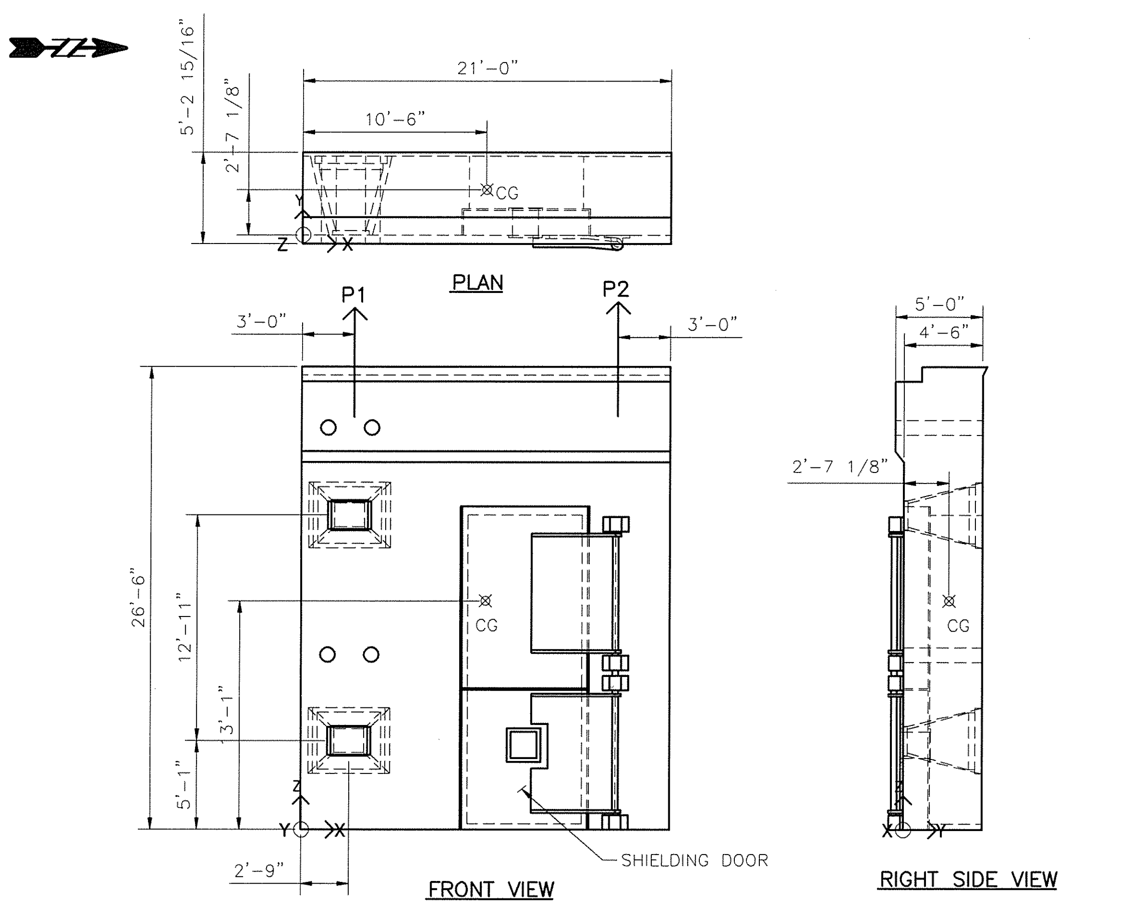
TASK	DRAWING NO.	REV. NO.
_	M3A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XX	A



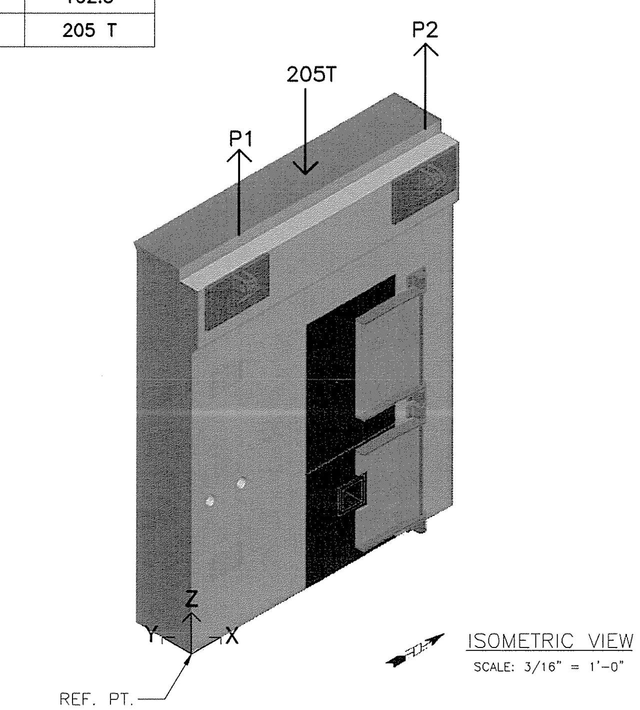
SCALE: 3/16" = 1'-0"

AIRLOCK FRONT WALL
MONOLITH NO. 3

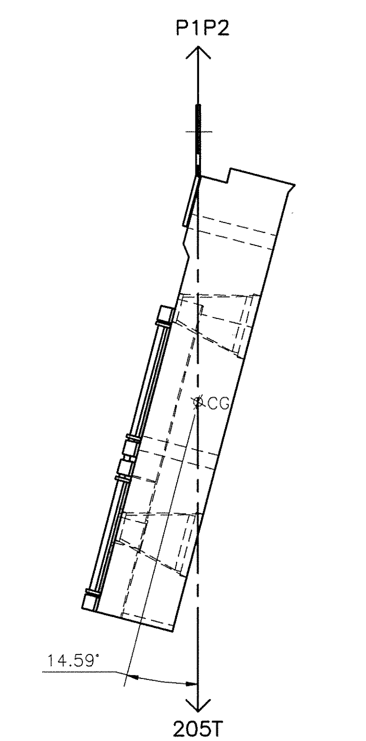
EST. WEIGHT: 205 TON

CENTROID: X: 126 IN
Y: 31.1 IN
Z: 157.7 IN

P1	102.5
P2	102.5
TOTAL	205 T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



SIDE VIEW
SCALE: 3/16" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARRAGEMENT
AIRLOCK FRONT WALL DETAIL PLAN/ISOMETRIC VIEW

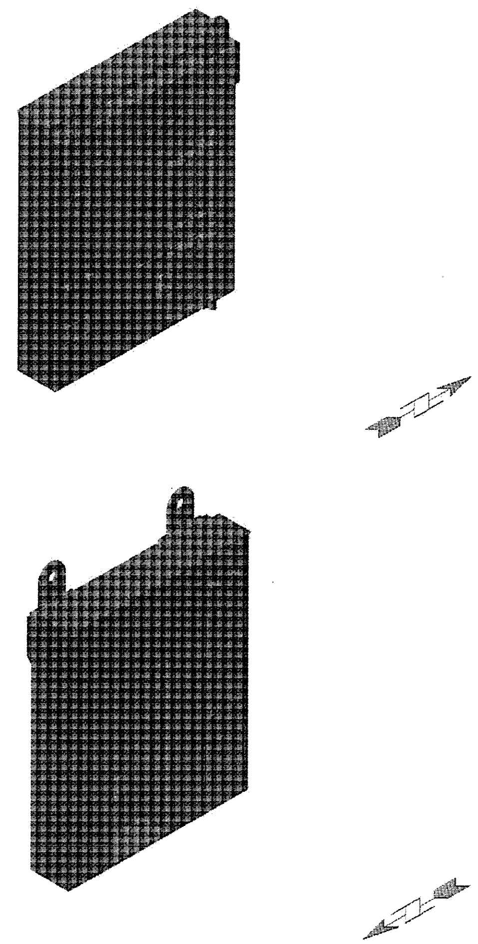
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M3B	A

RECORD INFORMATION

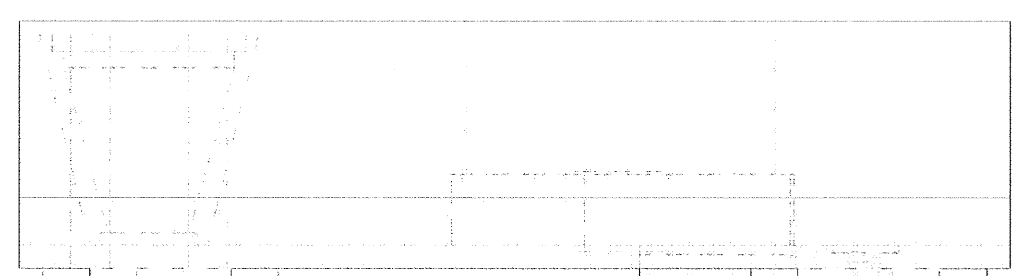
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M3C ISOMETRIC VIEWS – MONOLITH 3

SCALE: NONE



2 / M3C PLAN – MONOLITH 3

SCALE: 1/2"=1'-0"

River Corridor Closure Contract
Dedicated WCH Excellence

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

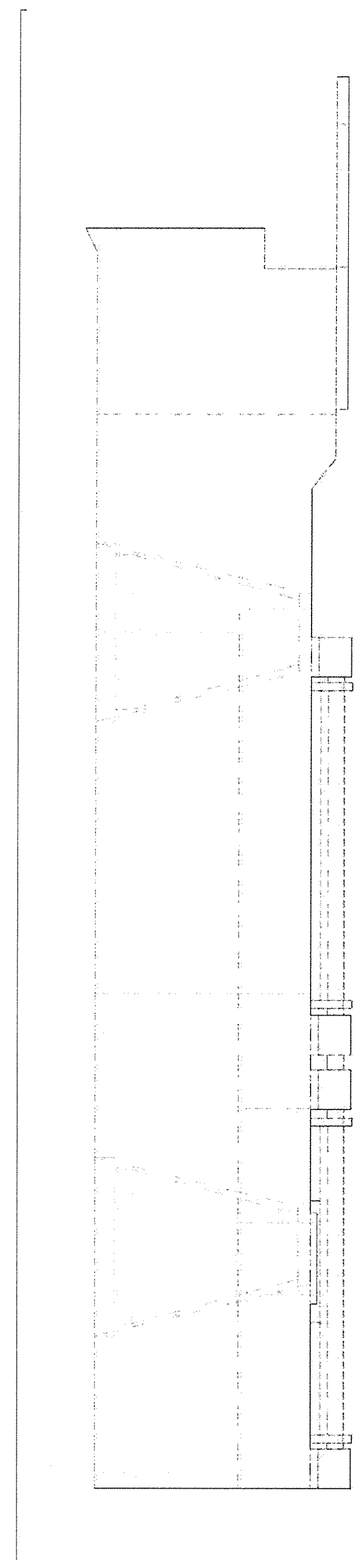
DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK FRONT WALL – ISOMETRIC/PLAN VIEWS

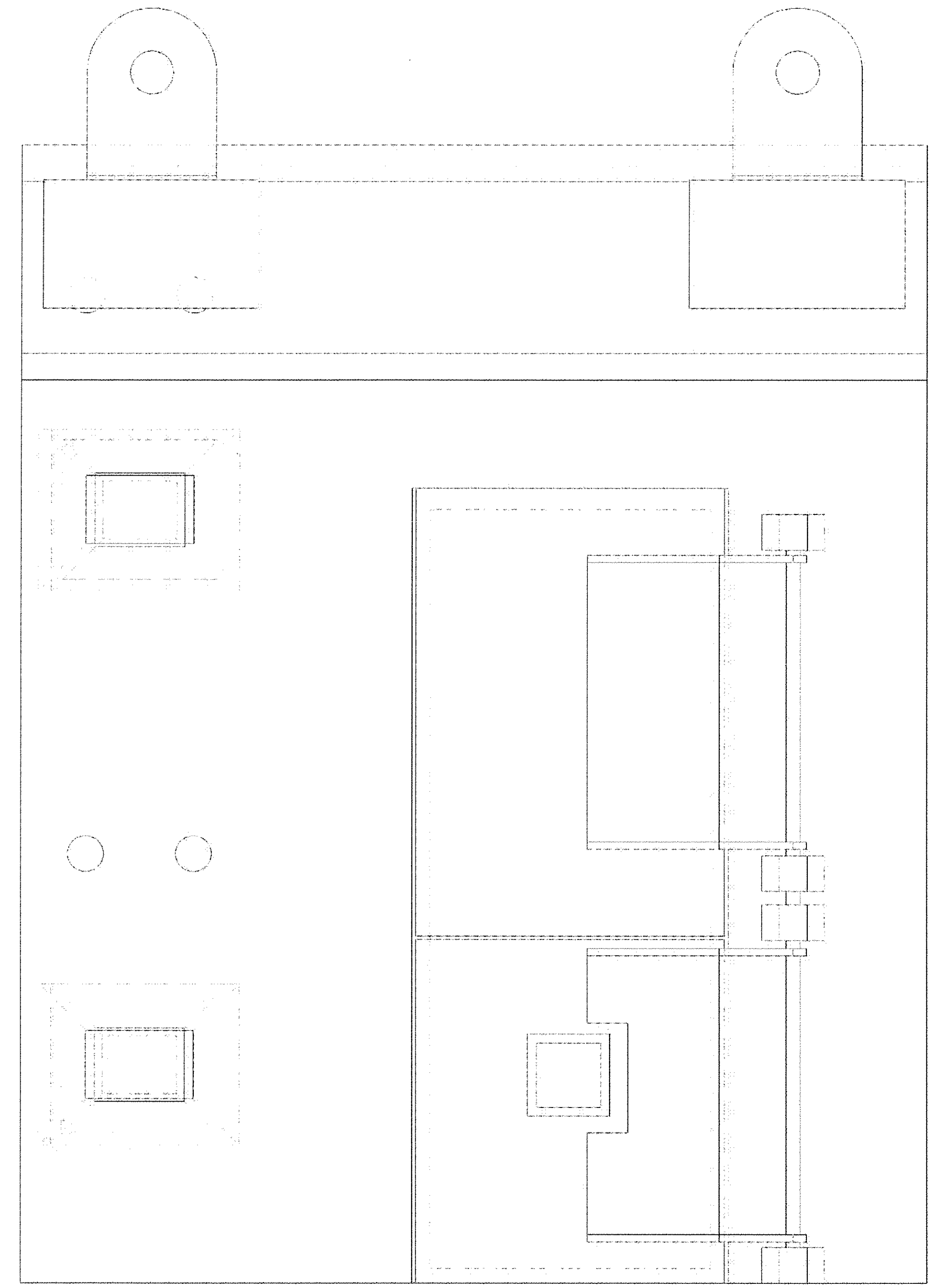
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M3C	A

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M3C1 SOUTH ELEVATION – MONOLITH 3
SCALE: 1/2"=1'-0"



2 / M3C1 EAST ELEVATION – MONOLITH 3
SCALE: 1/2"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK FRONT WALL – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M3C1	A

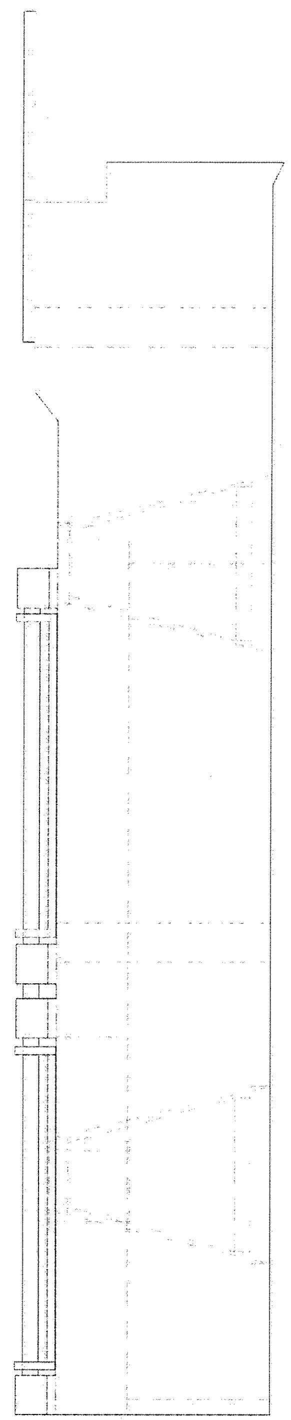
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract
Dedicated to Excellence

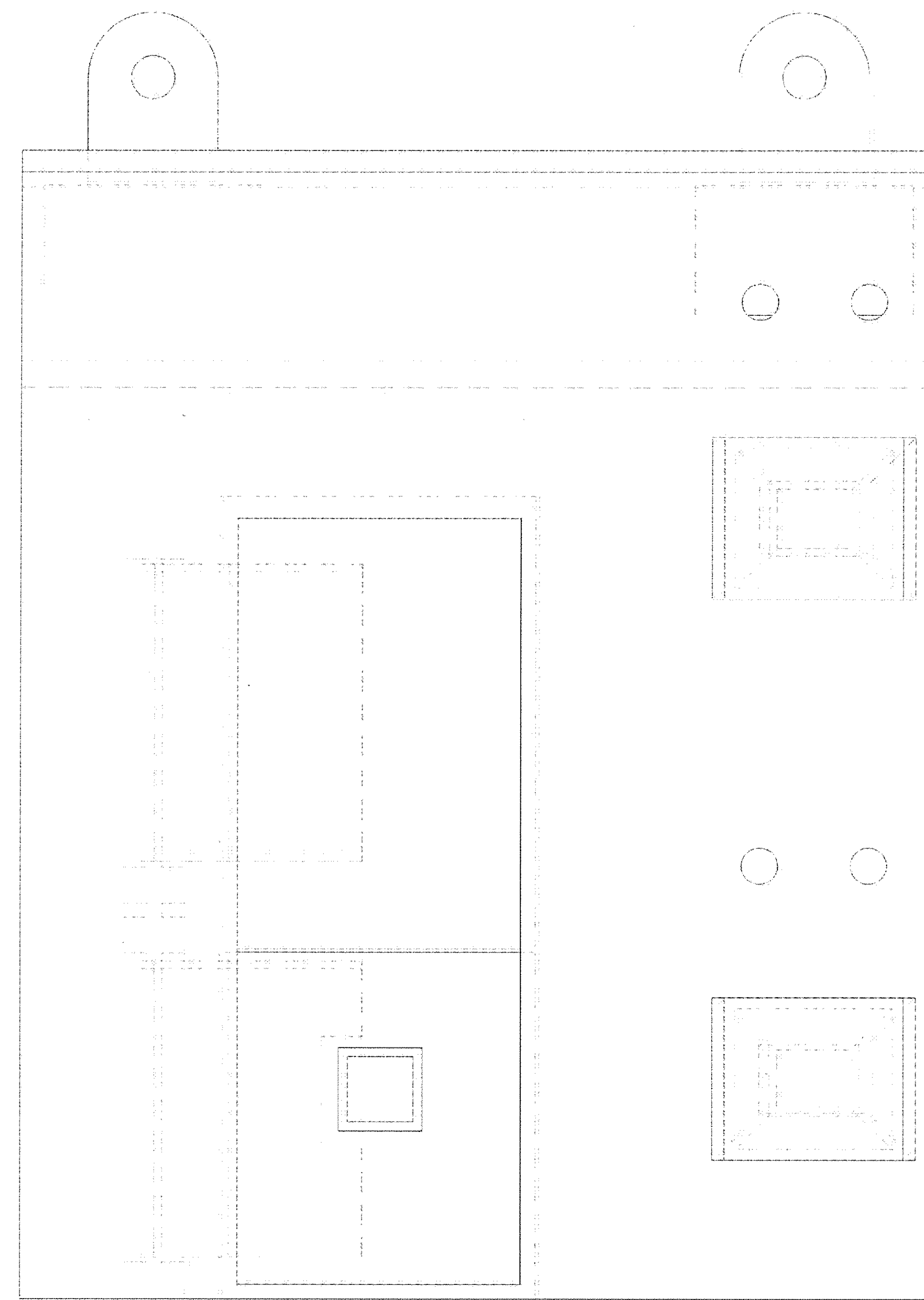
DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 / M3C2 NORTH ELEVATION – MONOLITH 3

SCALE: 1/2"=1'-0"



2 / M3C2 WEST ELEVATION – MONOLITH 3

SCALE: 1/2"=1'-0"

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK FRONT WALL – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

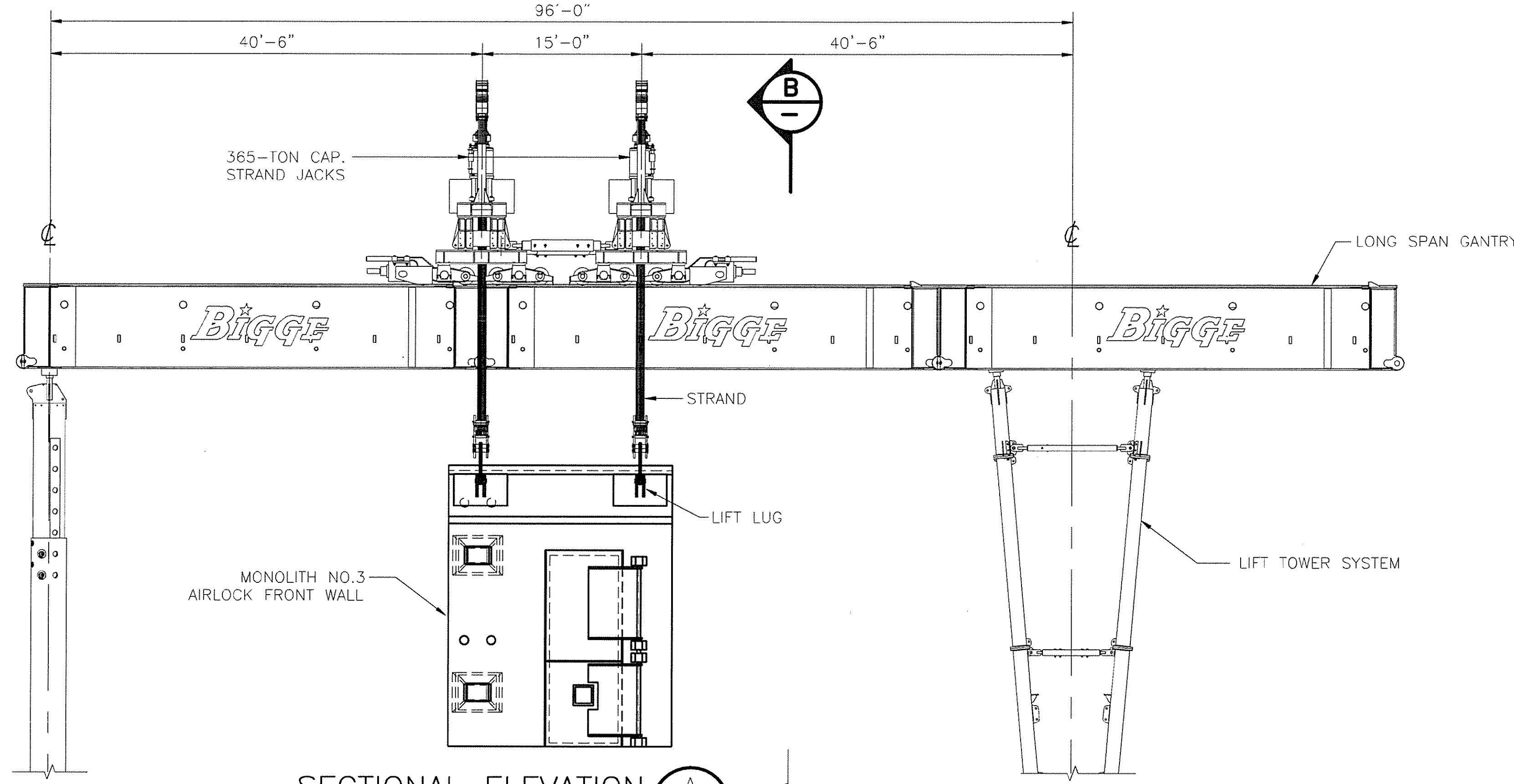
TASK	DRAWING NO.	REV. NO.
–	M3C2	A

RECORD INFORMATION

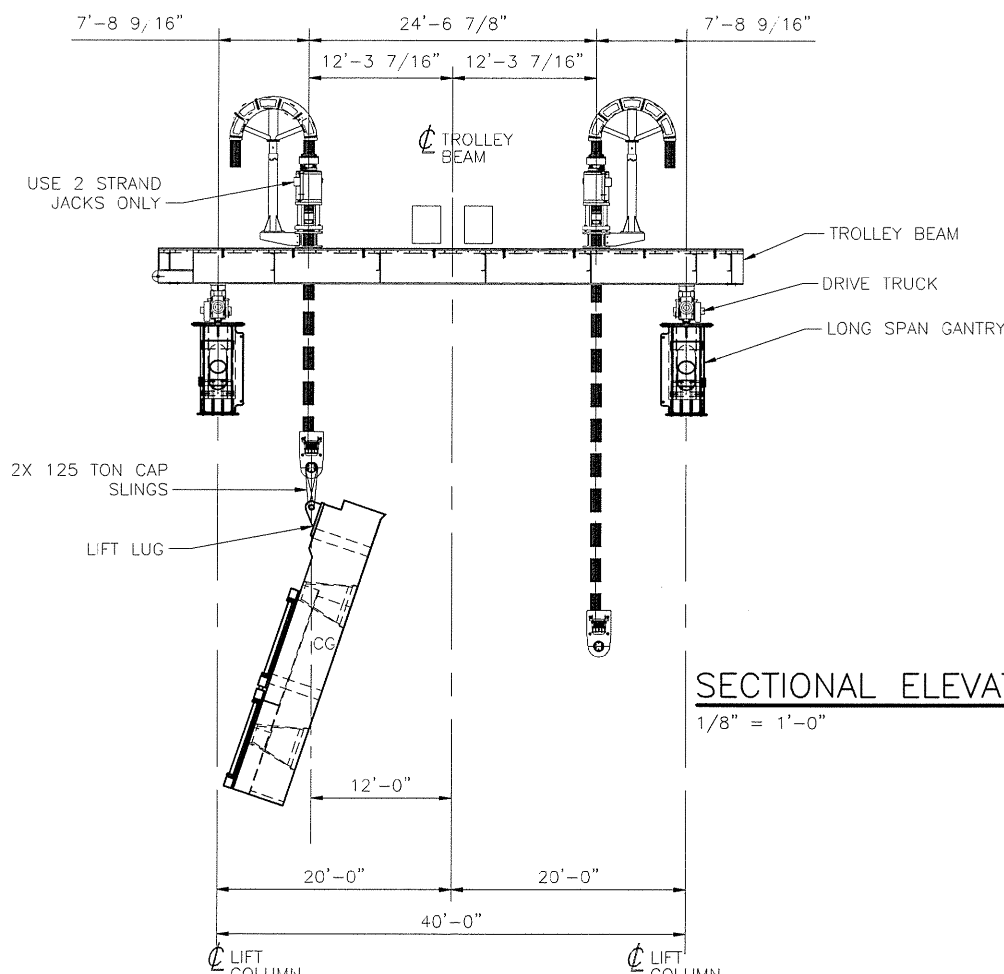
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract
Dedicated to Safety, Performance, Cleanup Excellence

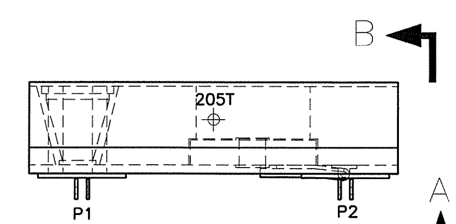
DRAWING NO.	REV. NO.
XX	A



SECTIONAL ELEVATION (A / M3D)
1/8" = 1'-0"



SECTIONAL ELEVATION (B / M3D)
1/8" = 1'-0"



PLAN
MONOLITH NO.3
AIRLOCK FRONT WALL

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

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A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
AIRLOCK FRONT WALL SECTIONAL ELEVATIONS

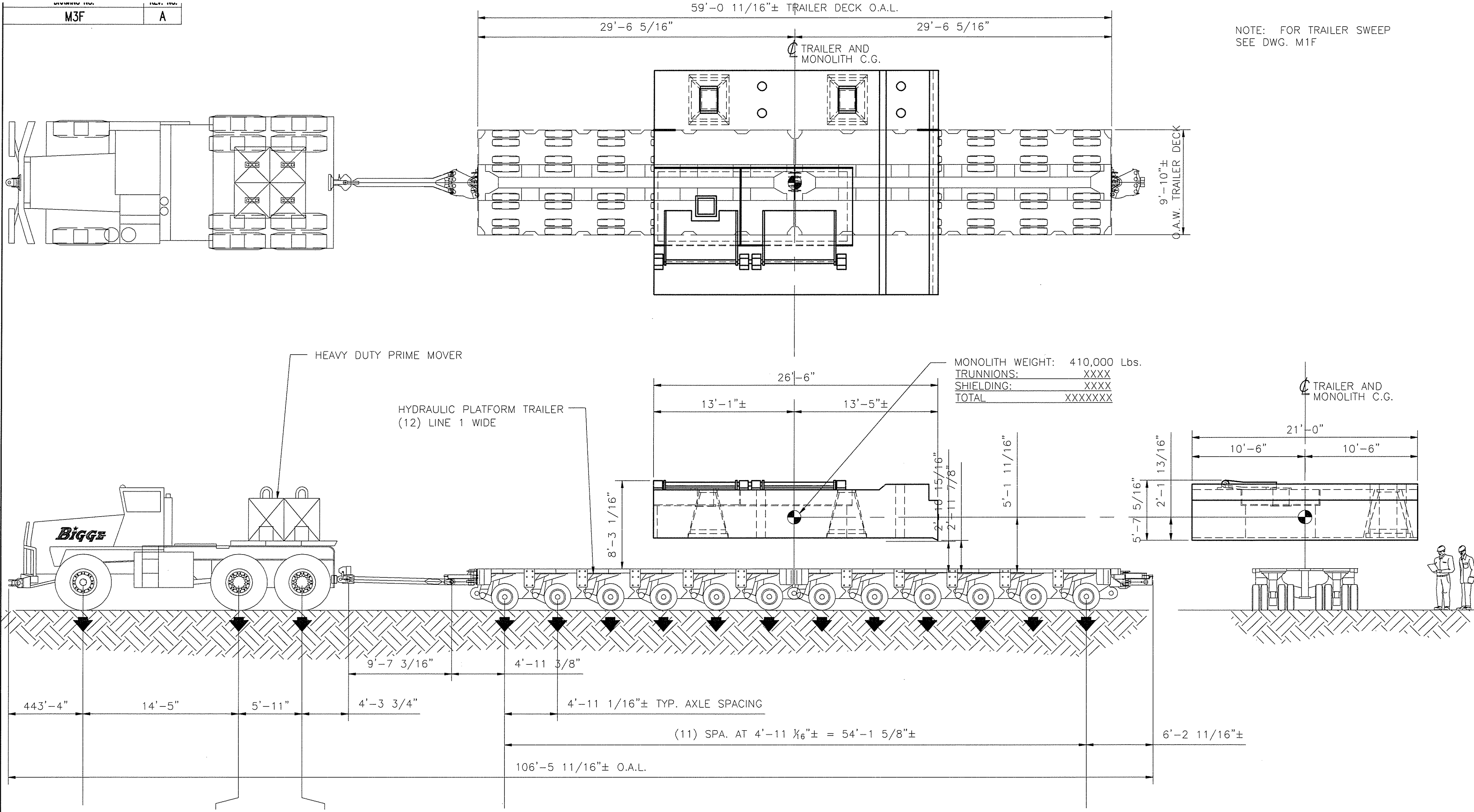
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M3D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M3F	A



1	2	3	4	AXLE No.	4 - 15		15
2	4	4		No. TIRES/AXLE	8		
11'-9"	12'-7"	12-7"		WIDTH	9'-10"		
29,000 Lbs.	47,000 Lbs.	47,000 Lbs.		GROSS WT./AXLE	XXX Lbs.		
				GROSS WT./TIRE	XXX Lbs.	(TOTAL TIRES = 96)	

AIR LOCK FRONT WALL MONOLITH 3

ELEVATION VIEW — / M3F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	145,400 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/16" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
AIR LOCK FRONT WALL TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M3F.DWG

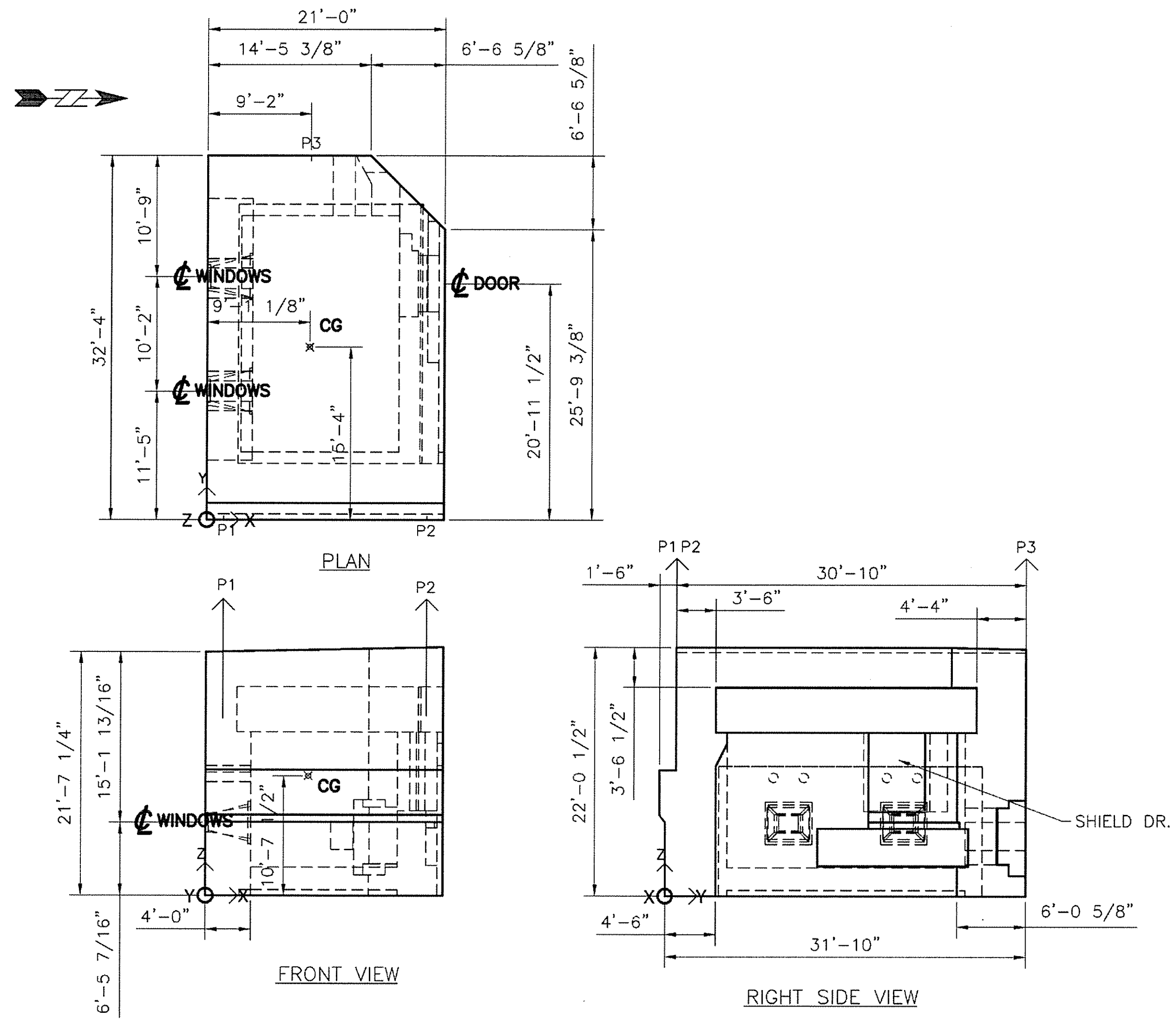
TASK	DRAWING NO.	REV. NO.
	M3F	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

G:\Engineering_Jobs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F-M...\30% Submit.dwg

DRAWING NO.	REV. NO.
_____-__-____	A



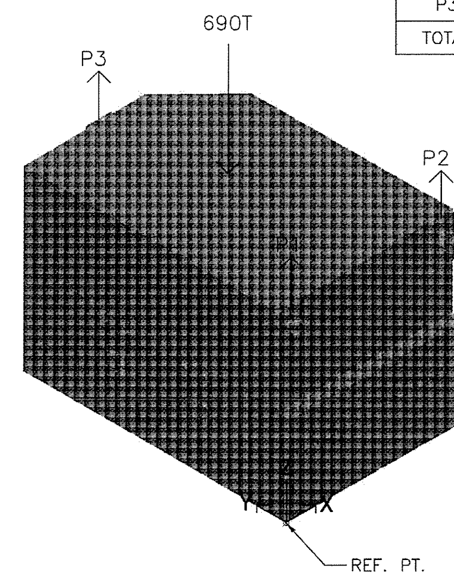
SCALE: 1/8" = 1'-0"

D-CELL
MONOLITH NO. 4

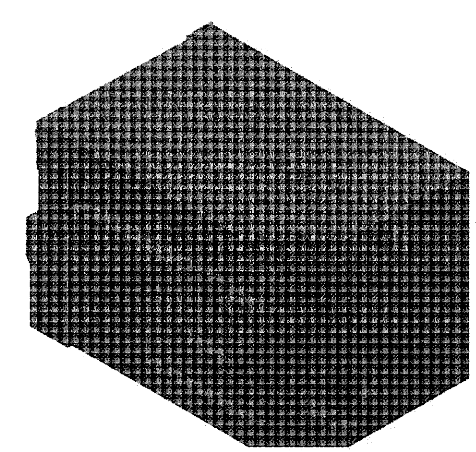
EST. WEIGHT: 690 TON

CENTROID: **X: 109.1 IN**
Y: 184.0 IN
Z: 127.5 IN

P1	211.3
P2	151.5
P3	327.2
TOTAL	690 T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
D-CELL DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	_______.DWG

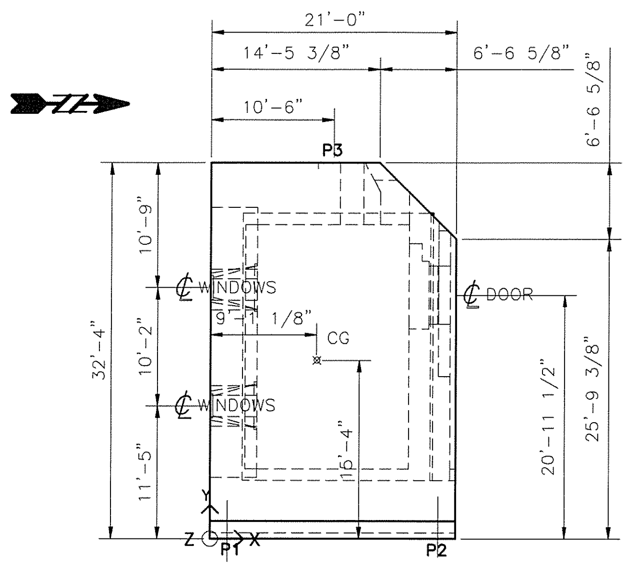
TASK	DRAWING NO.	REV. NO.
—	M4A	A

RECORD INFORMATION

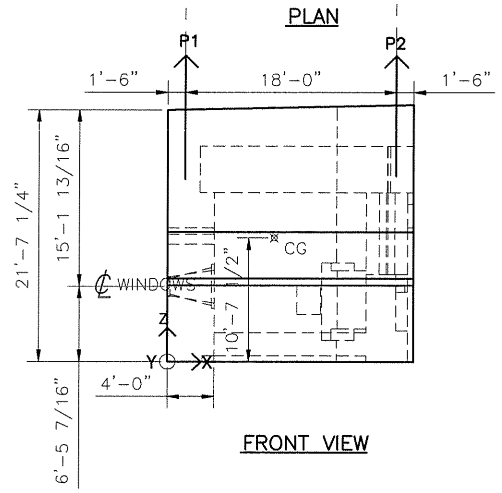
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated to Excellence

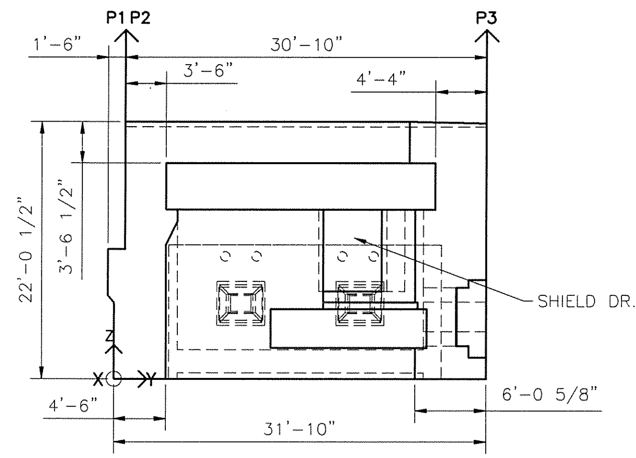
DRAWING NO.	REV. NO.
XX	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

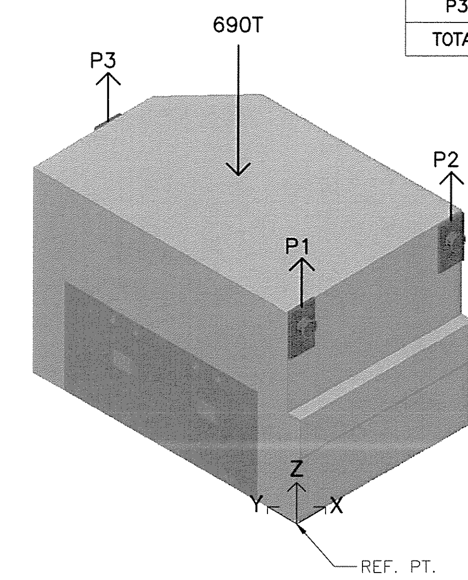
SCALE: 1/8" = 1'-0"

D-CELL
MONOLITH NO. 4

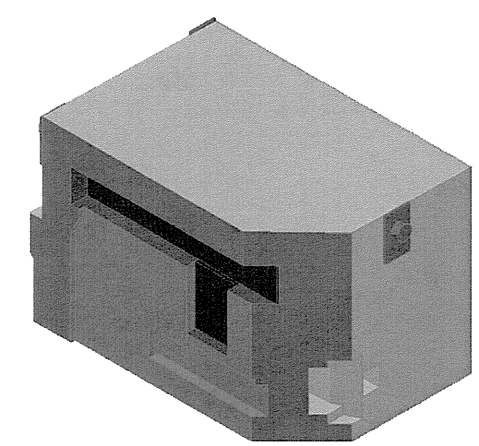
EST. WEIGHT: 690 TON

CENTROID: X: 109.1 IN
Y: 184.0 IN
Z: 127.5 IN

P1	211.3
P2	151.5
P3	327.2
TOTAL	690 T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS DEMOLITION
REC MONOLITH LIFTING ARRAGEMENT
D-CELL DETAIL PLAN/ISOMETRIC VIEW

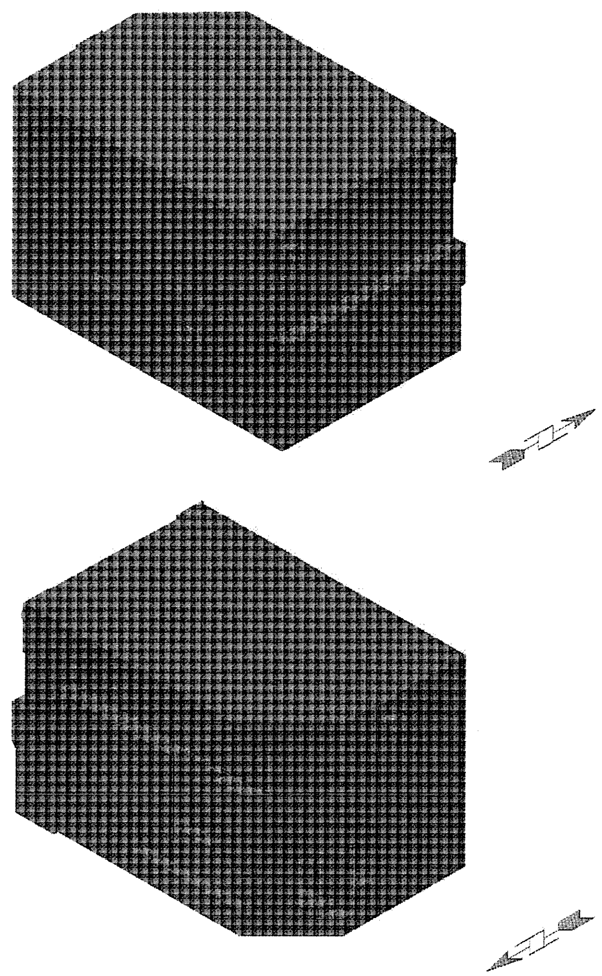
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M4B	A

RECORD INFORMATION

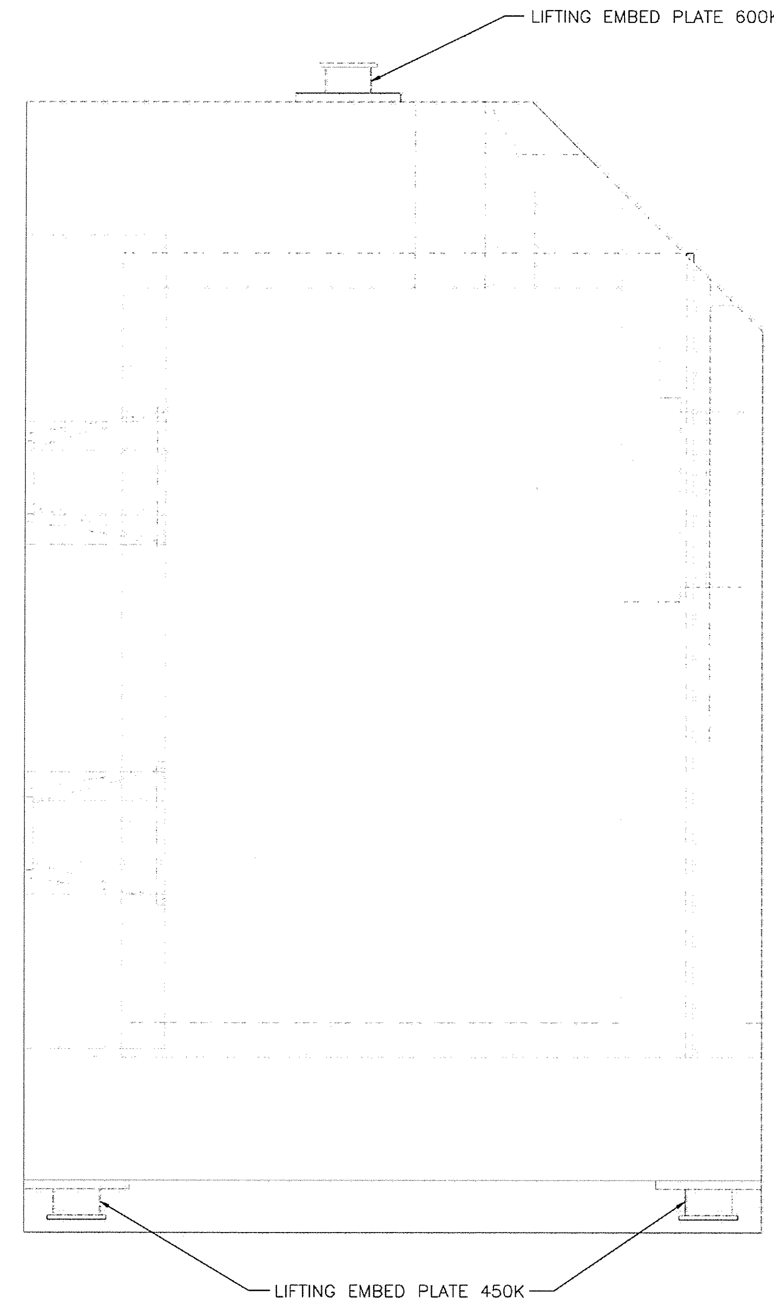
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M4C ISOMETRIC VIEWS – MONOLITH 4

SCALE: NONE



2 / M4C PLAN – MONOLITH 4

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
A-CELL TOP – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M4C	A

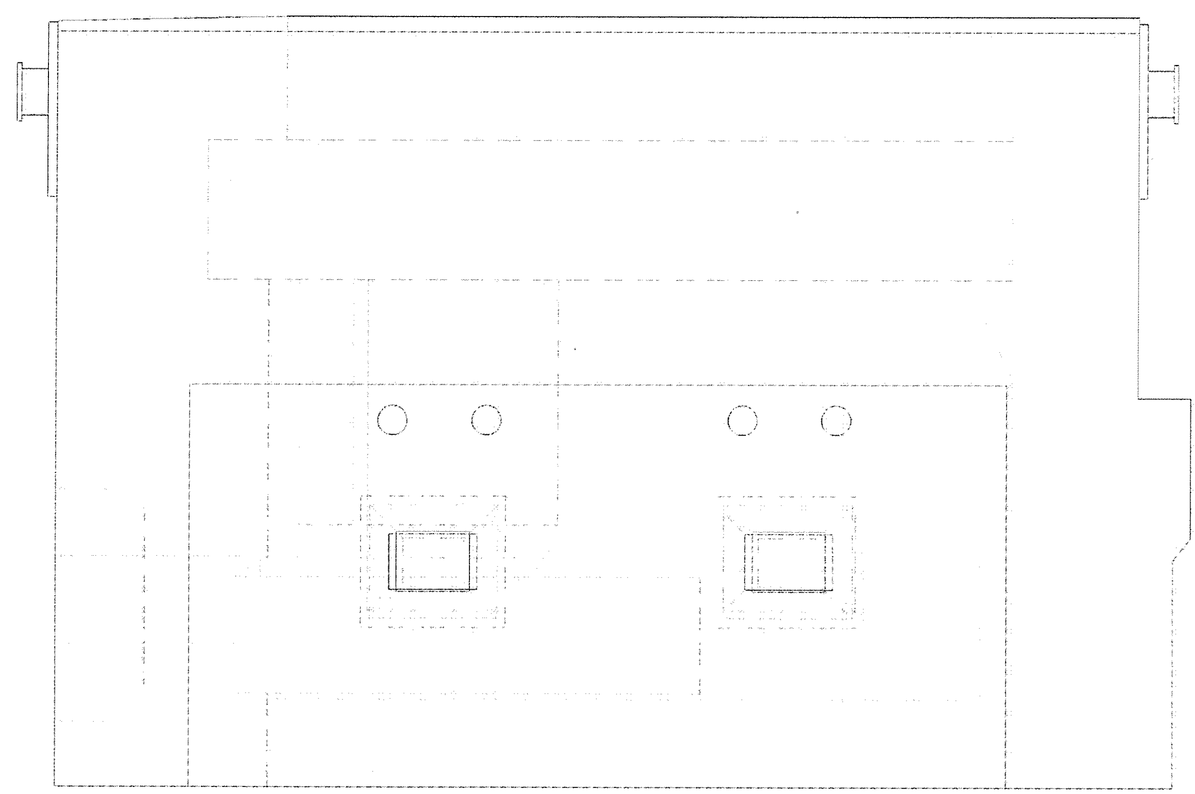
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

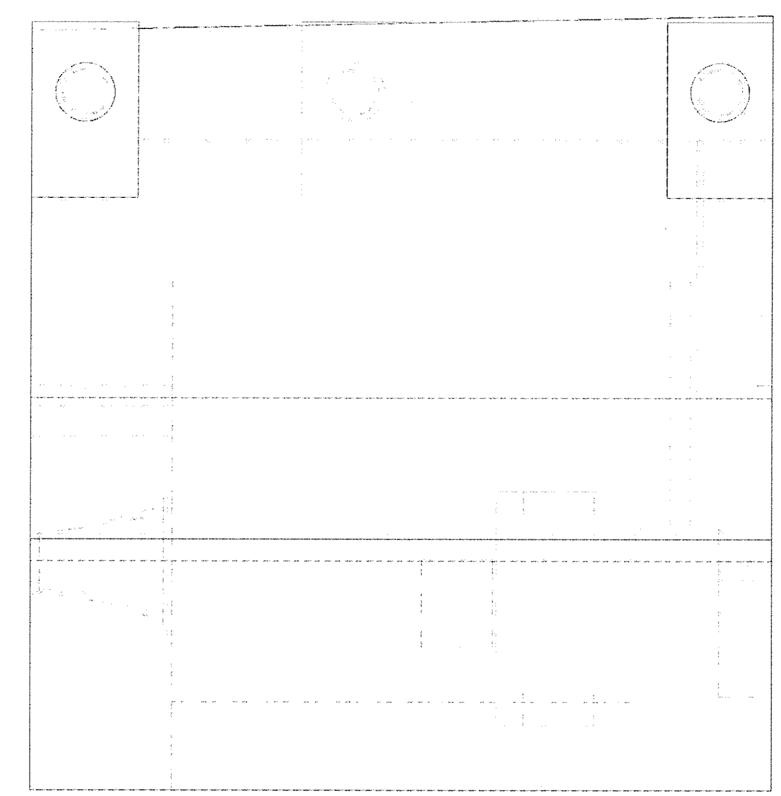
River Corridor Closure Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 / M4C1 SOUTH ELEVATION – MONOLITH 4
SCALE: 3/8"=1'-0"



2 / M4C1 EAST ELEVATION – MONOLITH 4
SCALE: 3/8"=1'-0"

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
A-CELL TOP – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M4C1	A

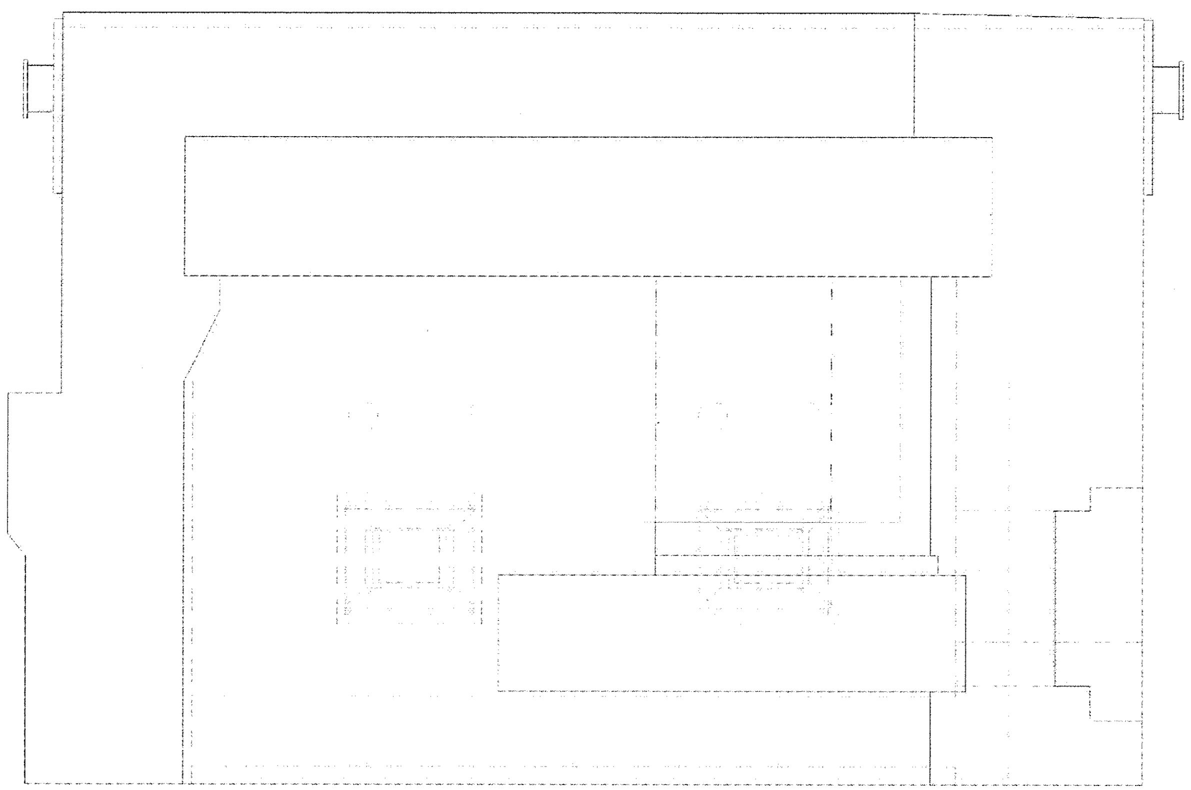
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

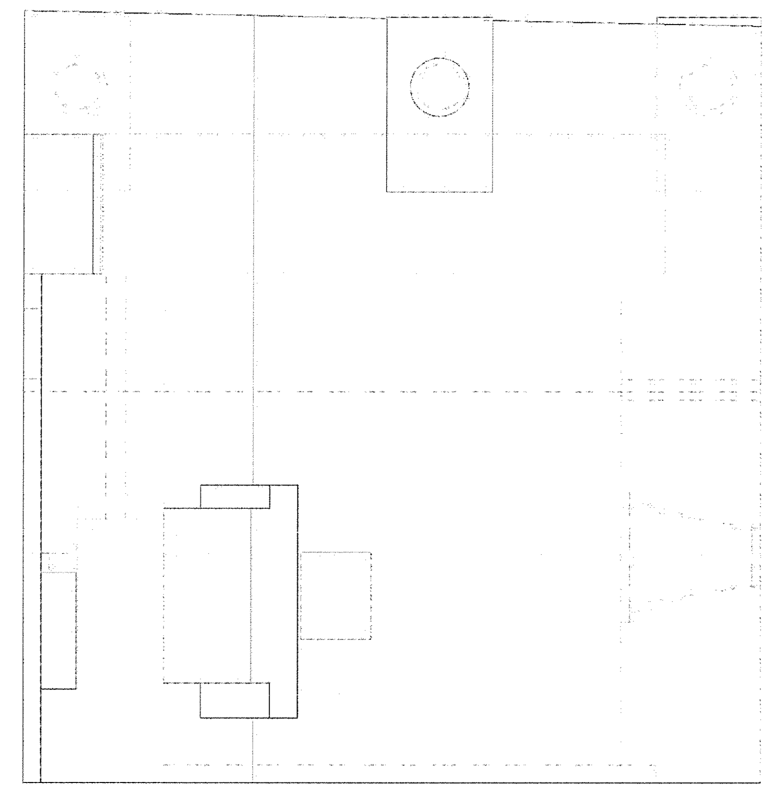
River Corridor Closure Contract
Dedicated to Safety Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 / M4C2 NORTH ELEVATION – MONOLITH 4
SCALE: 3/8"=1'-0"



2 / M4C2 WEST ELEVATION – MONOLITH 4
SCALE: 3/8"=1'-0"

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
A-CELL TOP – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

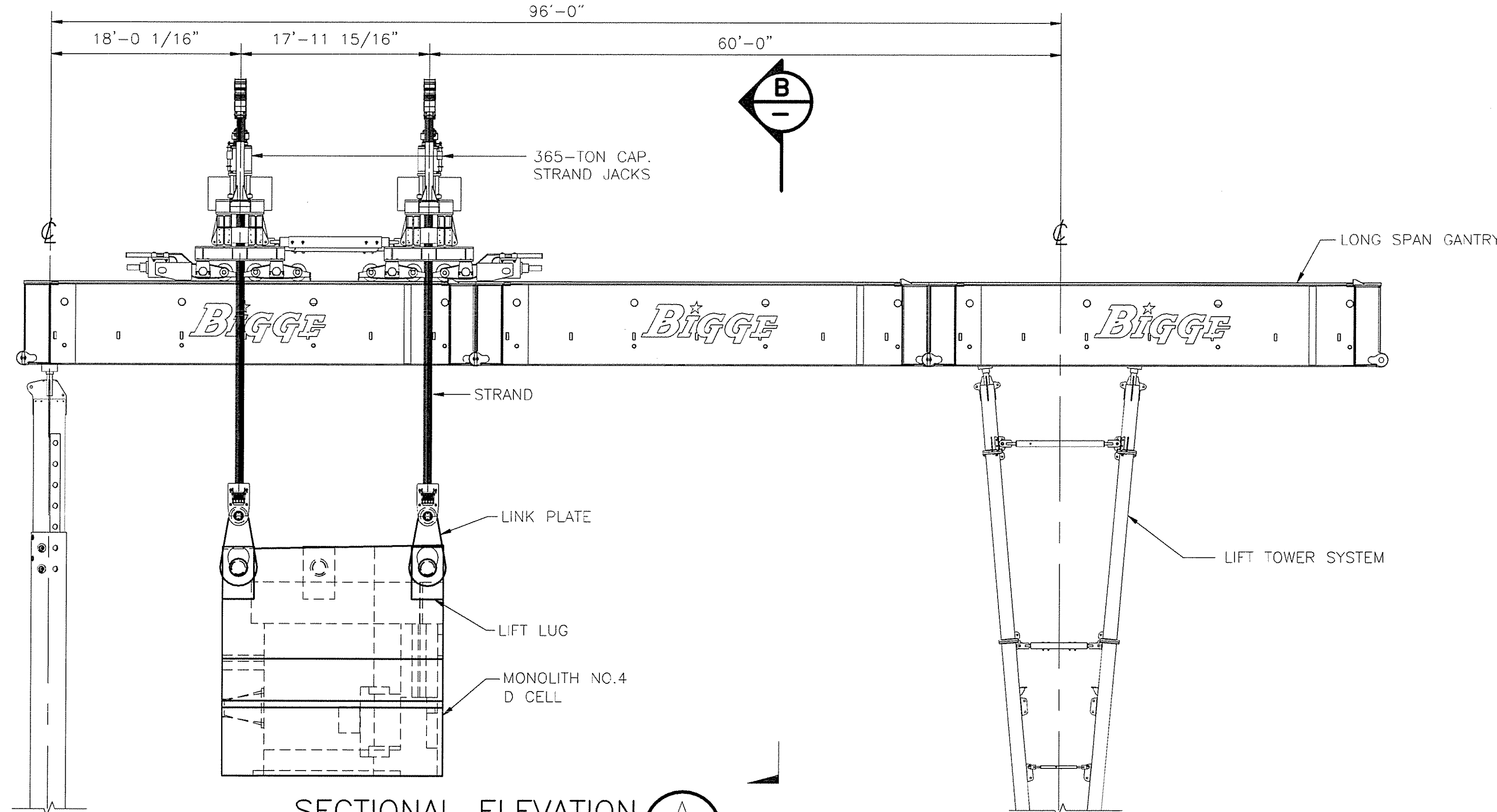
TASK	DRAWING NO.	REV. NO.
–	M4C2	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

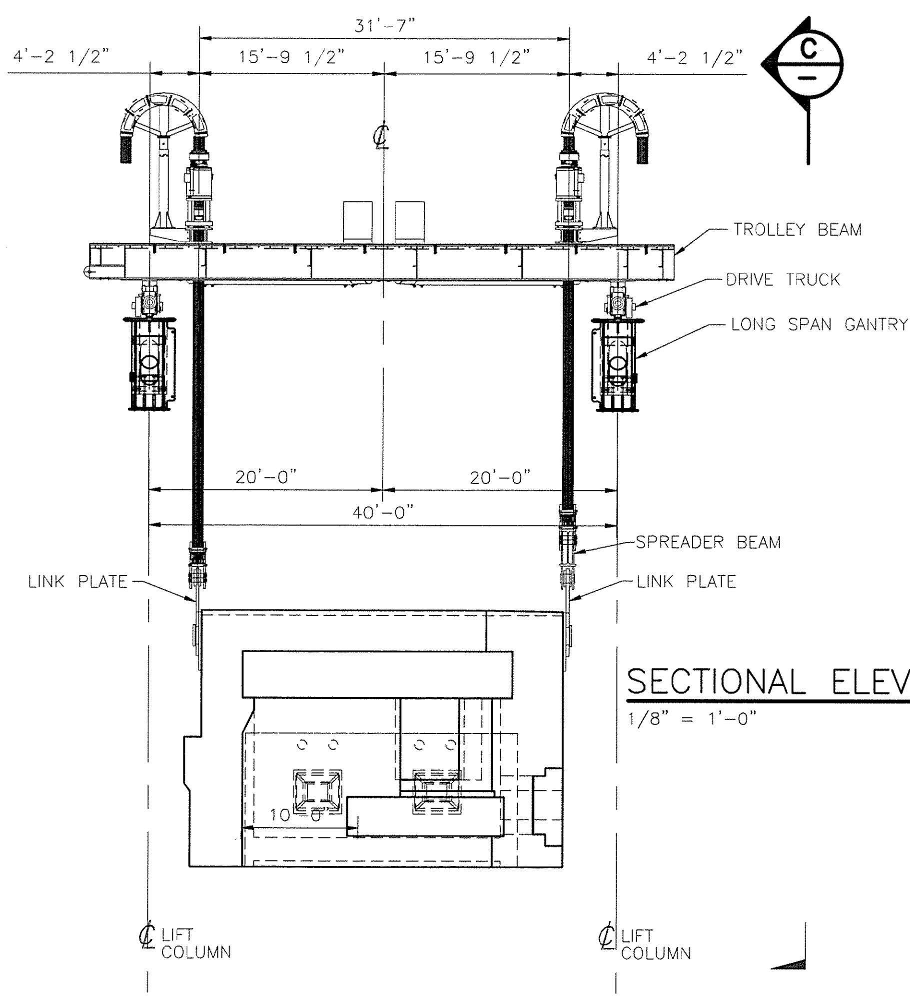
River Corridor Closure Contract
Dedicated WCH to Safety and Excellence

DRAWING NO.	REV. NO.
XX	A



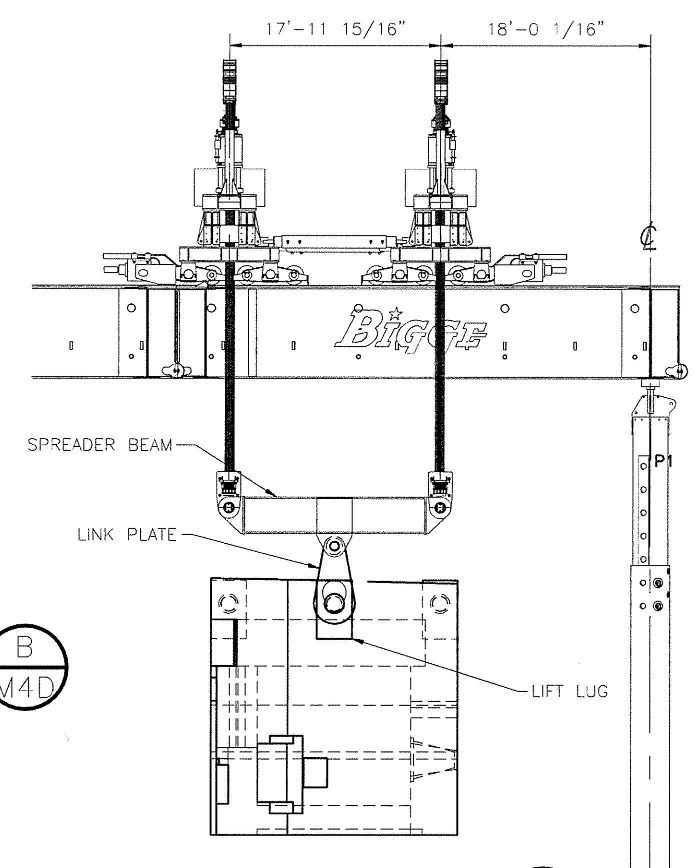
SECTIONAL ELEVATION A / M4D

1/8" = 1'-0"



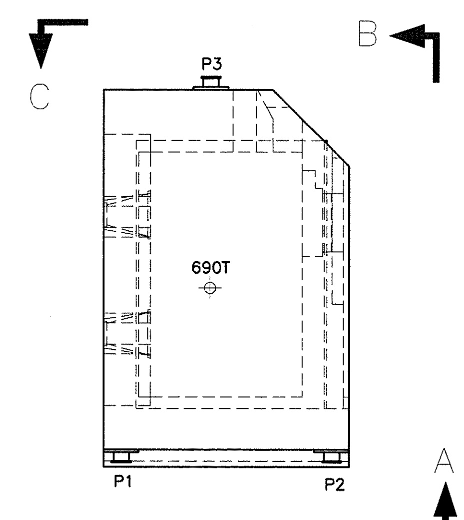
SECTIONAL ELEVATION B / M4D

1/8" = 1'-0"



SECTIONAL ELEVATION C / M4D

1/8" = 1'-0"



PLAN

MONOLITH NO.4
D CELL

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
D CELL SECTIONAL ELEVATIONS

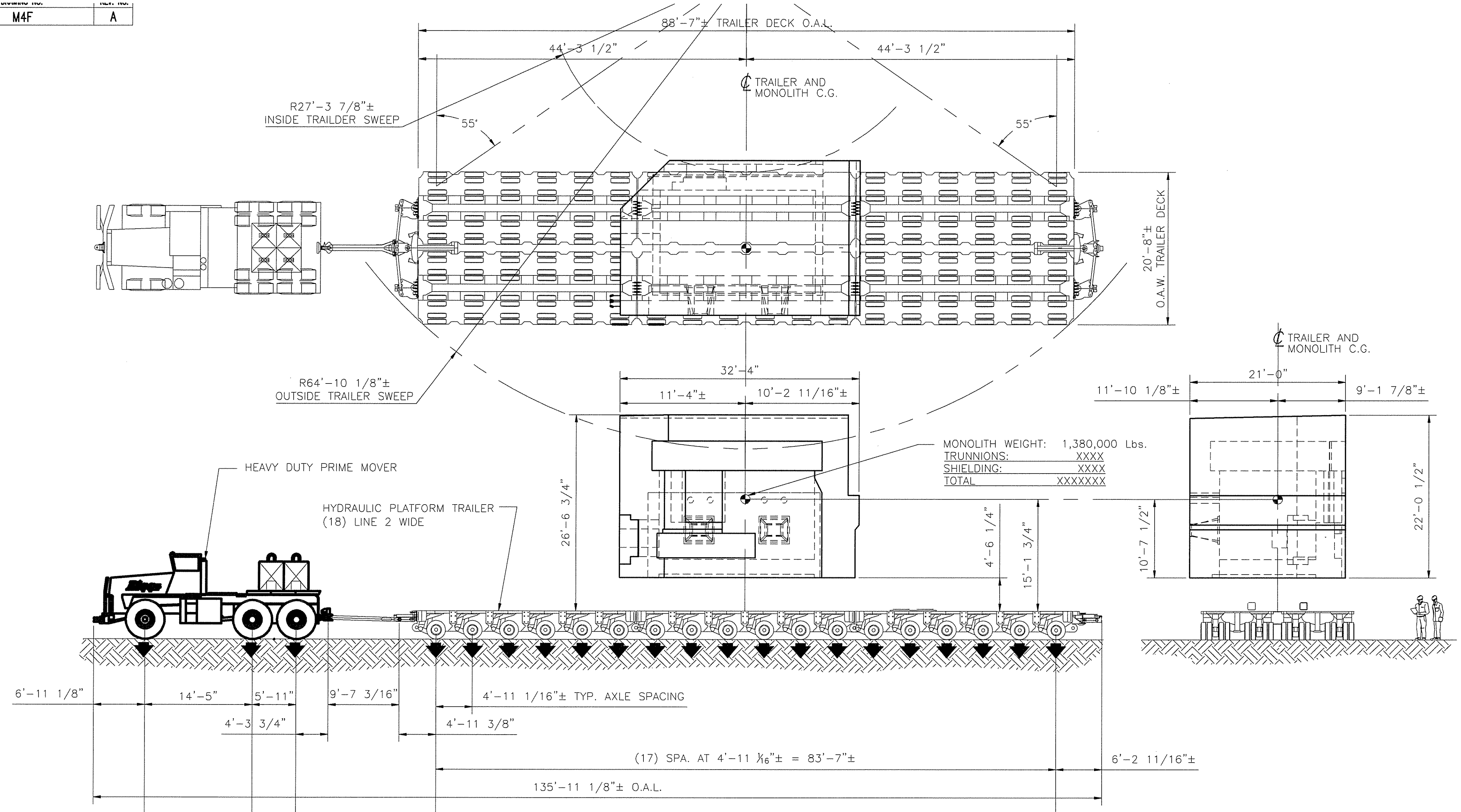
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M4D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

M4F | A



AXLE No.	1	2	3	4 – 21
No. TIRES/AXLE	2	4	4	16
WIDTH	11'-9"	12'-7"	12-7"	20'-8"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 288)

D–CELL
MONOLITH 4

ELEVATION VIEW – / M4F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	261,720 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
D-CELL TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M4F.DWG

TASK	DRAWING NO.	REV. NO.
	M4F	A

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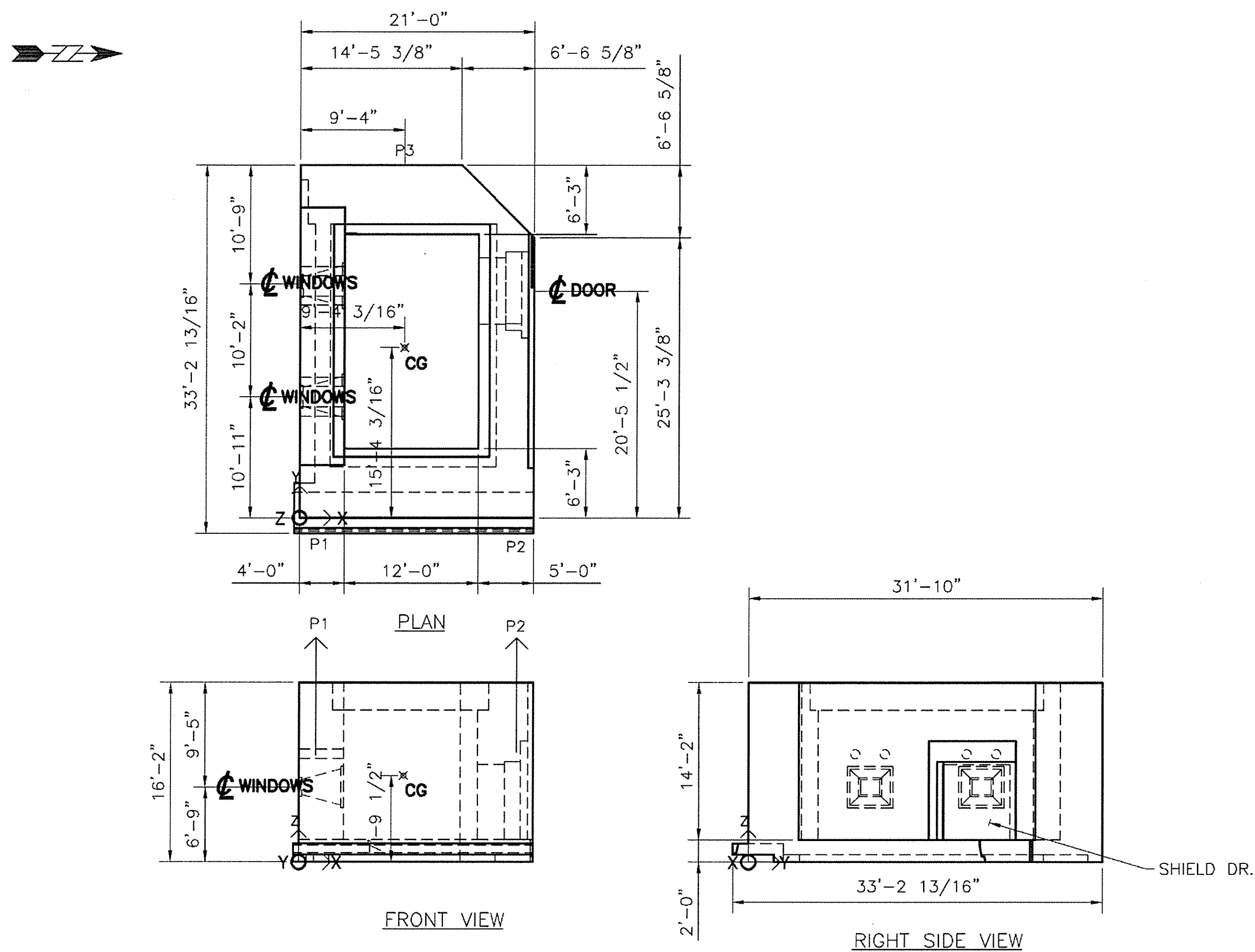
DRAWING NO.	REV. NO.
_____-__-_____	A



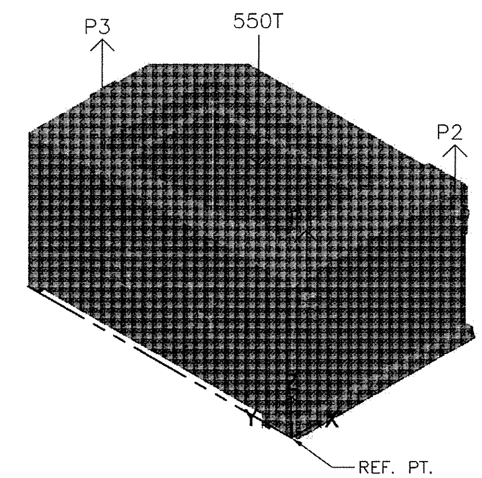
SCALE: 1/8" = 1'-0"

C-CELL
MONOLITH NO. 5

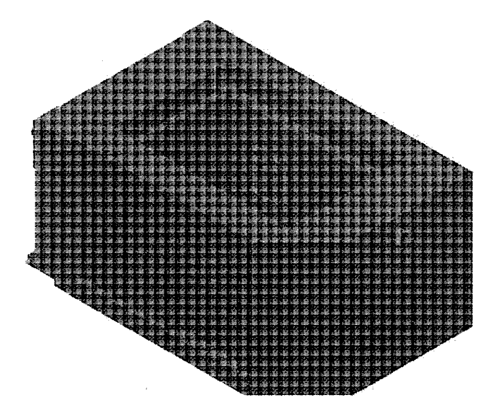
EST. WEIGHT: 550 TON

CENTROID: X: 112.2 IN
Y: 184.2 IN
Z: 93.5 IN

P1	160.3
P2	124.5
P3	265.2
TOTAL	550 T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
C-CELL DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

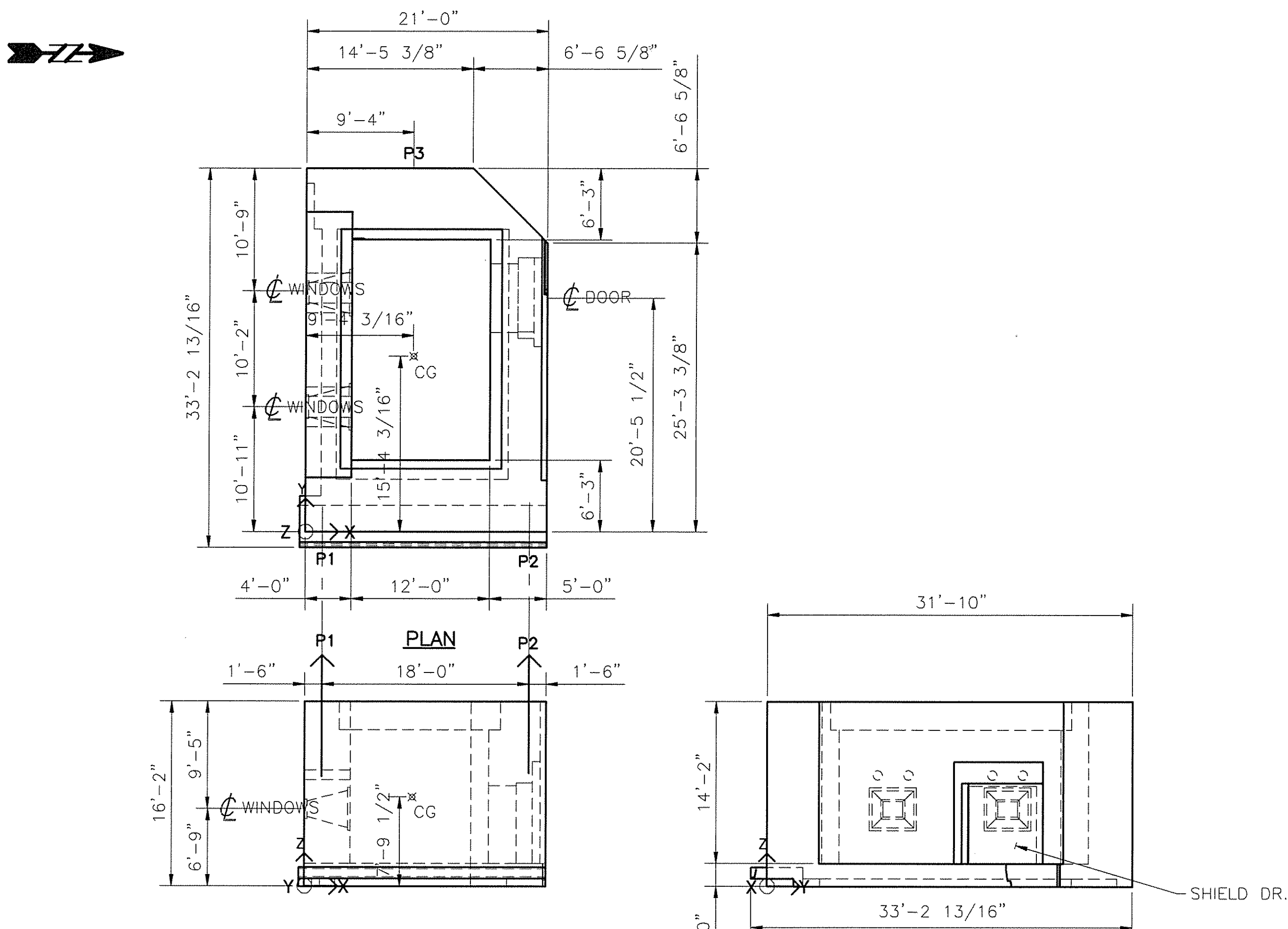
TASK	DRAWING NO.	REV. NO.
–	M5A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XX	A



PLAN

FRONT VIEW

RIGHT SIDE VIEW

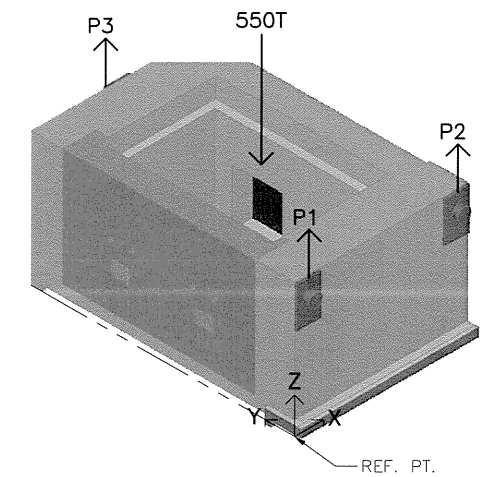
SCALE: 1/8" = 1'-0"

C-CELL
MONOLITH NO. 5

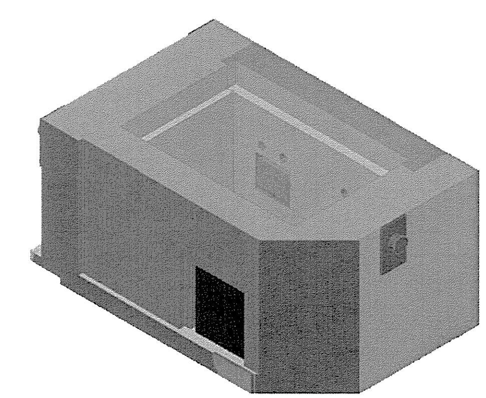
EST. WEIGHT: 550 TON

CENTROID: X: 112.2 IN
Y: 184.2 IN
Z: 93.5 IN

P1	160.3
P2	124.5
P3	265.2
TOTAL	550 T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELL
REC MONOLITH LIFTING ARRAGEMENT
C-CELL DETAIL PLAN/ISOMETRIC VIEW

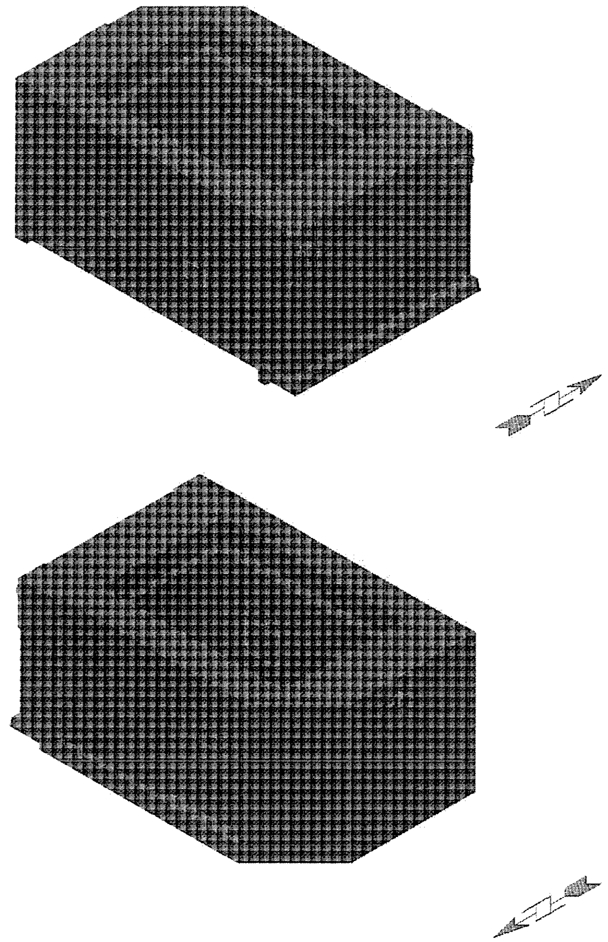
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M5B	A

RECORD INFORMATION

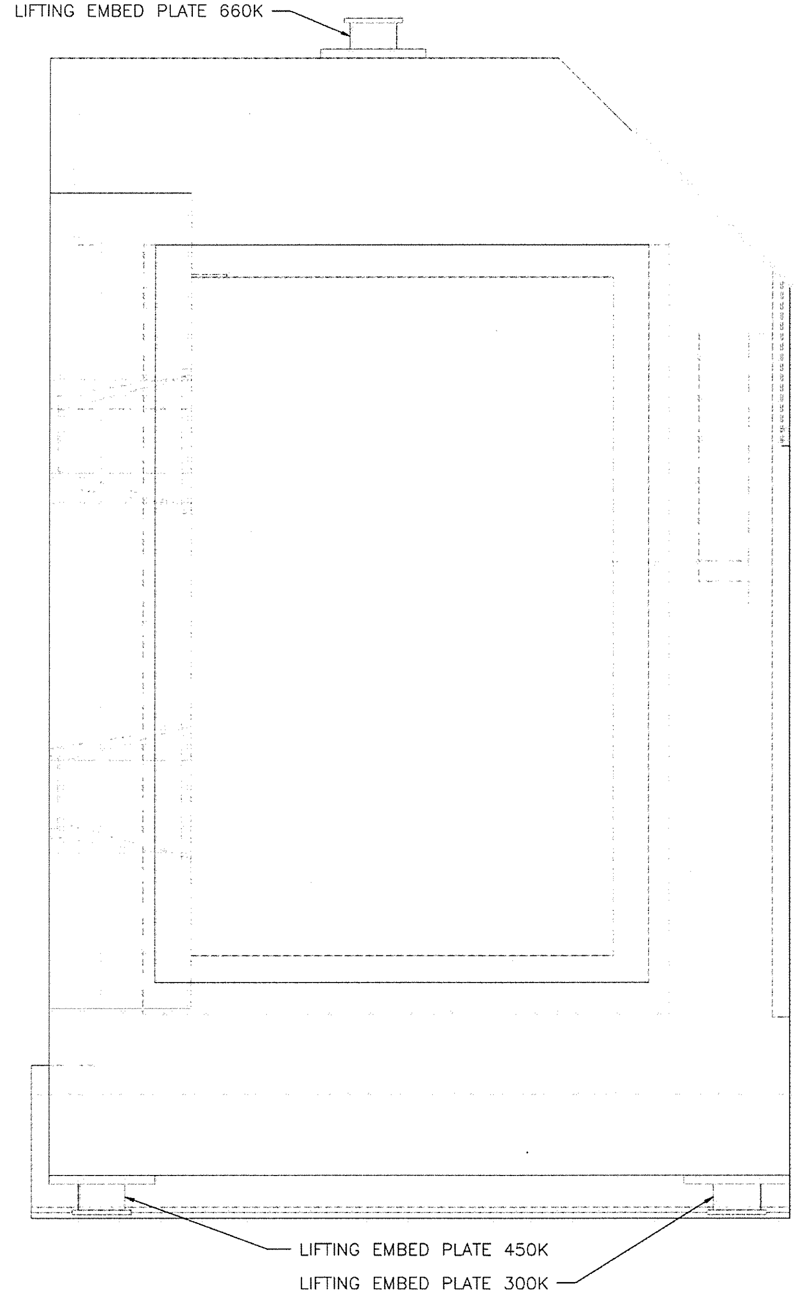
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M5C — ISOMETRIC VIEWS – MONOLITH 5

SCALE: NONE



2 / M5C — PLAN – MONOLITH 5

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
A-CELL BOTTOM – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

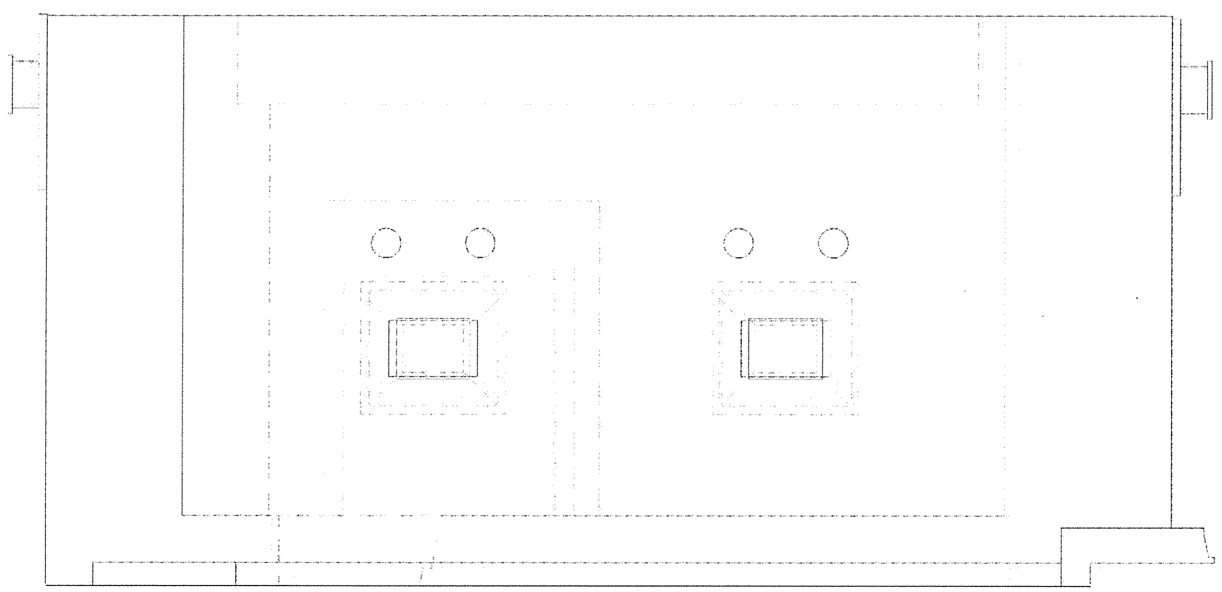
TASK	DRAWING NO.	REV. NO.
–	M5C	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

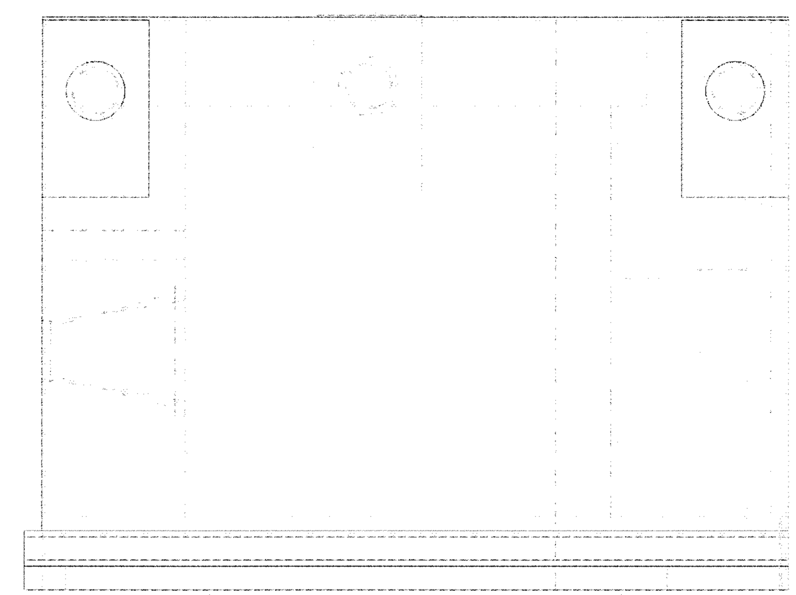
River Corridor Closure Contract
Dedicated WCH Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M5C1 SOUTH ELEVATION – MONOLITH 5

SCALE: 3/8"=1'-0"



2 / M5C1 EAST ELEVATION – MONOLITH 5

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
A-CELL BOTTOM – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M5C1	A

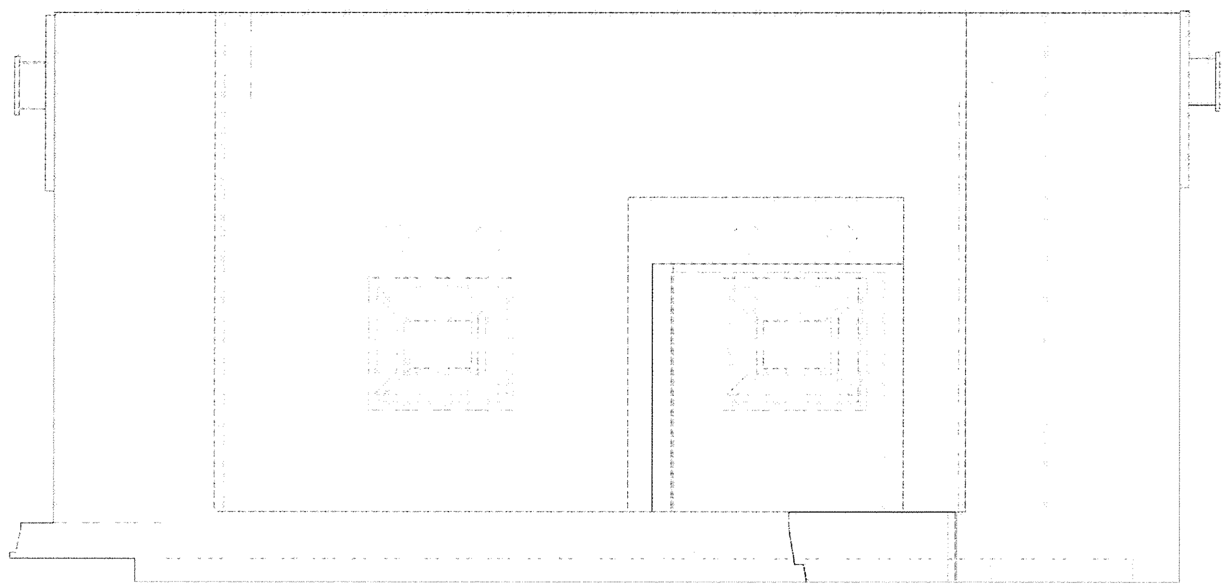
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_______	324	___

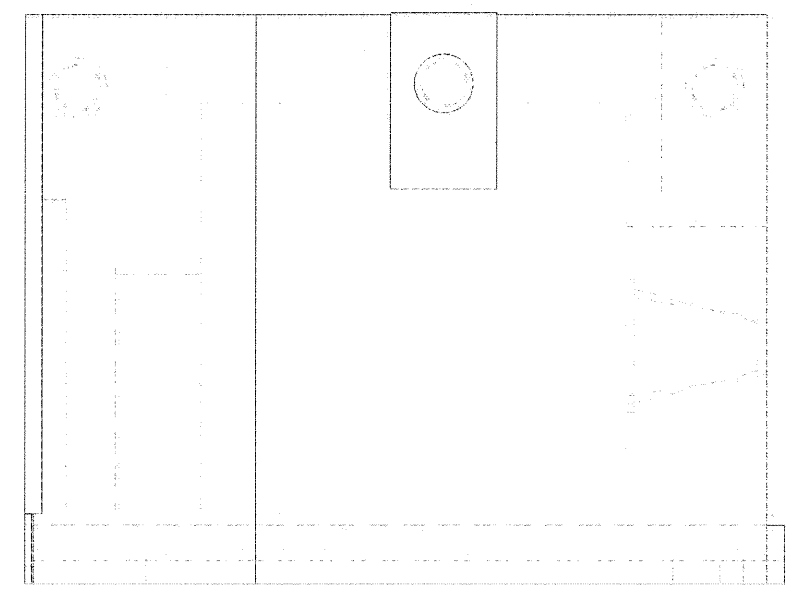
River Corridor Closure Contract
Dedicated WCH Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1
M5C2
NORTH ELEVATION – MONOLITH 5
SCALE: 3/8"=1'-0"



2
M5C2
WEST ELEVATION – MONOLITH 5
SCALE: 3/8"=1'-0"

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
A-CELL BOTTOM – ELEVATION VIEWS

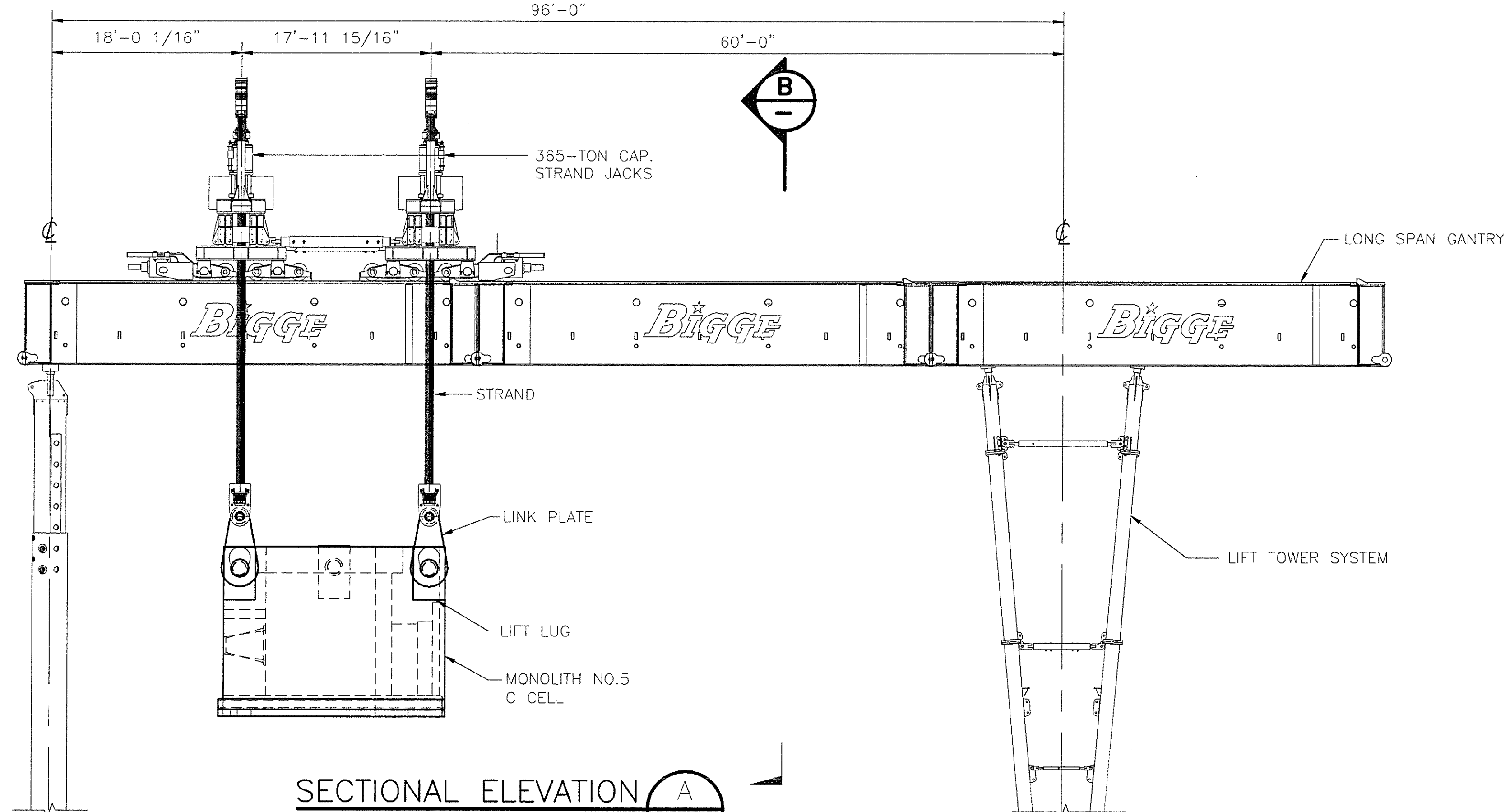
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M5C2	A

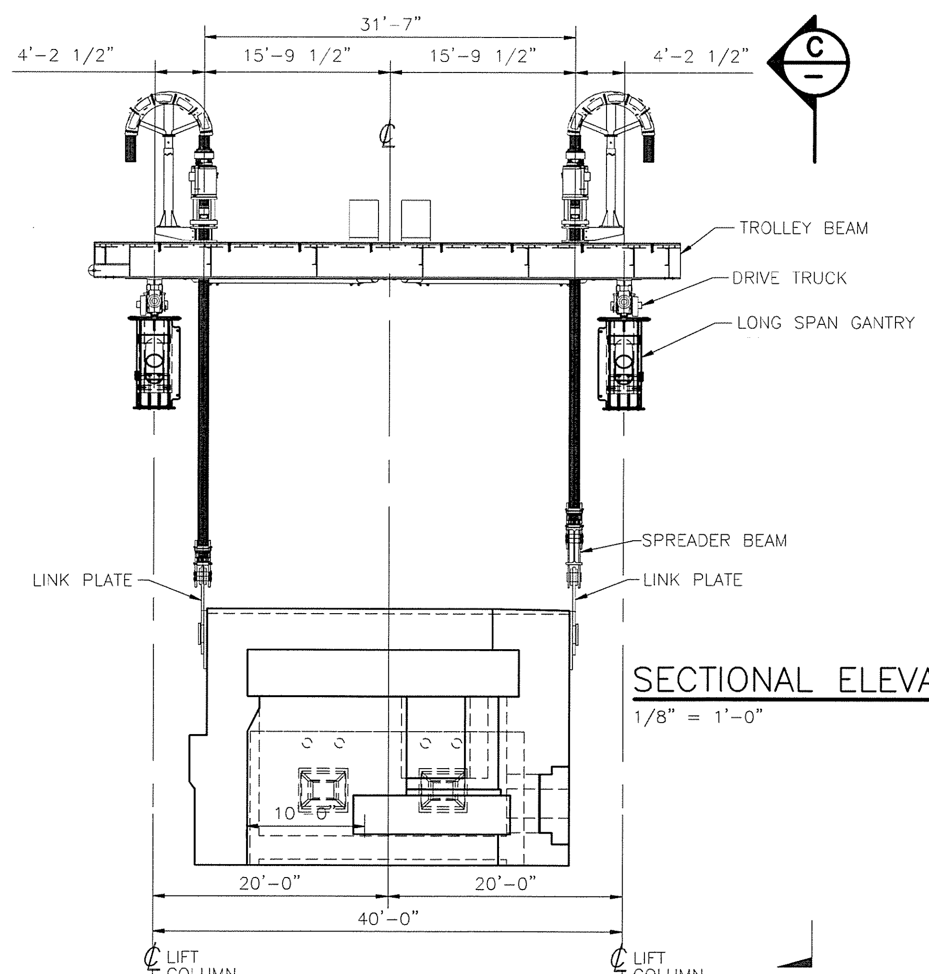
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

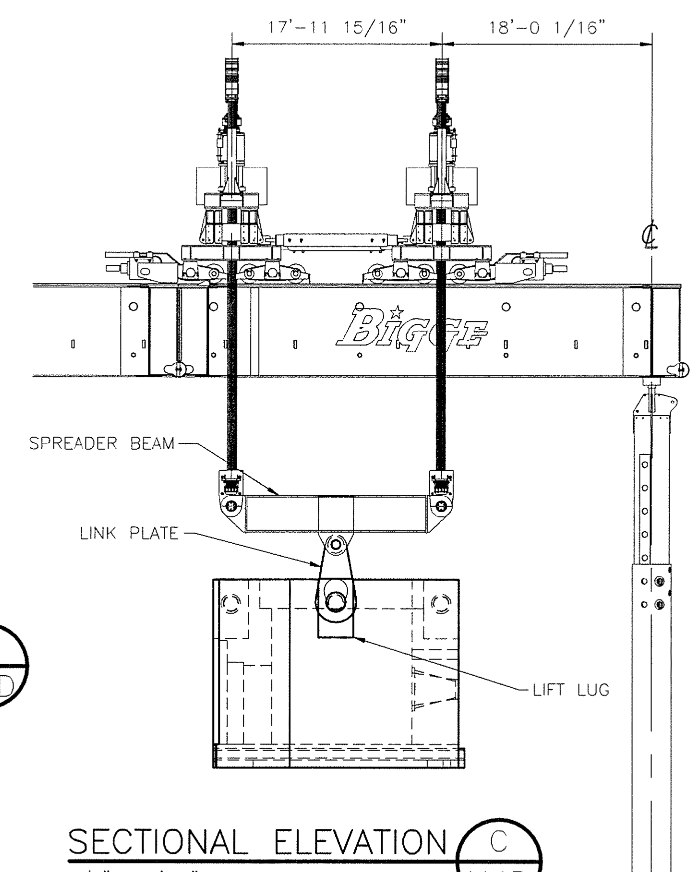
DRAWING NO.	REV. NO.
XX	A



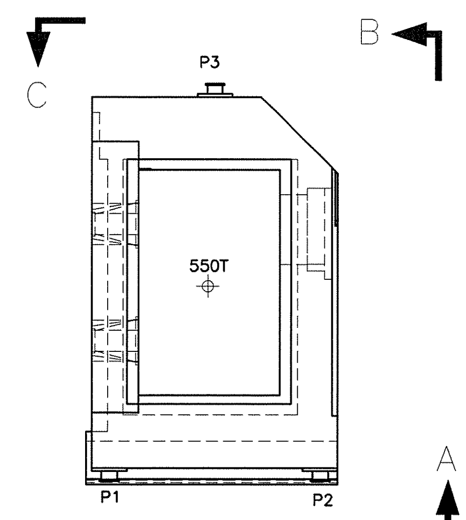
SECTIONAL ELEVATION (A / M5D)
1/8" = 1'-0"



SECTIONAL ELEVATION (B / M5D)
1/8" = 1'-0"



SECTIONAL ELEVATION (C / M4D)
1/8" = 1'-0"



PLAN
MONOLITH NO.5
C CELL

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
C CELL SECTIONAL ELEVATIONS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

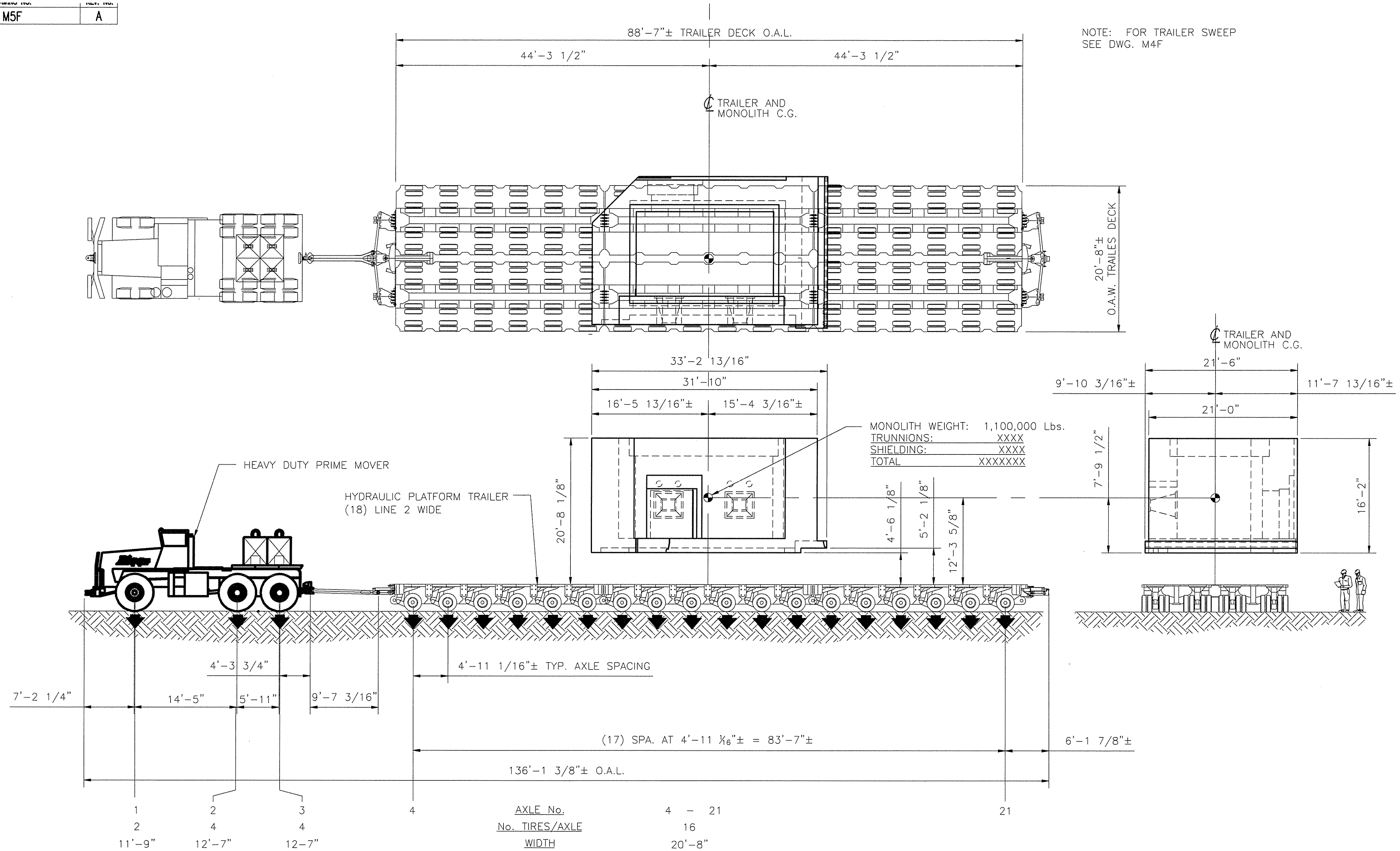
TASK	DRAWING NO.	REV. NO.
	M5D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M5F	A

NOTE: FOR TRAILER SWEEP SEE DWG. M4F



AXLE No.	1	2	3	4 – 21
No. TIRES/AXLE	2	4	4	16
WIDTH	11'-9"	12'-7"	12-7"	20'-8"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 288)

C-CELL
MONOLITH 5
ELEVATION VIEW — / M5F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	261,720 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

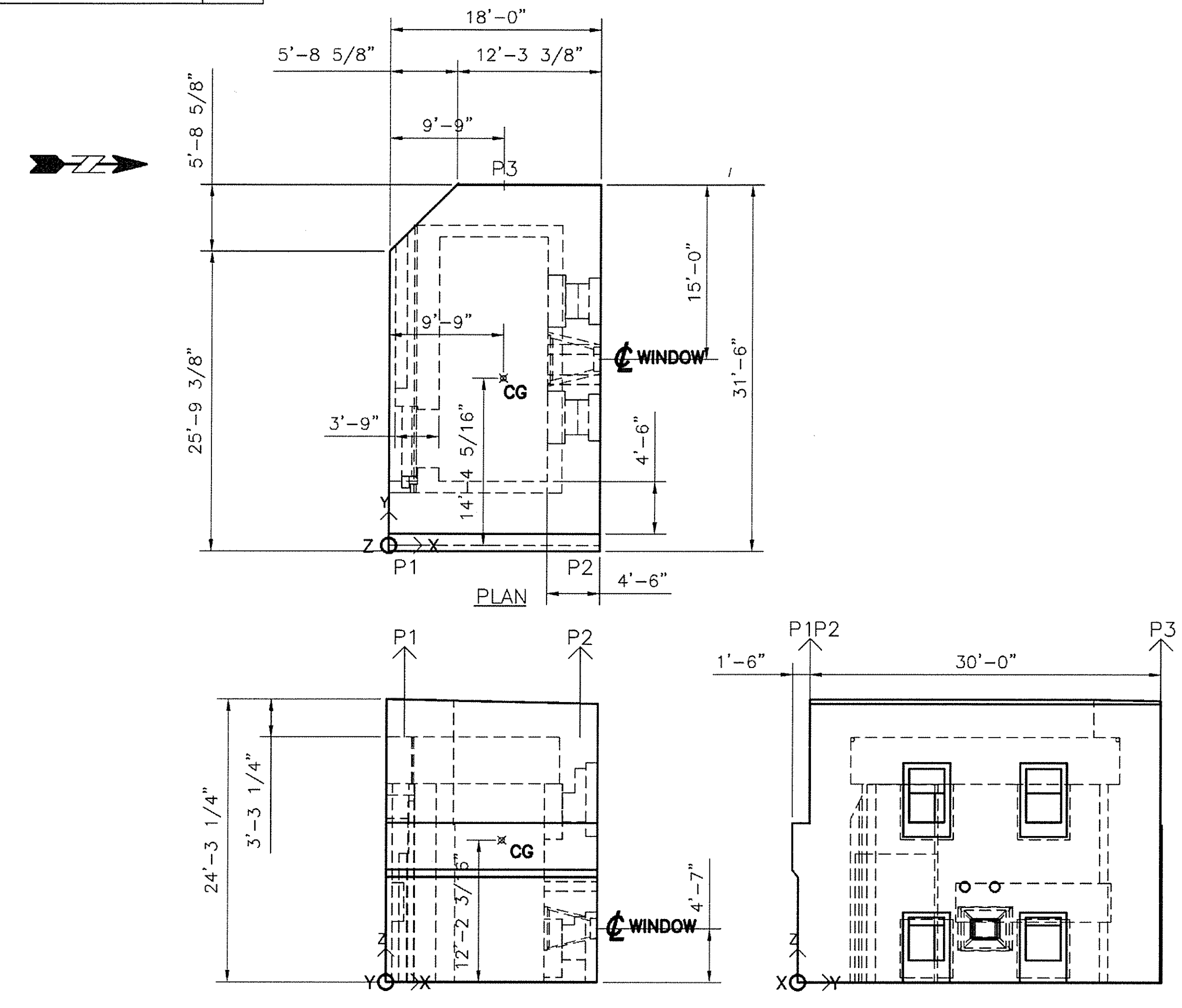
BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
C-CELL TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M5F.DWG

TASK	DRAWING NO.	REV. NO.
	M5F	A

G:\Engineering\Jobs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F-M19F 30% Submit.dwg

DRAWING NO.	REV. NO.
_____-__-______	A



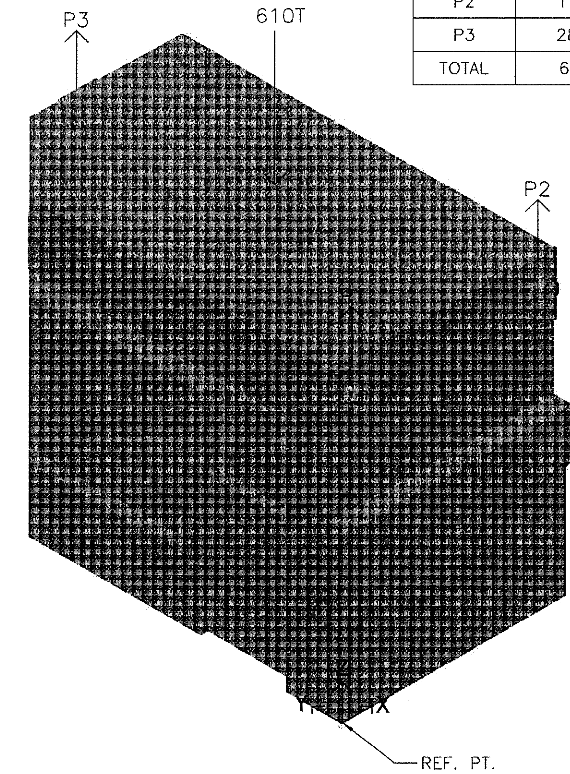
SCALE: 1/8" = 1'-0"

A-CELL TOP
MONOLITH NO. 6

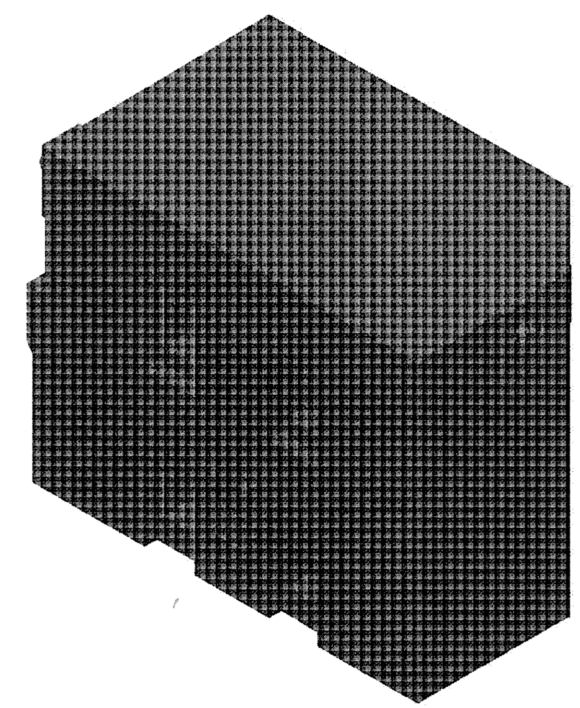
EST. WEIGHT: 610 TON

CENTROID: X: 117.3 IN
Y: 178.3 IN
Z: 146.2 IN

P1	144
P2	178.1
P3	287.9
TOTAL	610T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
A-CELL TOP DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

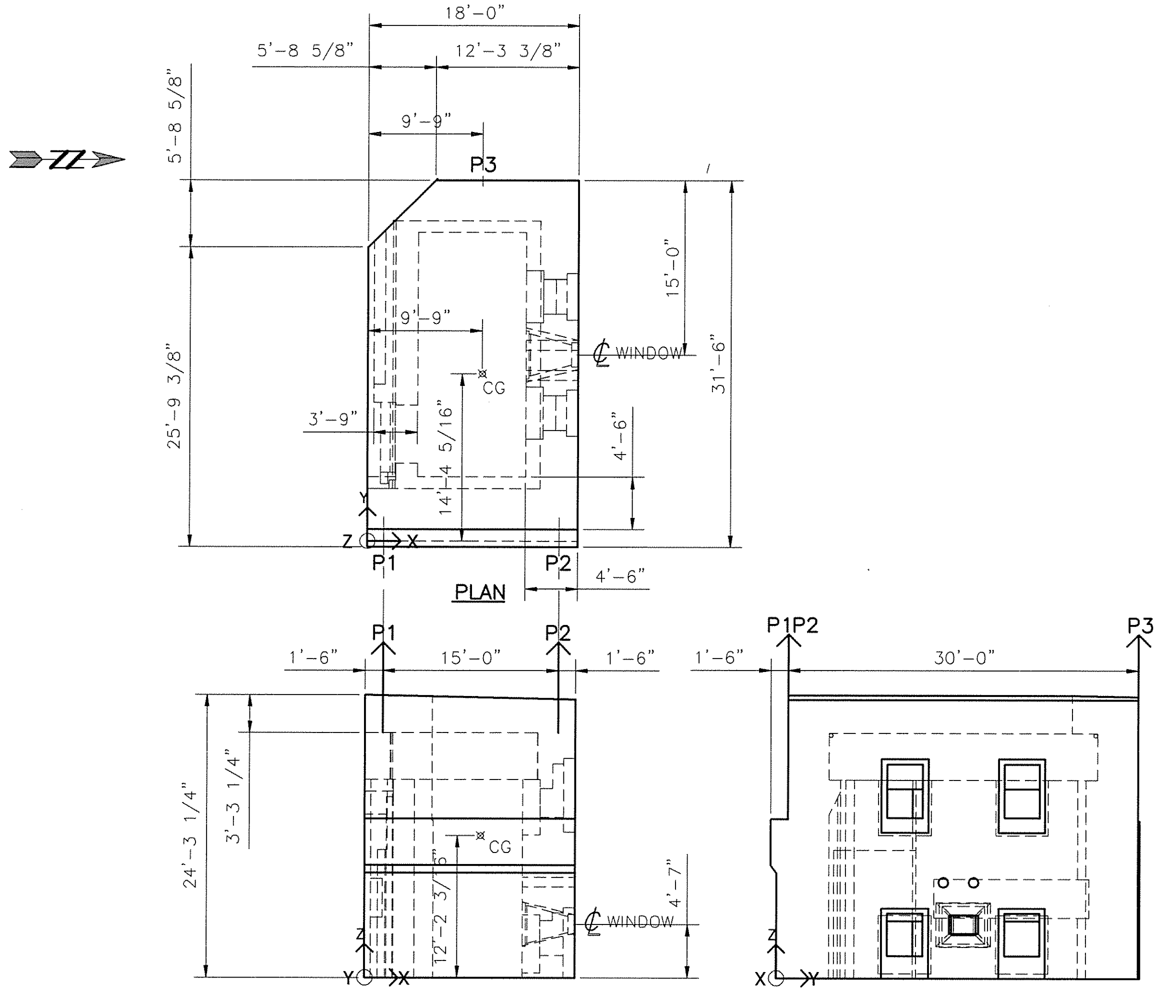
TASK	DRAWING NO.	REV. NO.
—	M6A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated to Safety, Quality, Excellence

XX	A



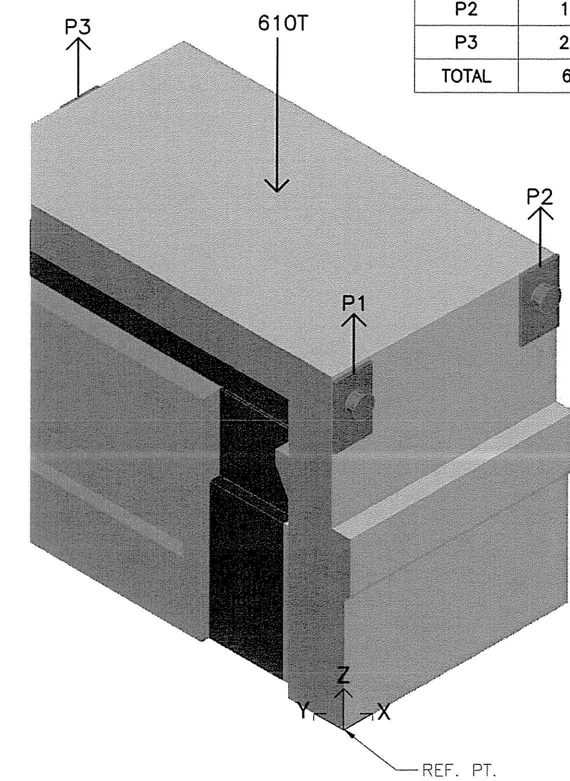
SCALE: 1/8" = 1'-0"

A-CELL TOP
MONOLITH NO. 6

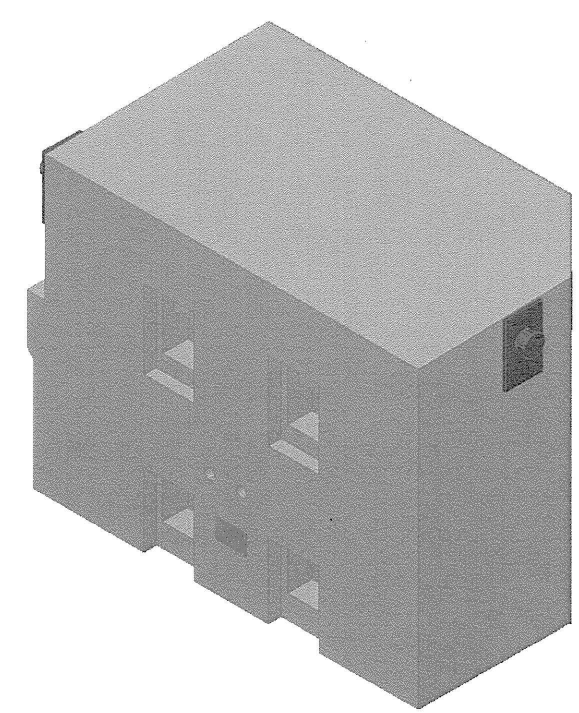
EST. WEIGHT: 610 TON

CENTROID: X: 117.3 IN
Y: 178.3 IN
Z: 146.2 IN

P1	144
P2	178.1
P3	287.9
TOTAL	610T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARRAGEMENT
A-CELL TOP DETAIL PLAN/ISOMETRIC VIEW

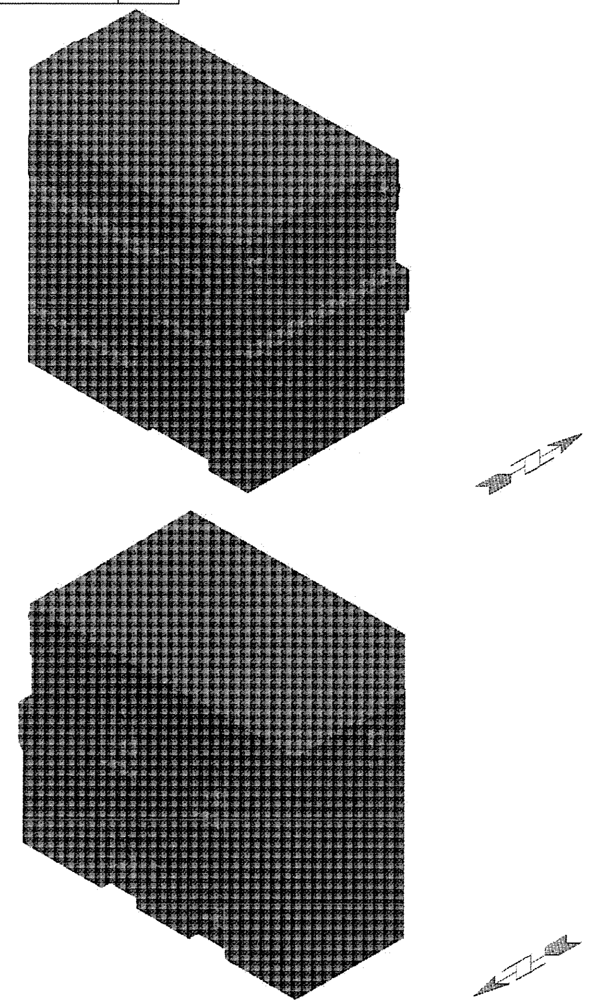
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M6B	A

RECORD INFORMATION

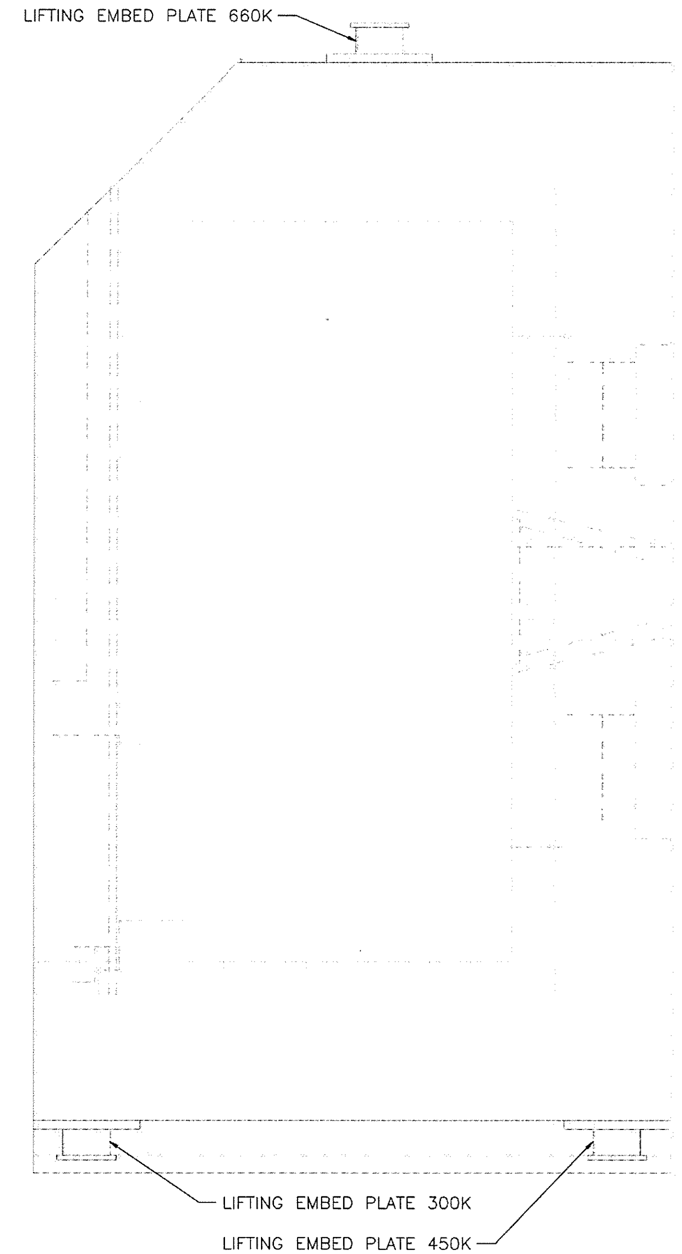
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M6C ISOMETRIC VIEWS – MONOLITH 6

SCALE: NONE



2 / M6C PLAN – MONOLITH 6

SCALE: 3/8"=1'-0"

River Corridor Closure Contract — Dedicated to Excellence

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

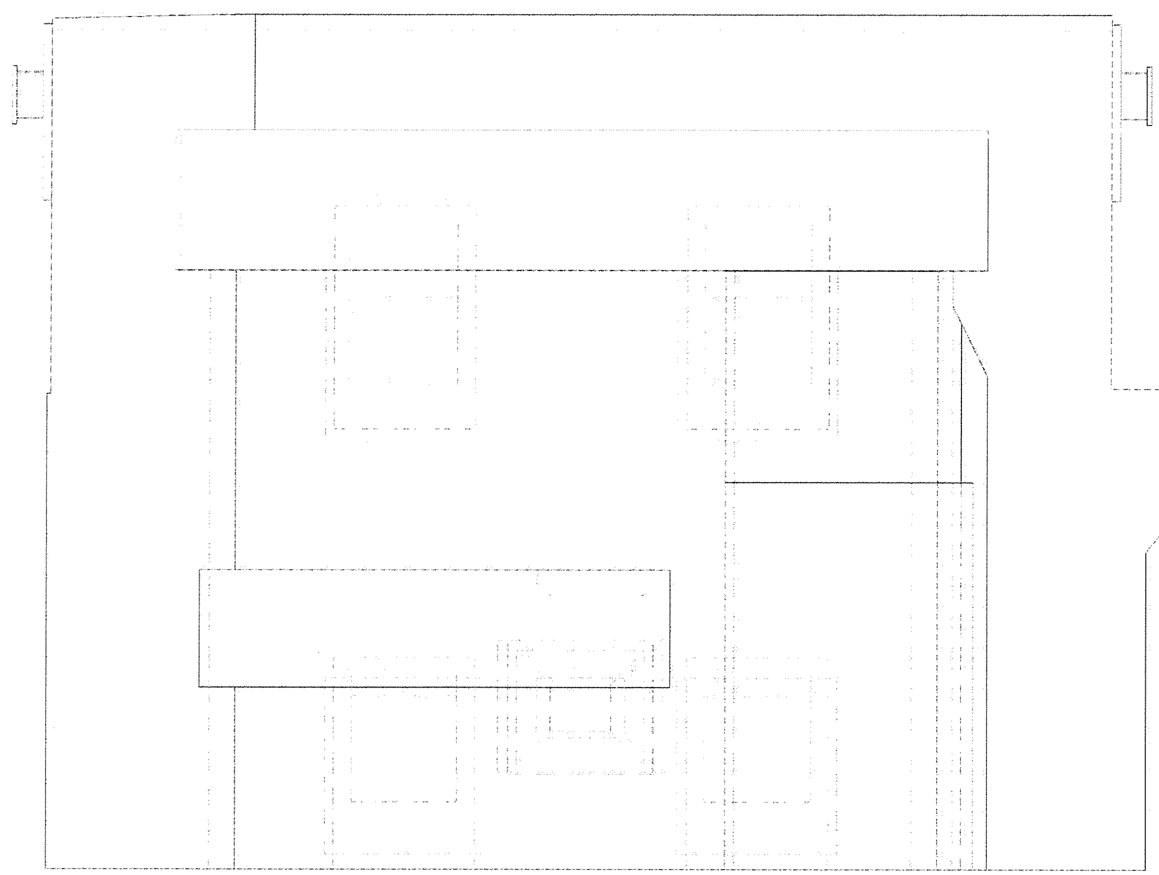
DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
D-CELL – ISOMETRIC/PLAN VIEWS

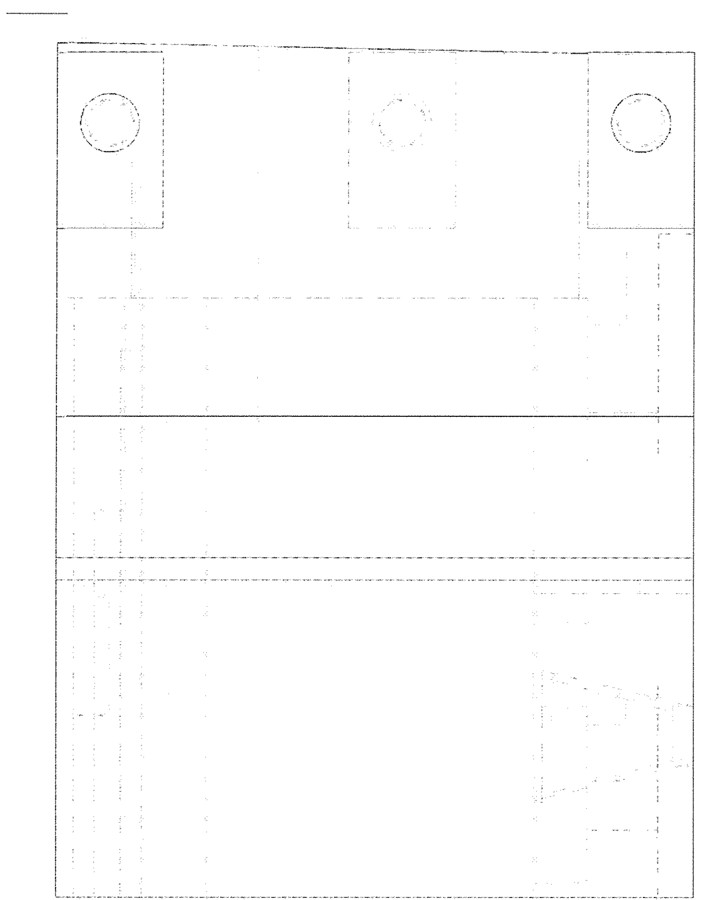
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M6C	A

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1
M6C1
SOUTH ELEVATION – MONOLITH 6
SCALE: 3/8"=1'-0"



2
M6C1
EAST ELEVATION – MONOLITH 6
SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
D-CELL – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M6C1	A

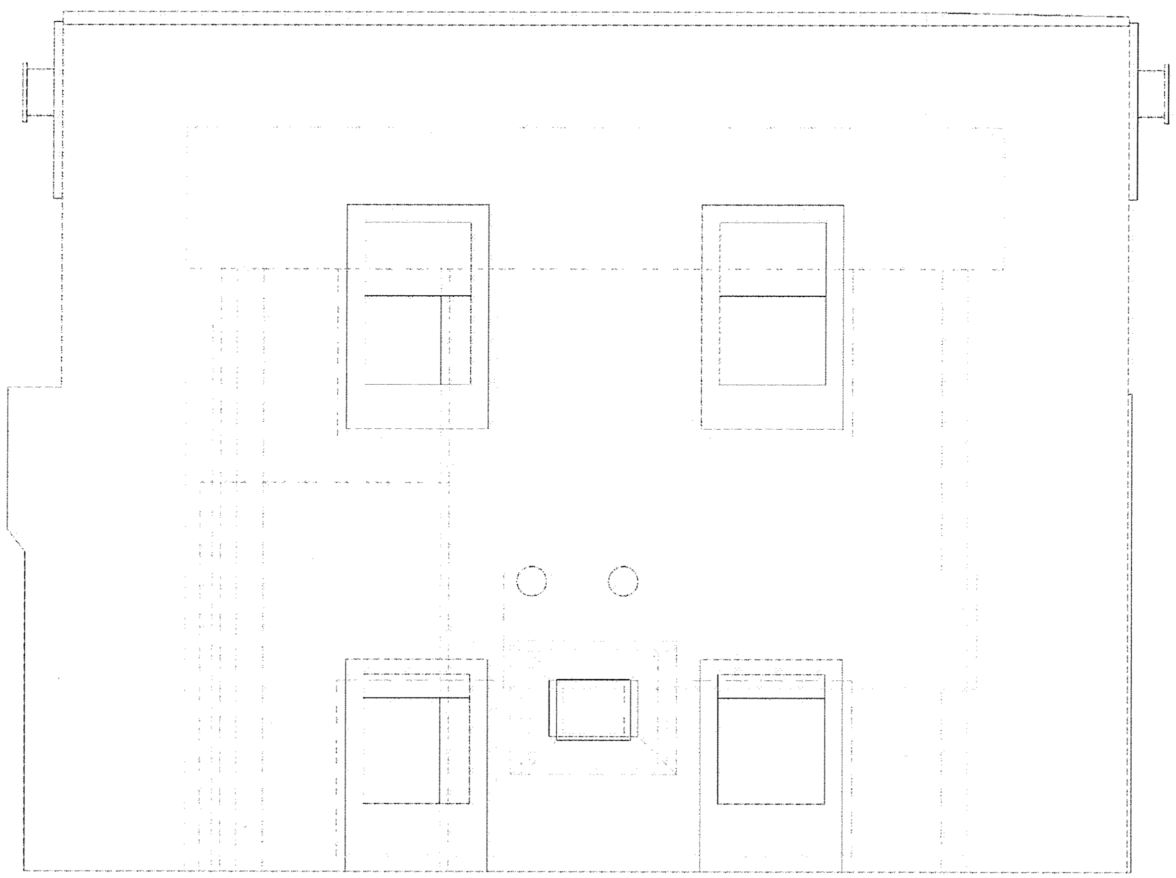
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated WCH Excellence

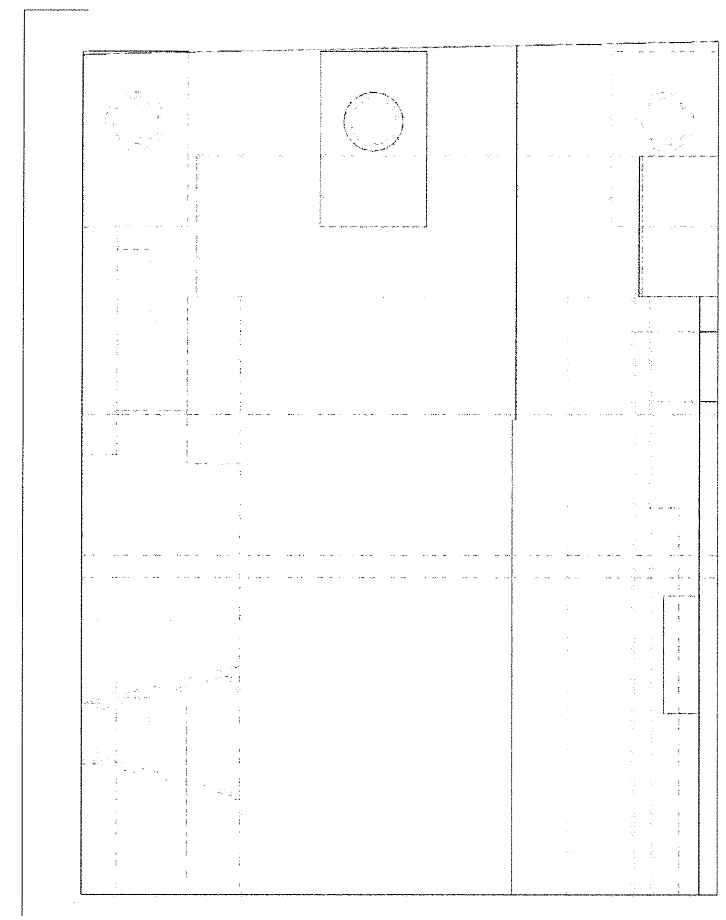
DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 / M6C2 NORTH ELEVATION – MONOLITH 6

SCALE: 3/8"=1'-0"



2 / M6C2 WEST ELEVATION – MONOLITH 6

SCALE: 3/8"=1'-0"

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
D-CELL – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

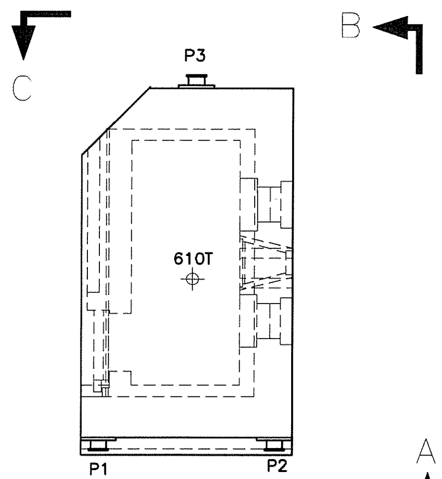
TASK	DRAWING NO.	REV. NO.
–	M6C2	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

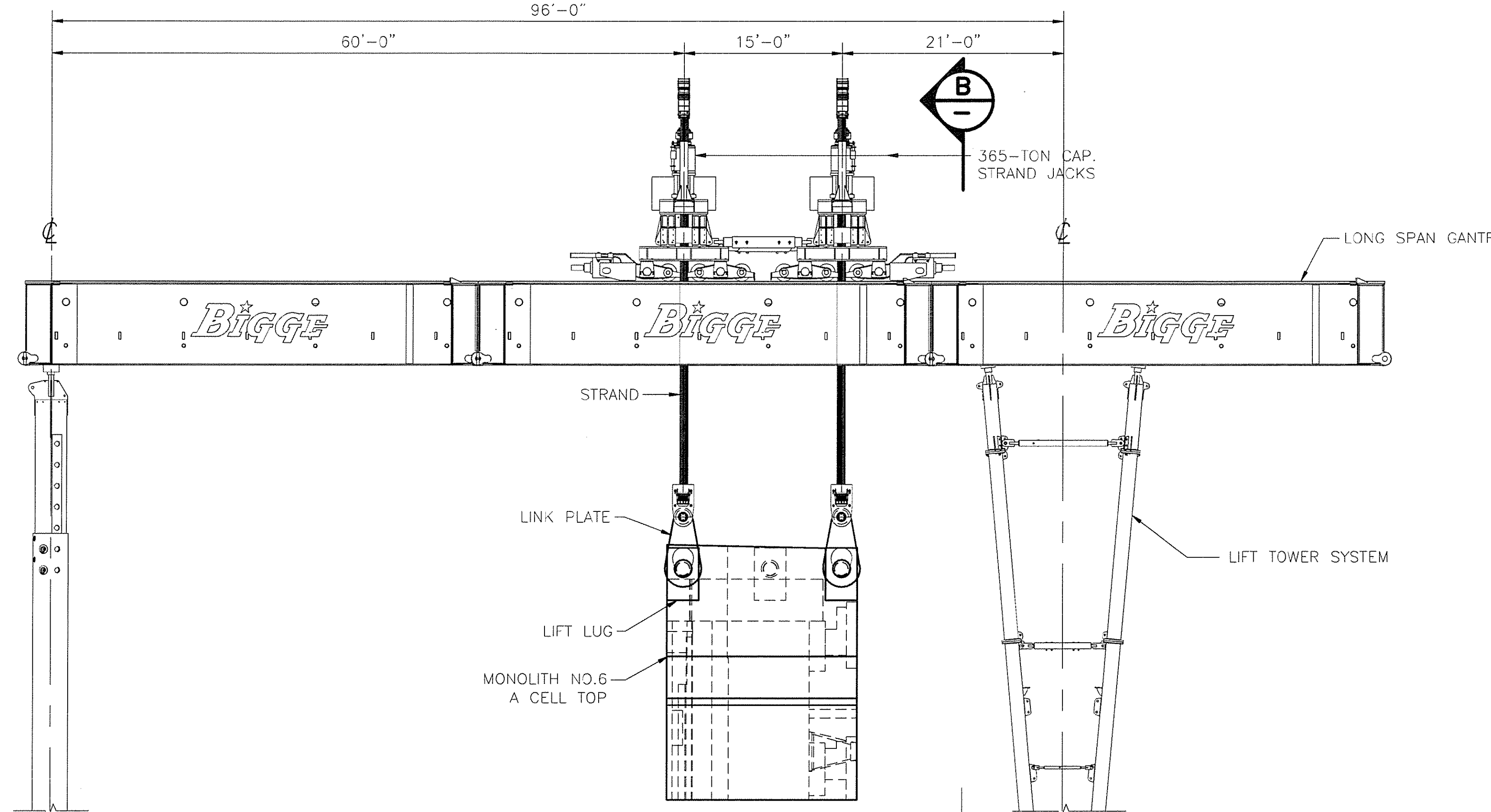
River Corridor Closure Contract — Dedicated to Safety and Excellence

DRAWING NO.	REV. NO.
XX	A



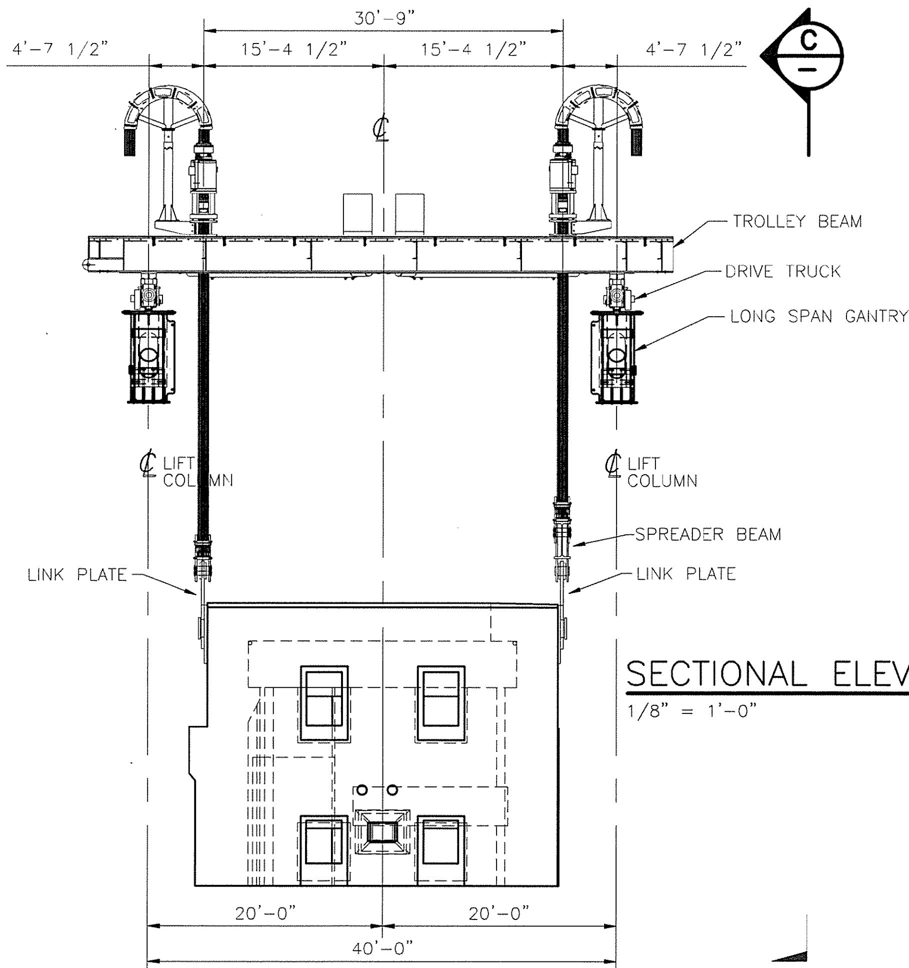
PLAN

MONOLITH NO.6
A CELL TOP



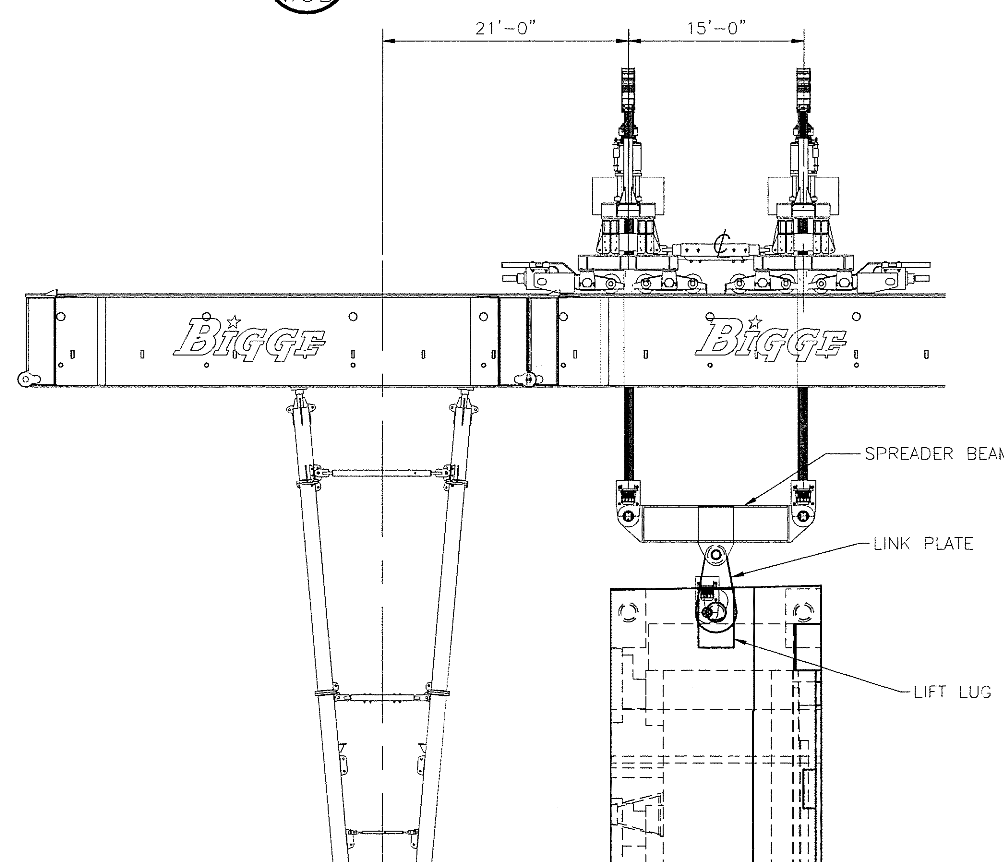
SECTIONAL ELEVATION A/M6D

1/8" = 1'-0"



SECTIONAL ELEVATION B/M6D

1/8" = 1'-0"



SECTIONAL ELEVATION C/M6D

1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	DSGN/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
A CELL TOP SECTIONAL ELEVATIONS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

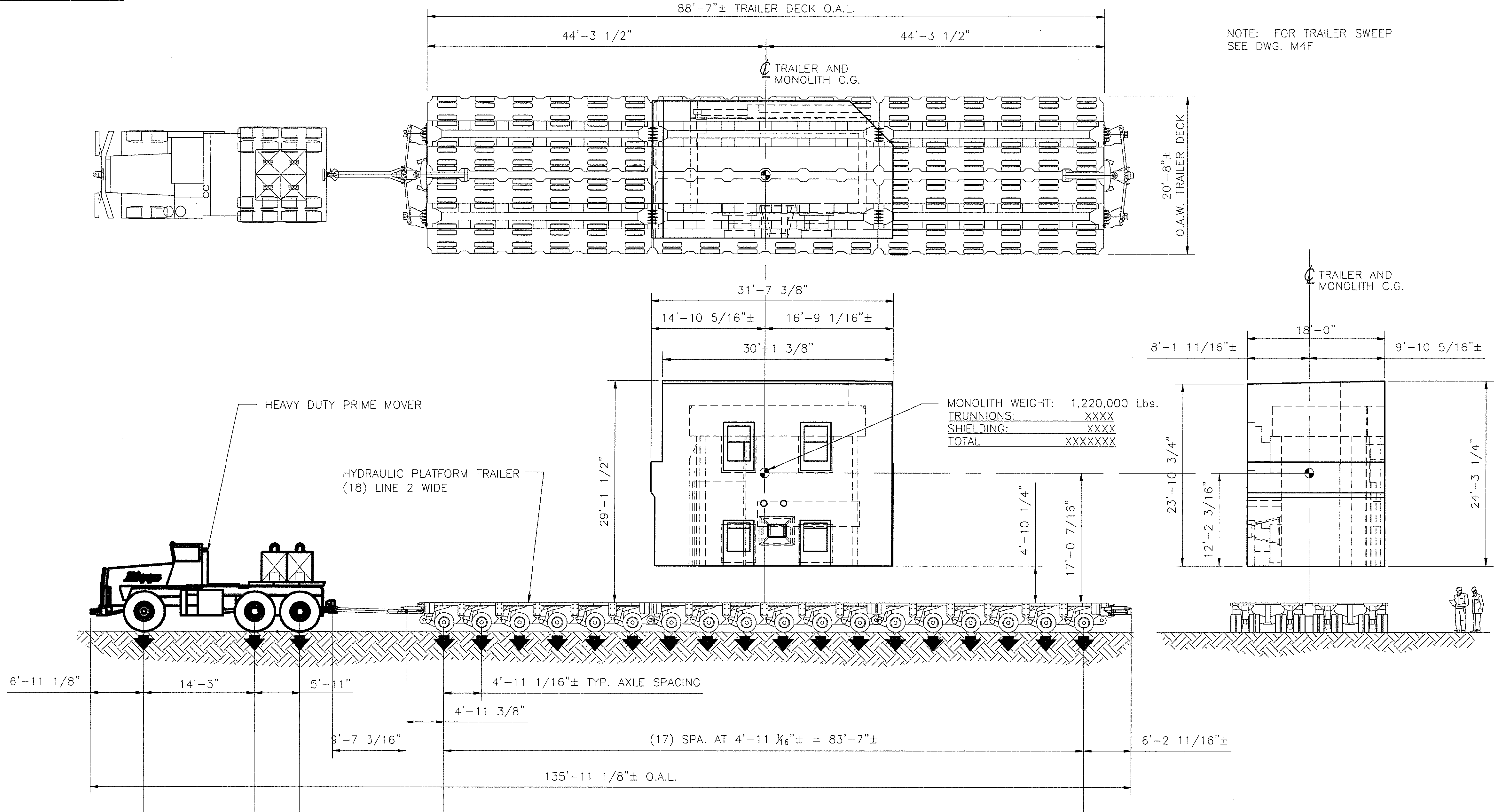
TASK	DRAWING NO.	REV. NO.
	M6D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M6F	A

NOTE: FOR TRAILER SWEEP SEE DWG. M4F



	1	2	3	4	AXLE No.	4 - 21	21
	2	4	4		No. TIRES/AXLE	16	
	11'-9"	12'-7"	12-7"		WIDTH	20'-8"	
	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.		GROSS WT./AXLE	XXX Lbs.	
					GROSS WT./TIRE	XXX Lbs. (TOTAL TIRES = 288)	

A-CELL TOP
MONOLITH 6

ELEVATION VIEW — / M6F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	261,720 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

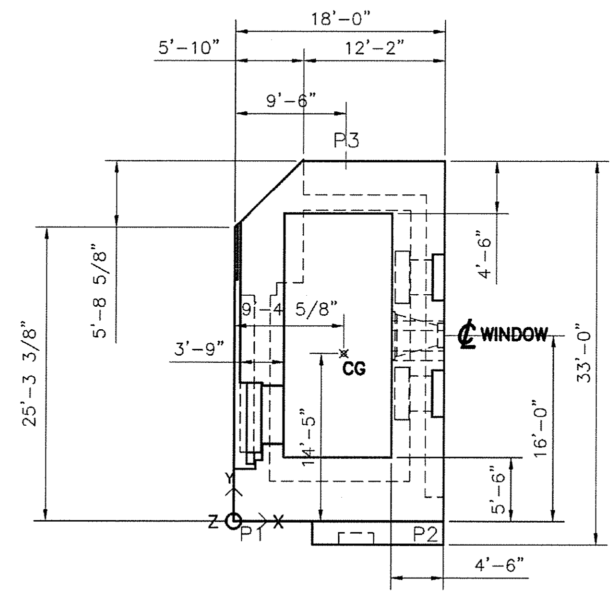
BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
A-CELL TOP TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M6F .DWG

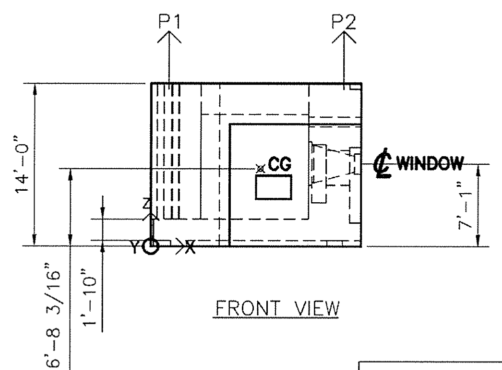
TASK	DRAWING NO.	REV. NO.
	M6F	A

G:\Engineering\Jobs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F-M19F 30% Submit.dwg

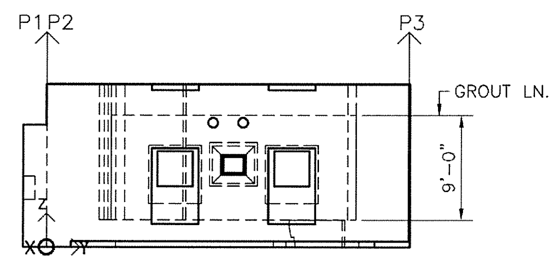
DRAWING NO.	REV. NO.
_____-__-_____	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

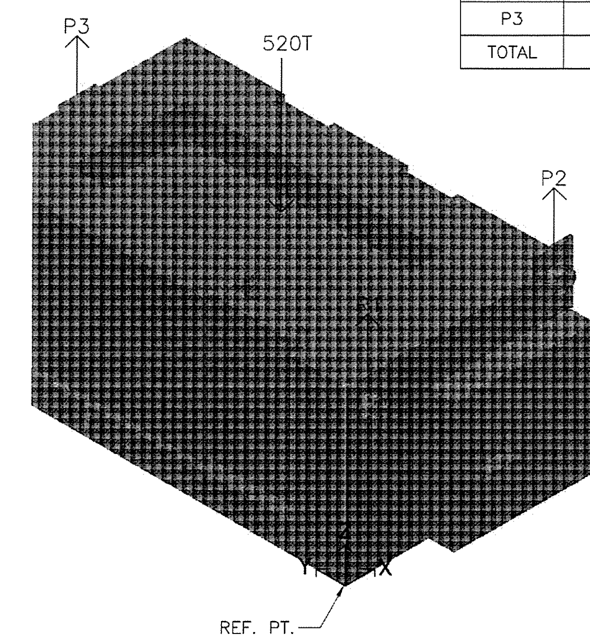
SCALE: 1/8" = 1'-0"

A-CELL BOTTOM
MONOLITH NO. 7

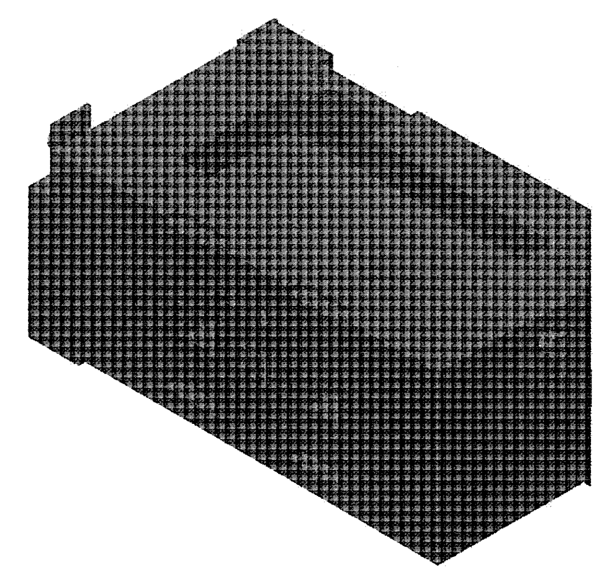
EST. WEIGHT: 520 TON

CENTROID: **X: 112.6 IN**
Y: 173.0 IN
Z: 80.2 IN

P1	135.6
P2	146.3
P3	238
TOTAL	520T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
A-CELL BOTTOM DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

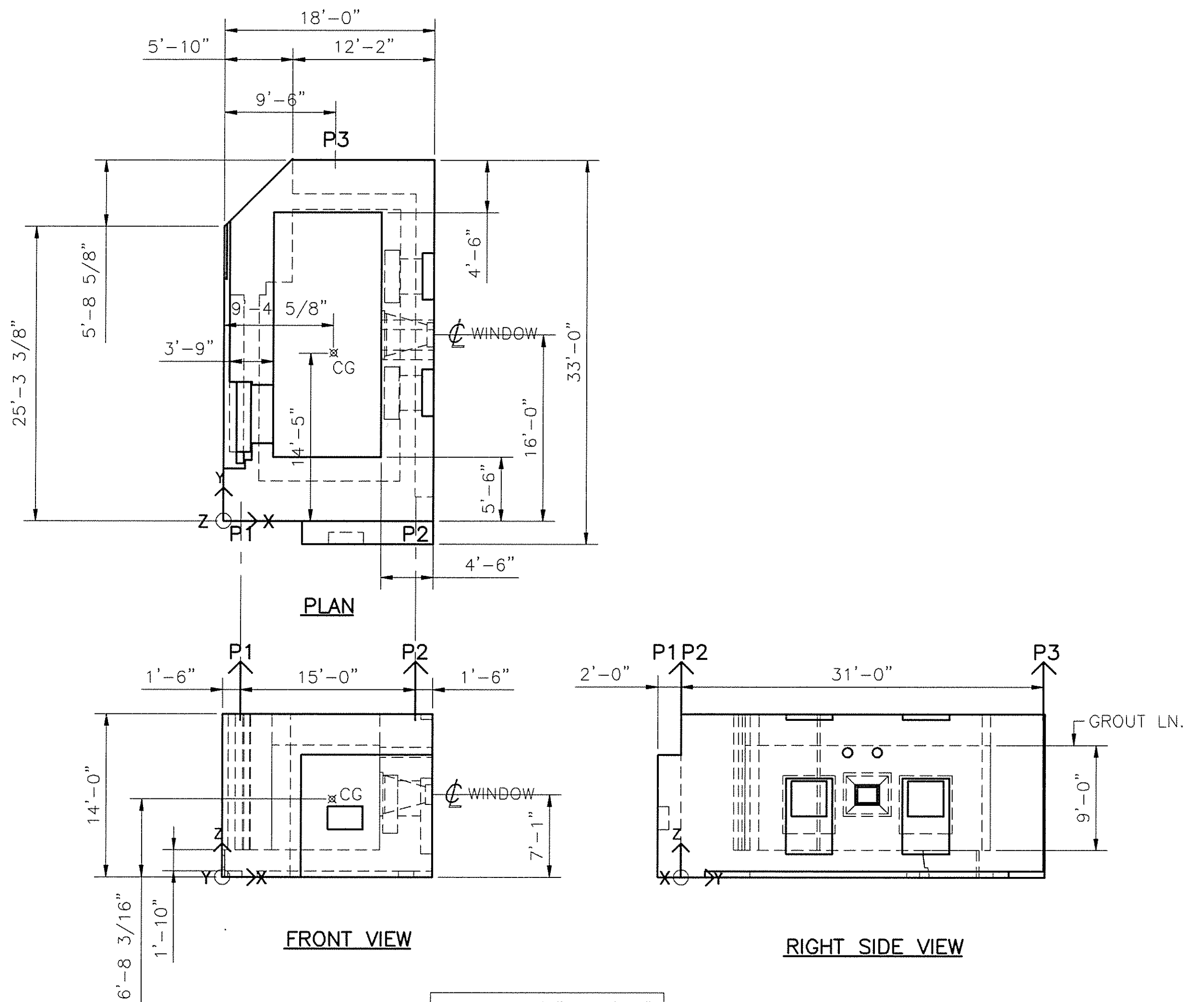
TASK	DRAWING NO.	REV. NO.
–	M7A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_______	324	___

River Corridor Closure Contract
Dedicated to Safety and Excellence

XX	A



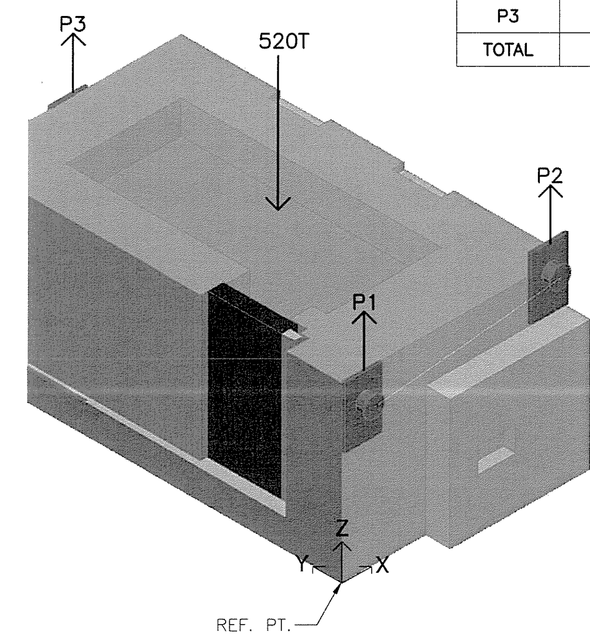
SCALE: 1/8" = 1'-0"

A-CELL BOTTOM
MONOLITH NO. 7

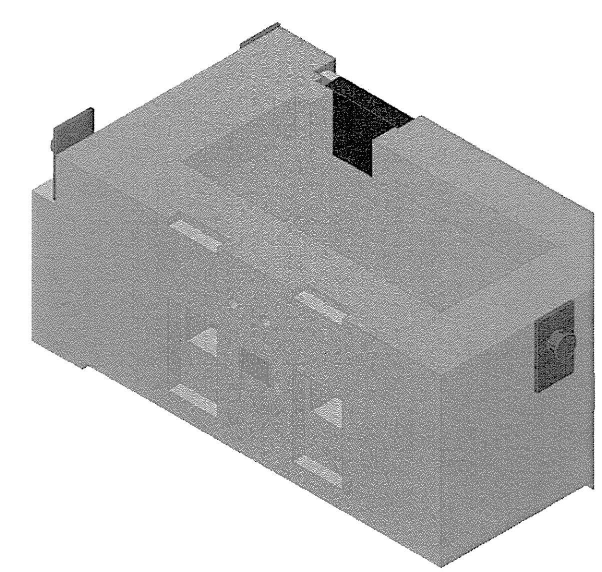
EST. WEIGHT: 520 TON

CENTROID: X: 112.6 IN
Y: 173.0 IN
Z: 80.2 IN

P1	135.6
P2	146.3
P3	238
TOTAL	520T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARRAGEMENT
A-CELL BOTTOM DETAIL PLAN/ISOMETRIC VIEW

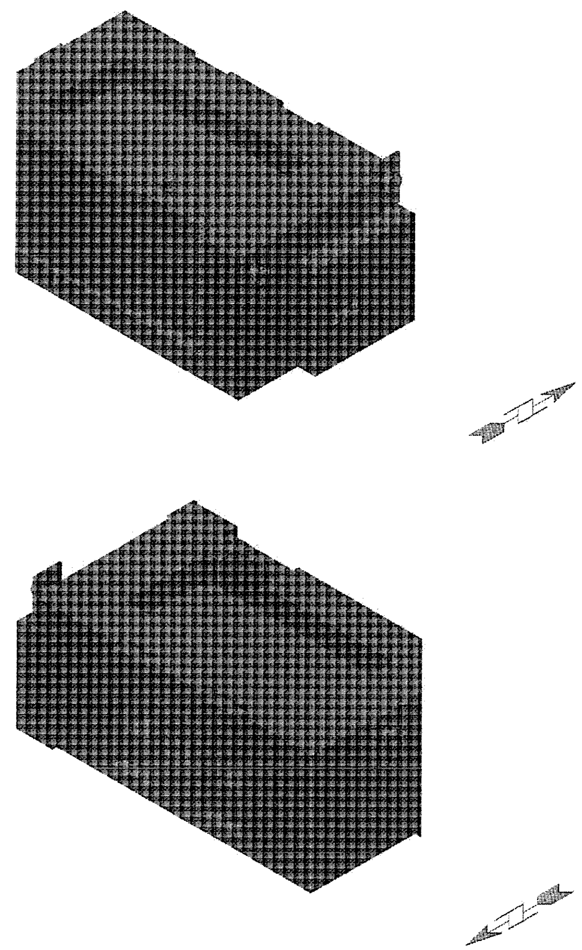
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M7B	A

RECORD INFORMATION

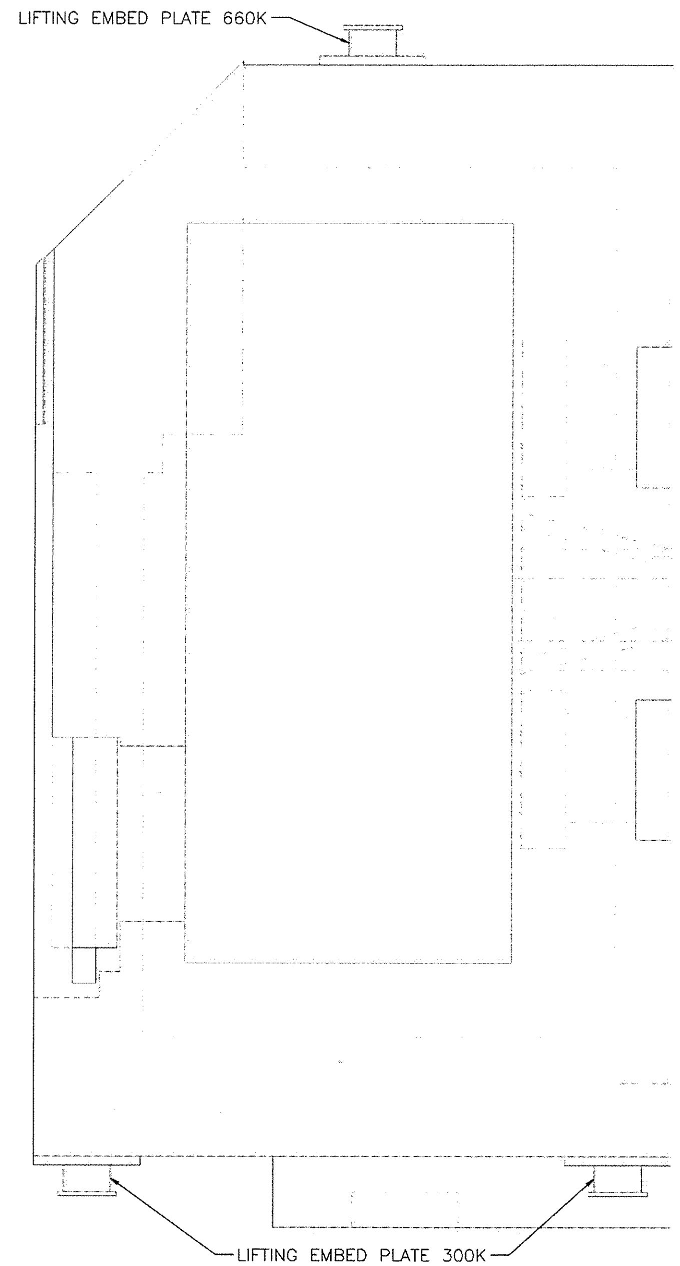
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M7C ISOMETRIC VIEWS – MONOLITH 7

SCALE: NONE



2 / M7C PLAN – MONOLITH 7

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
C-CELL – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

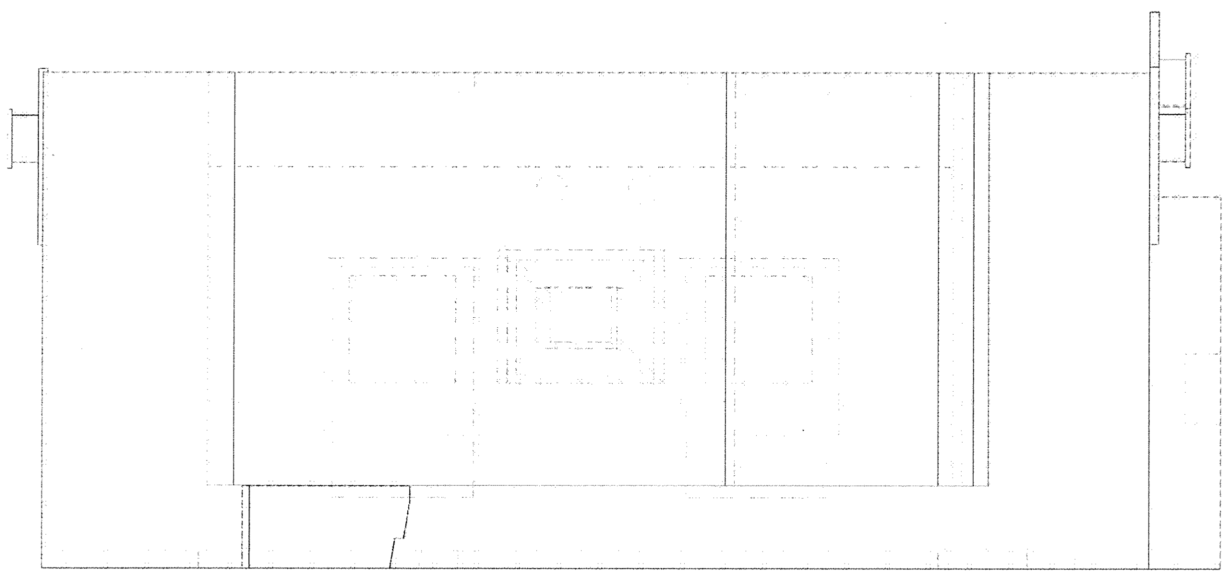
TASK	DRAWING NO.	REV. NO.
–	M7C	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

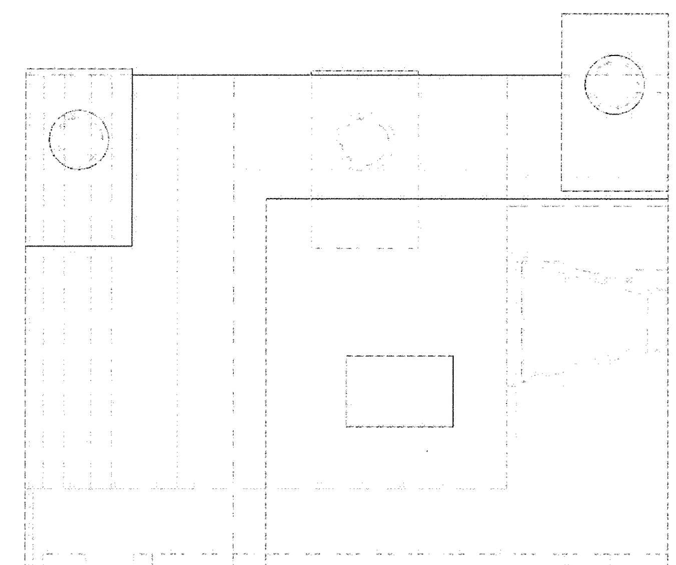
River Corridor Closure Contract — Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M7C1 SOUTH ELEVATION – MONOLITH 7

SCALE: 3/8"=1'-0"



2 / M7C1 EAST ELEVATION – MONOLITH 7

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
C-CELL – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

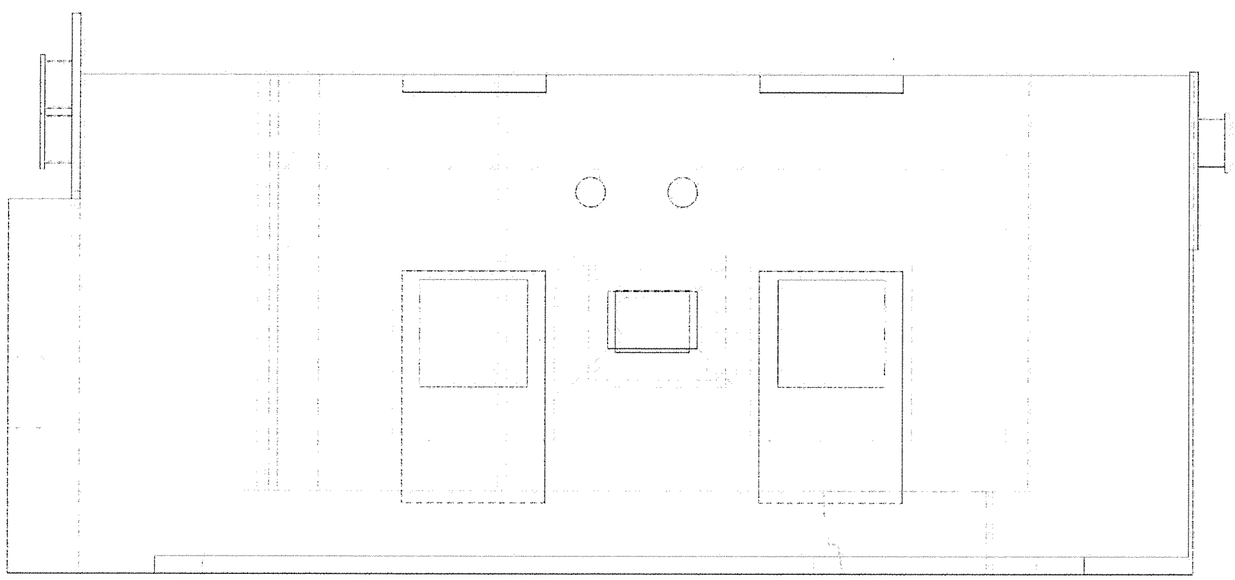
TASK	DRAWING NO.	REV. NO.
–	M7C1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

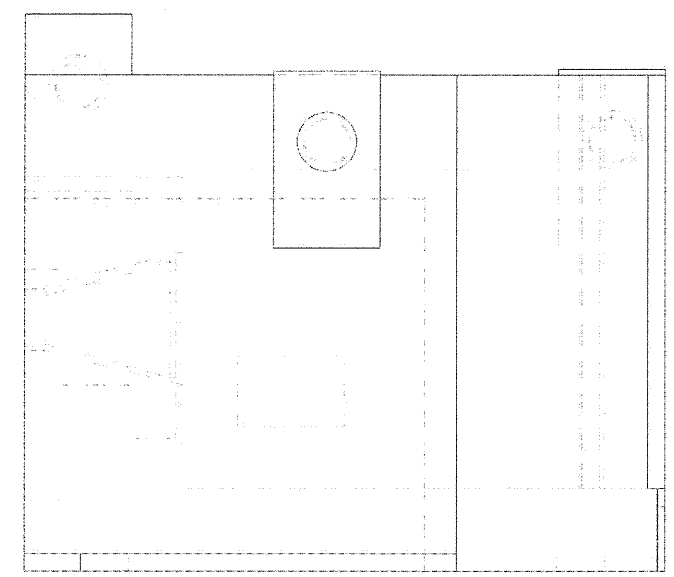
River Corridor Closure Contract — Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M7C2 NORTH ELEVATION – MONOLITH 7

SCALE: 3/8"=1'-0"



2 / M7C2 WEST ELEVATION – MONOLITH 7

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
C-CELL – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

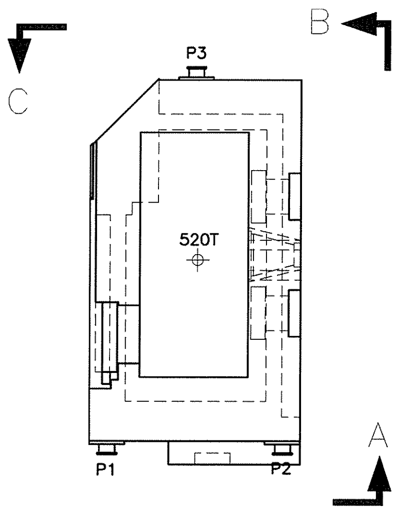
TASK	DRAWING NO.	REV. NO.
–	M7C2	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

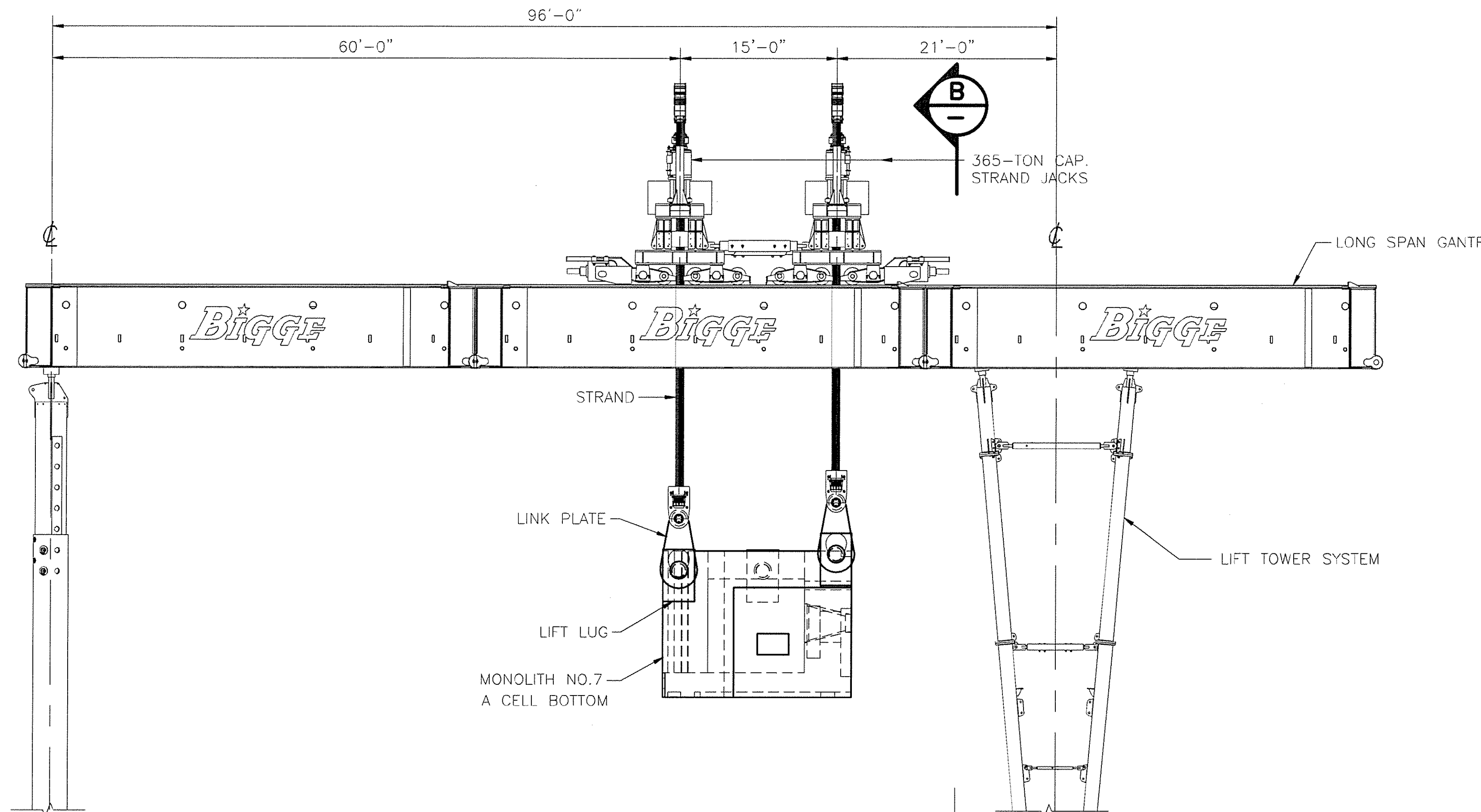
River Corridor Closure Contract — Dedicated to Excellence

DRAWING NO.	REV. NO.
XX	A



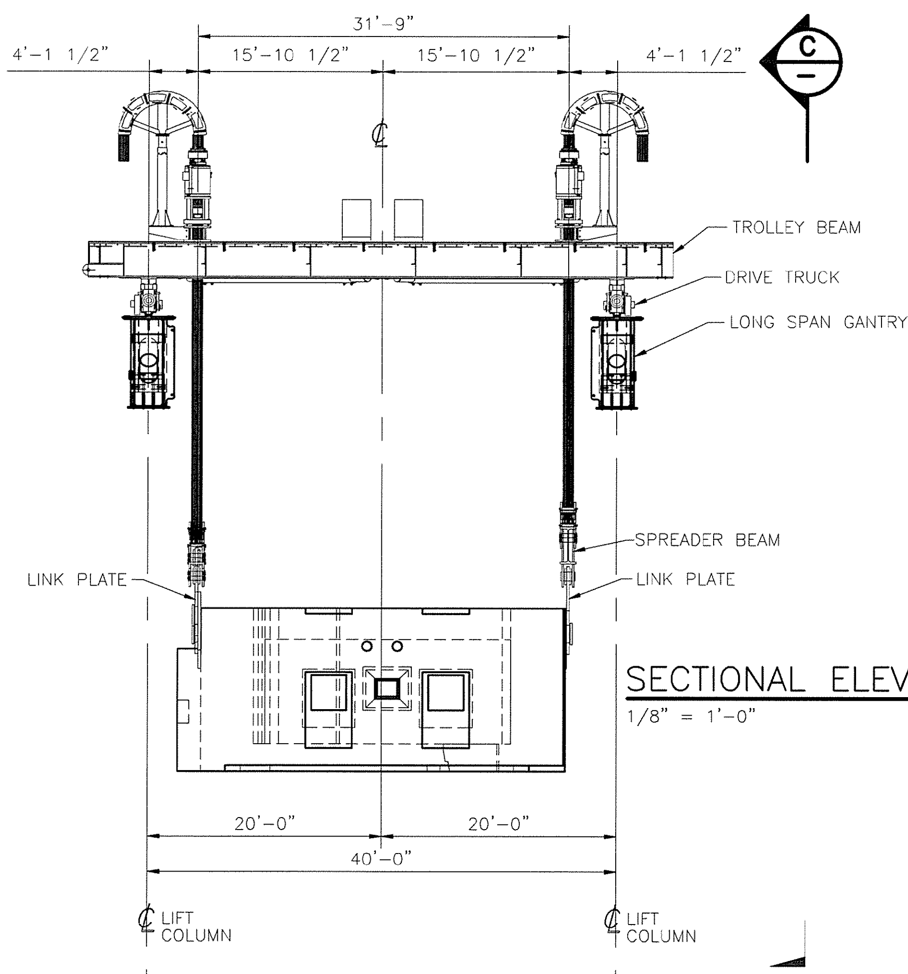
PLAN

MONOLITH NO.7
A CELL BOTTOM



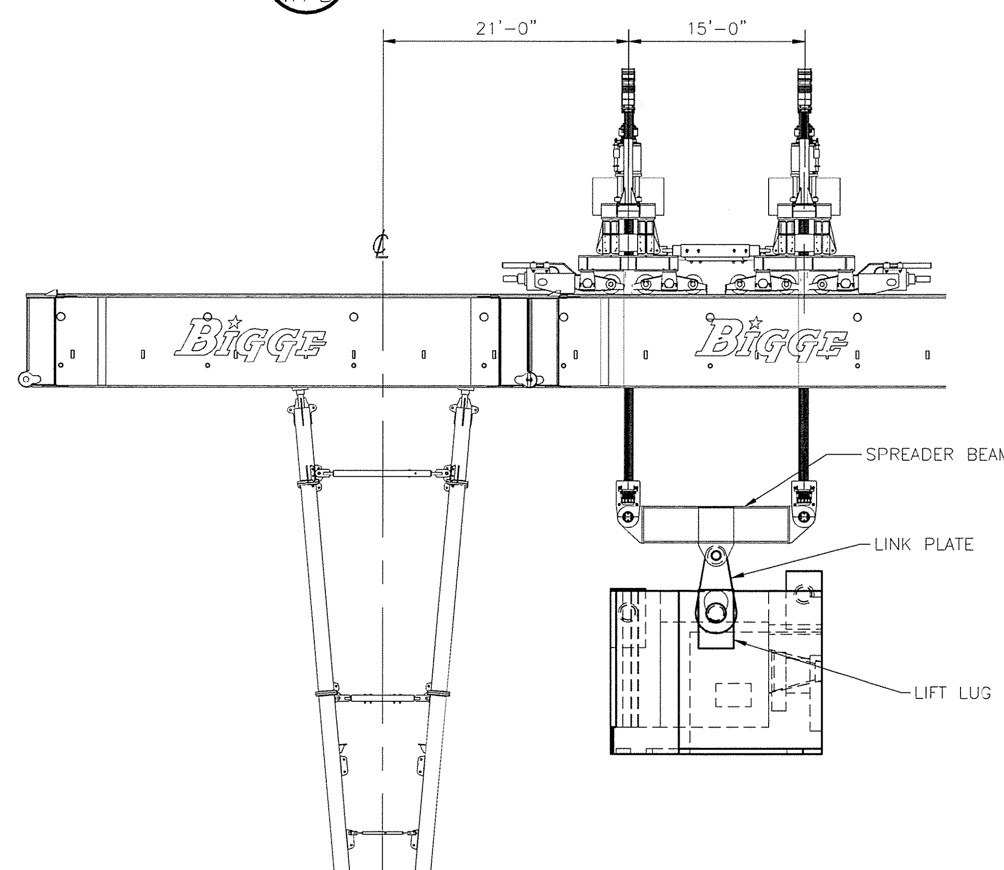
SECTIONAL ELEVATION A/M7D

1/8" = 1'-0"



SECTIONAL ELEVATION B/M7D

1/8" = 1'-0"



SECTIONAL ELEVATION C/M7D

1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ. ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
A CELL BOTTOM SECTIONAL ELEVATIONS

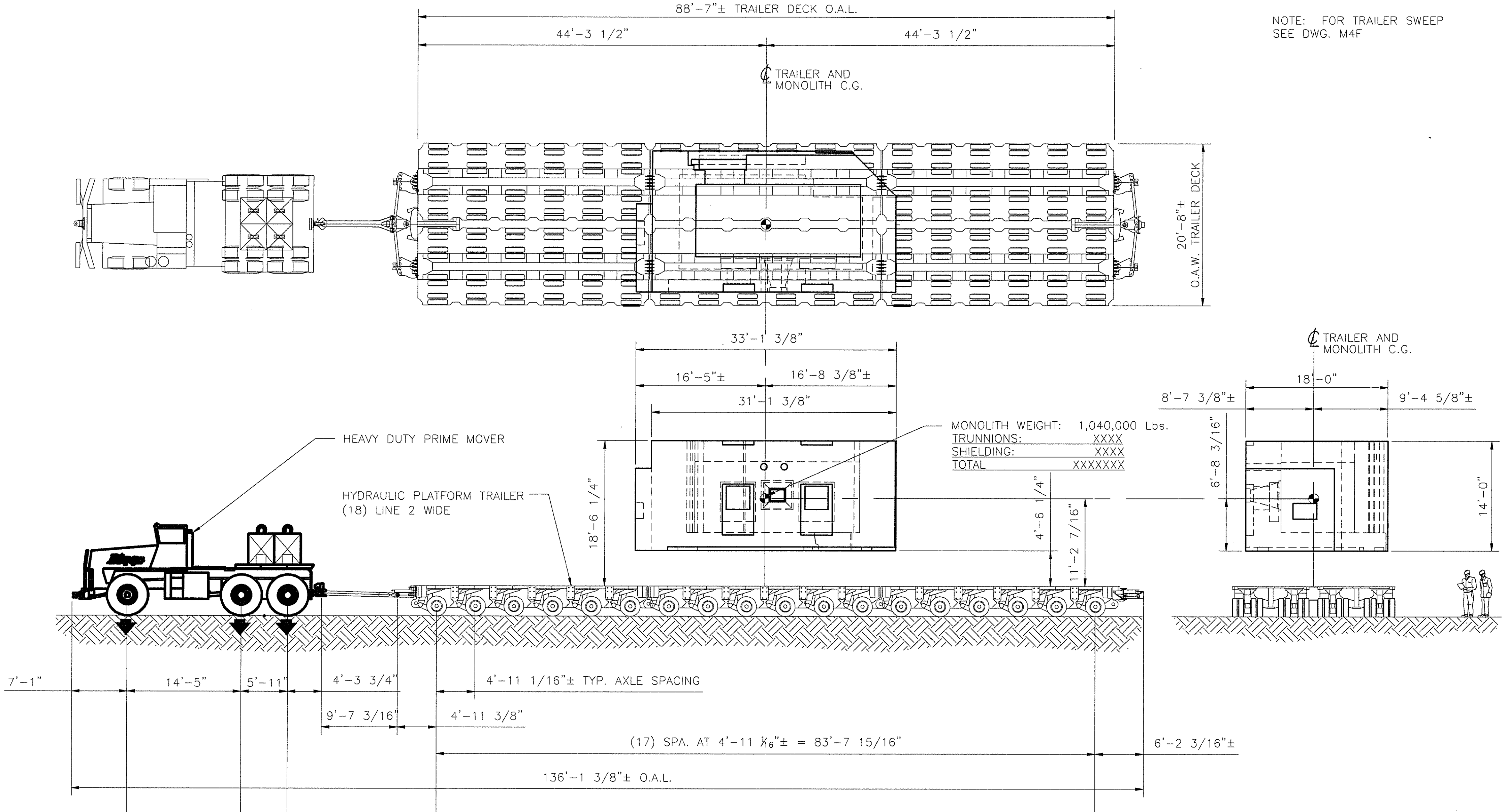
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M7D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M7F	A



AXLE No.	1	2	3	4 - 21
No. TIRES/AXLE	2	4	4	16
WIDTH	11'-9"	12'-7"	12-7"	20'-8"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 288)

NOTE: FOR TRAILER SWEEP SEE DWG. M4F

A-CELL BOTTOM
MONOLITH 7

ELEVATION VIEW — / M7F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	261,720 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
A-CELL BOTTOM TRANSPORT ARRANGEMENT

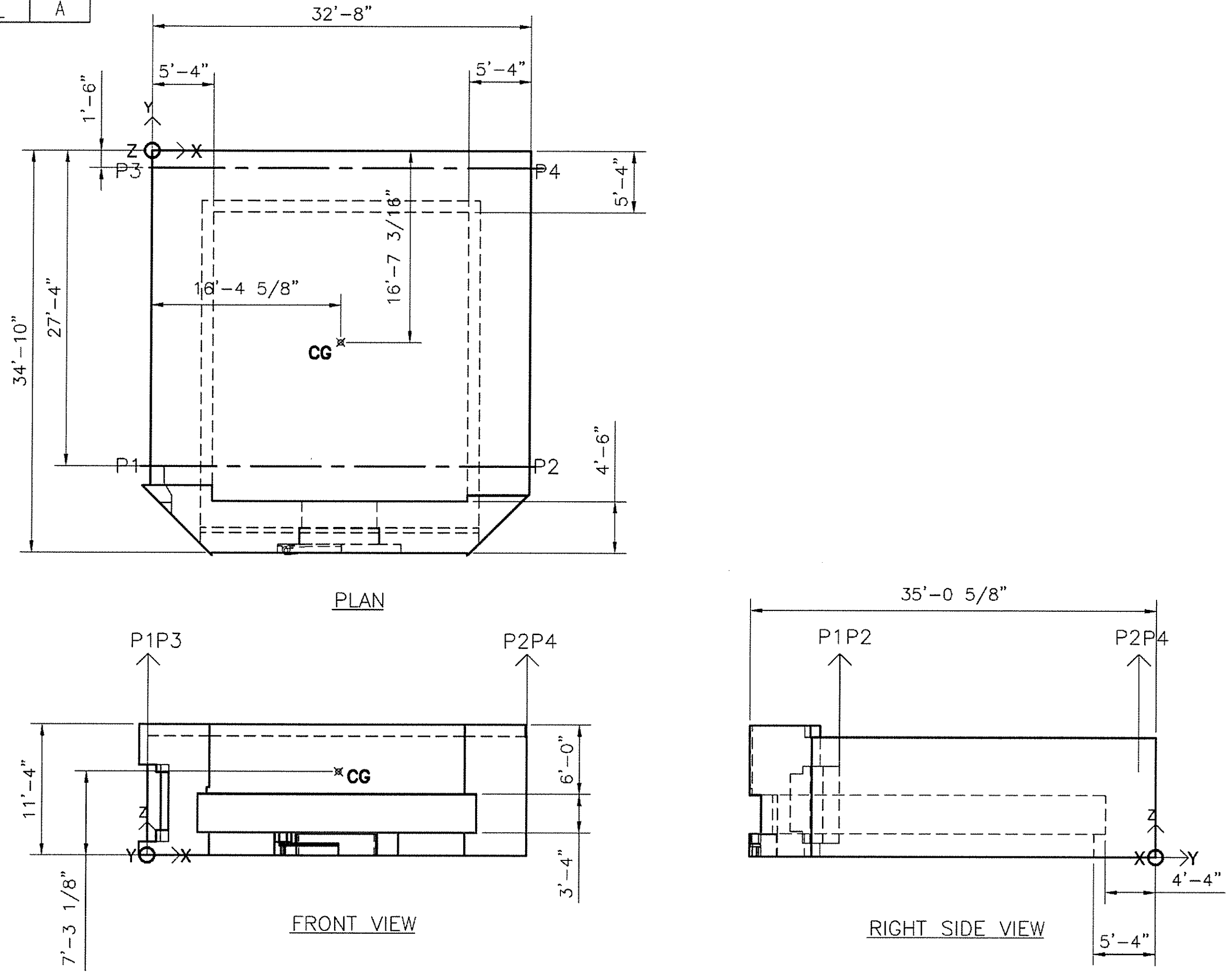
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M7F.DWG

TASK	DRAWING NO.	REV. NO.
	M7F	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
_____-__-_______	A



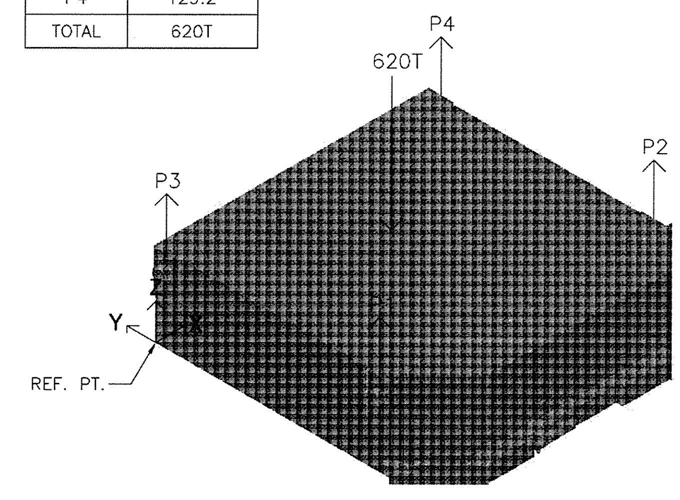
SCALE: 1/8" = 1'-0"

B-CELL TOP
MONOLITH NO. 8

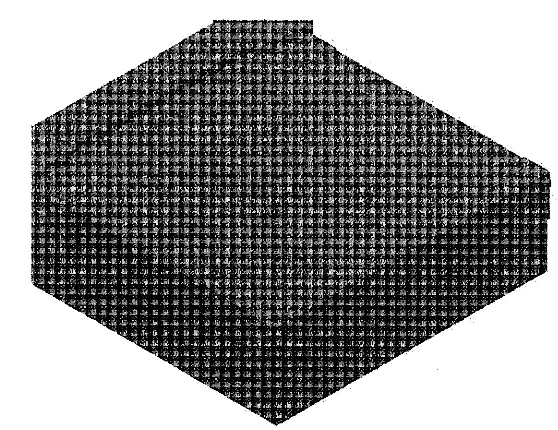
EST. WEIGHT: 620 TON

CENTROID: **X: 196.6 IN**
Y: −199.2 IN
Z: 87.1 IN

P1	180.7
P2	181.7
P3	128.4
P4	129.2
TOTAL	620T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
B-CELL TOP DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

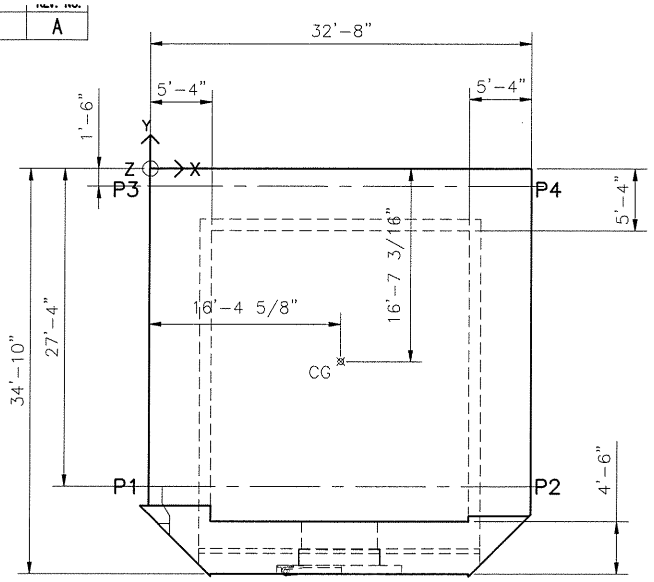
TASK	DRAWING NO.	REV. NO.
–	M8A	A

RECORD INFORMATION

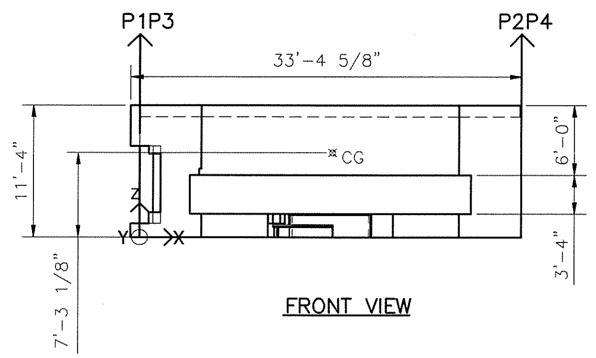
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated WCH Excellence

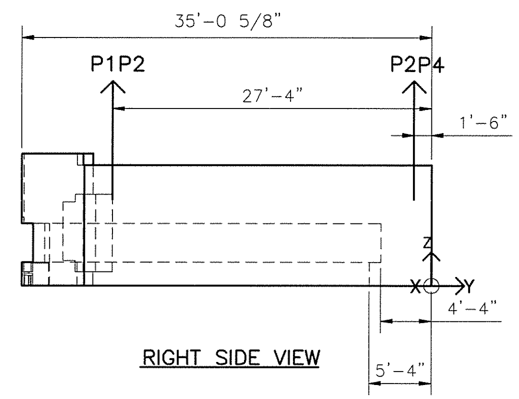
XX	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

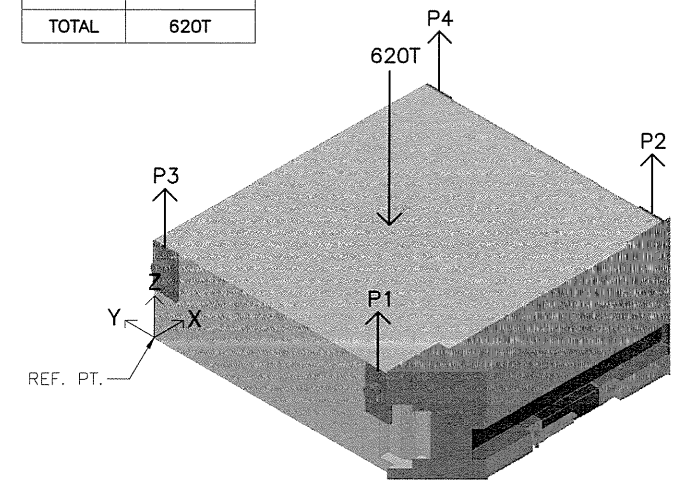
SCALE: 1/8" = 1'-0"

B-CELL TOP
MONOLITH NO. 8

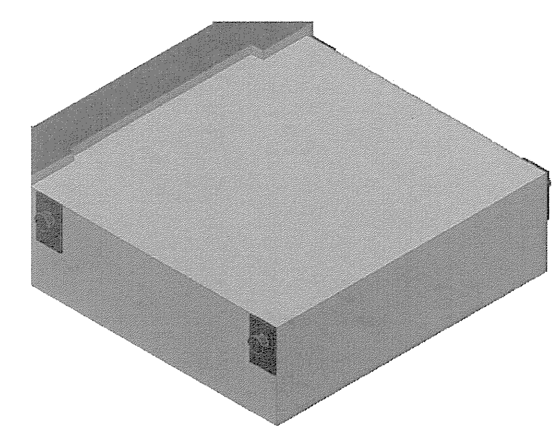
EST. WEIGHT: 620 TON

CENTROID: X: 196.6 IN
Y: -199.2 IN
Z: 87.1 IN

P1	180.7
P2	181.7
P3	128.4
P4	129.2
TOTAL	620T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARRAGEMENT
B-CELL TOP DETAIL PLAN/ISOMETRIC VIEW

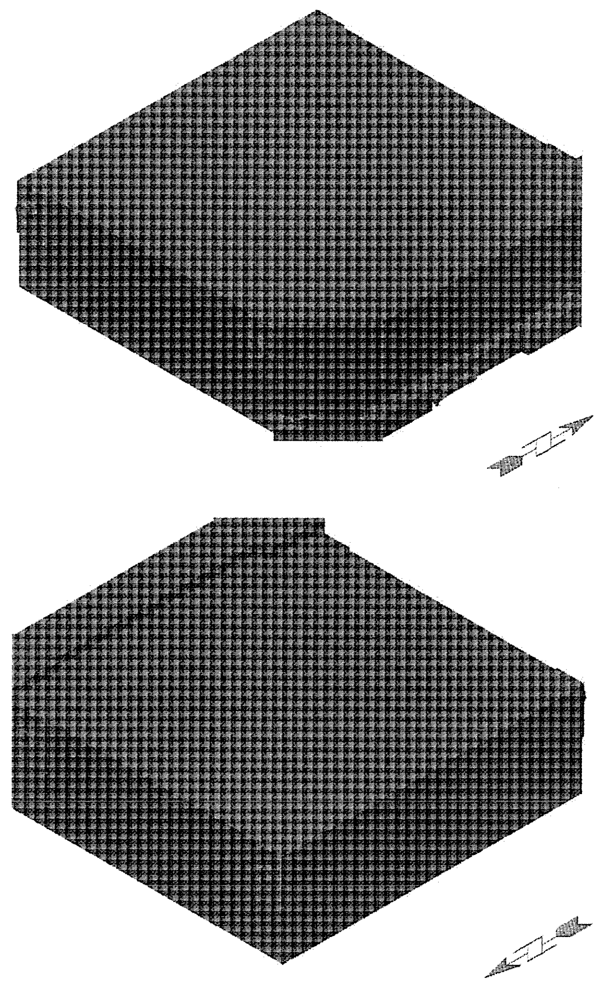
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M8B	A

RECORD INFORMATION

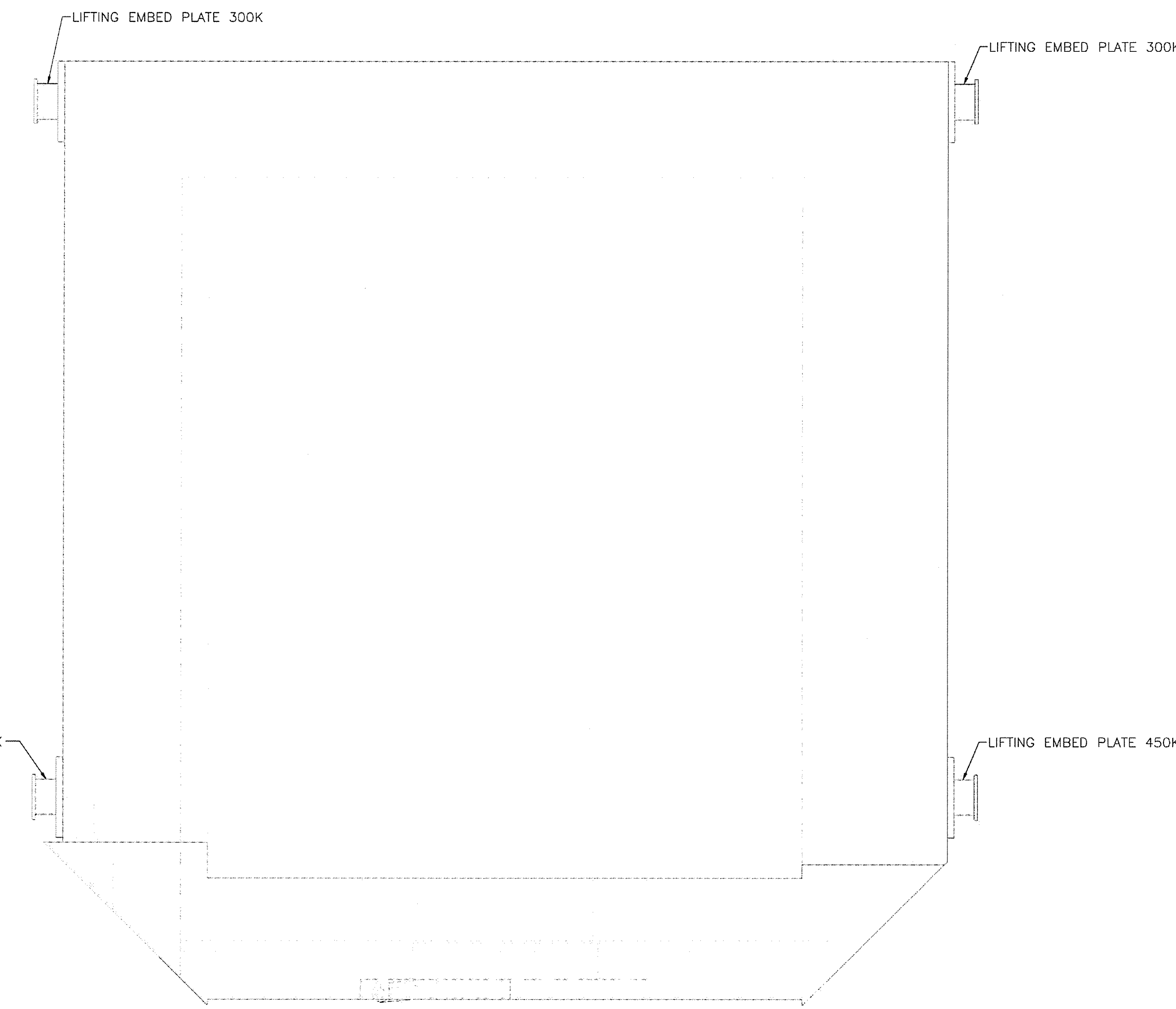
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



ISOMETRIC VIEWS – MONOLITH 8 (1 / M8C)

SCALE: NONE



PLAN – MONOLITH 8 (2 / M8C)

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
B-CELL TOP – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

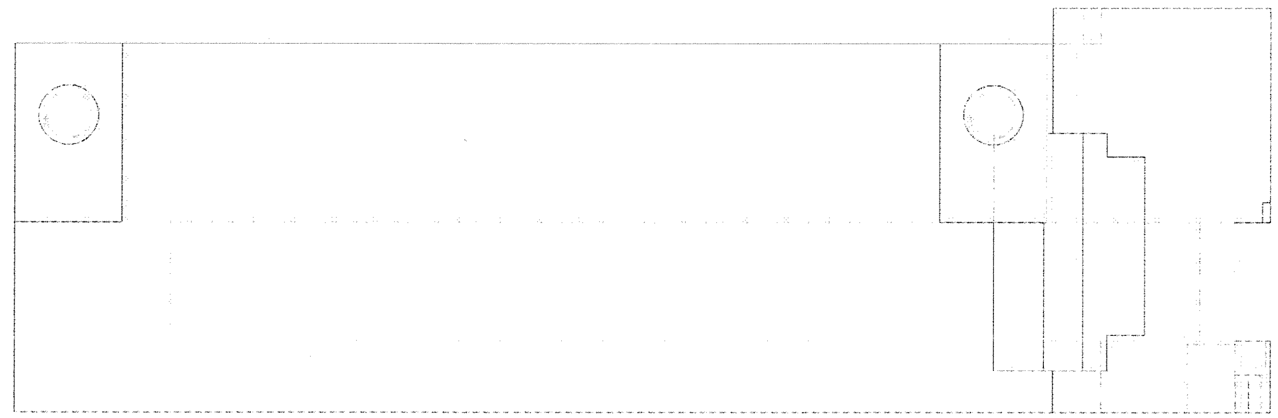
TASK	DRAWING NO.	REV. NO.
–	M8C	A

RECORD INFORMATION

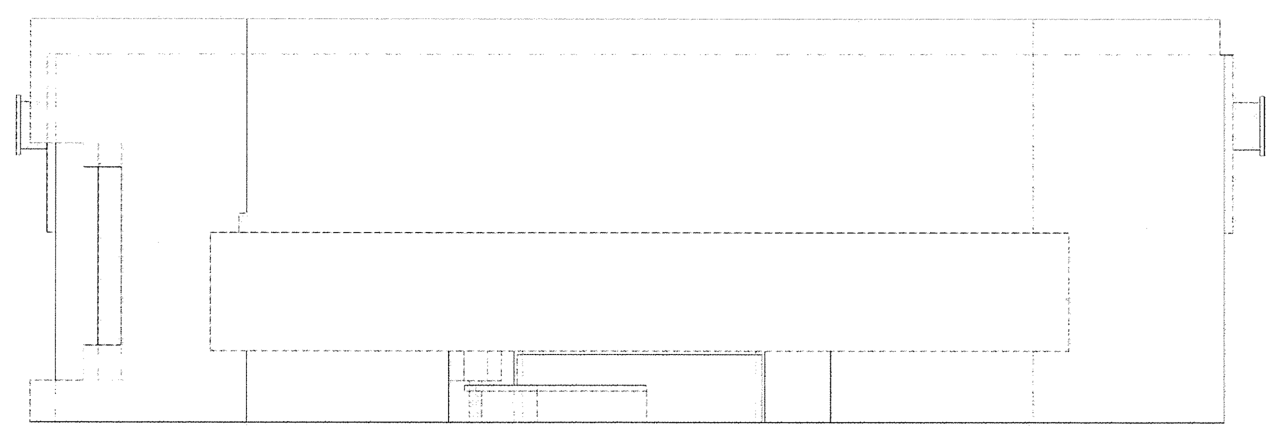
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated to Safety & Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M8C1 SOUTH ELEVATION – MONOLITH 8
SCALE: 3/8"=1'-0"



2 / M8C1 EAST ELEVATION – MONOLITH 8
SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
B-CELL TOP – ELEVATION VIEWS

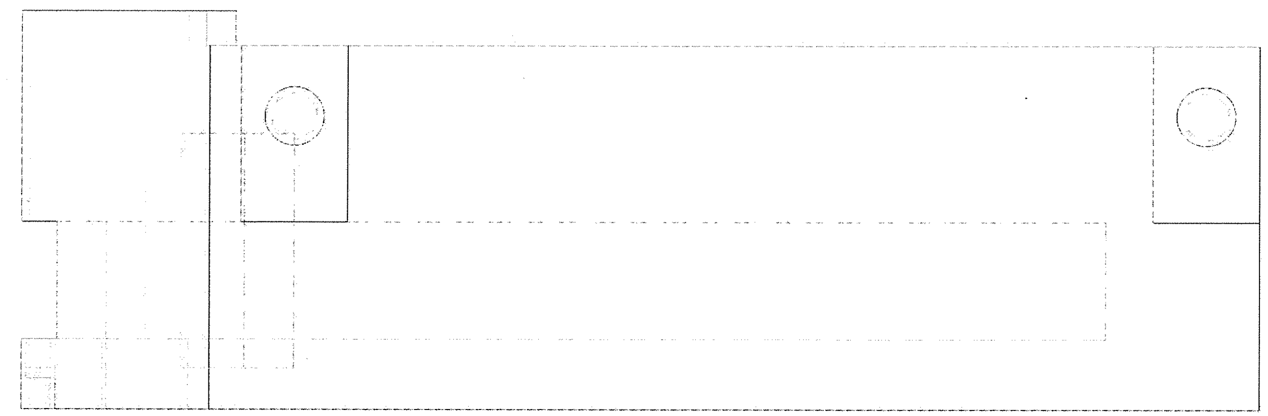
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M8C1	A

RECORD INFORMATION

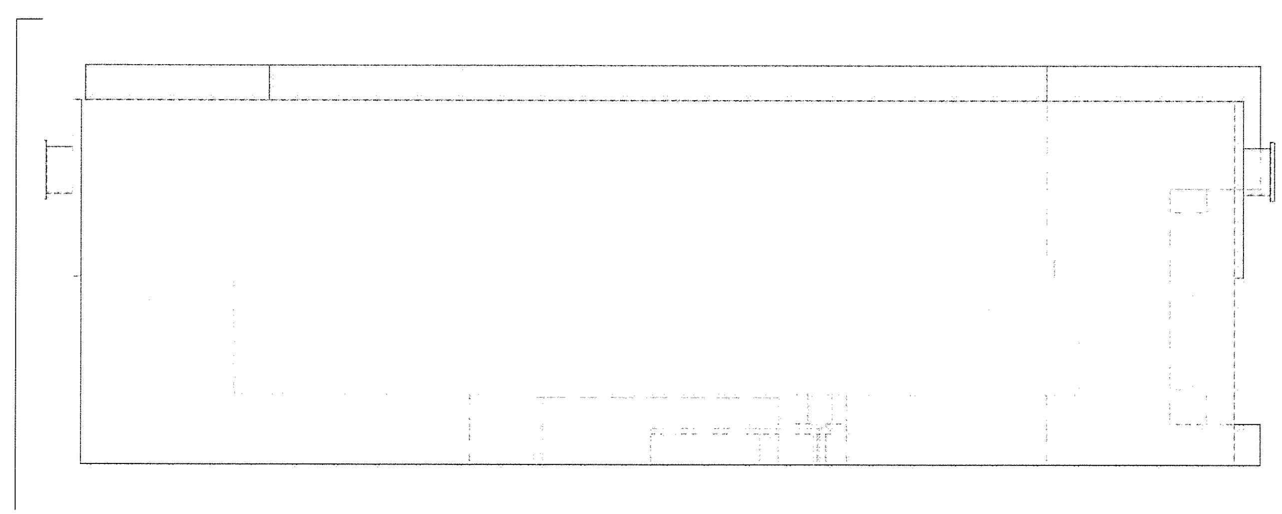
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M8C2 NORTH ELEVATION – MONOLITH 8

SCALE: 3/8"=1'-0"



2 / M8C2 WEST ELEVATION – MONOLITH 8

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
B-CELL TOP – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

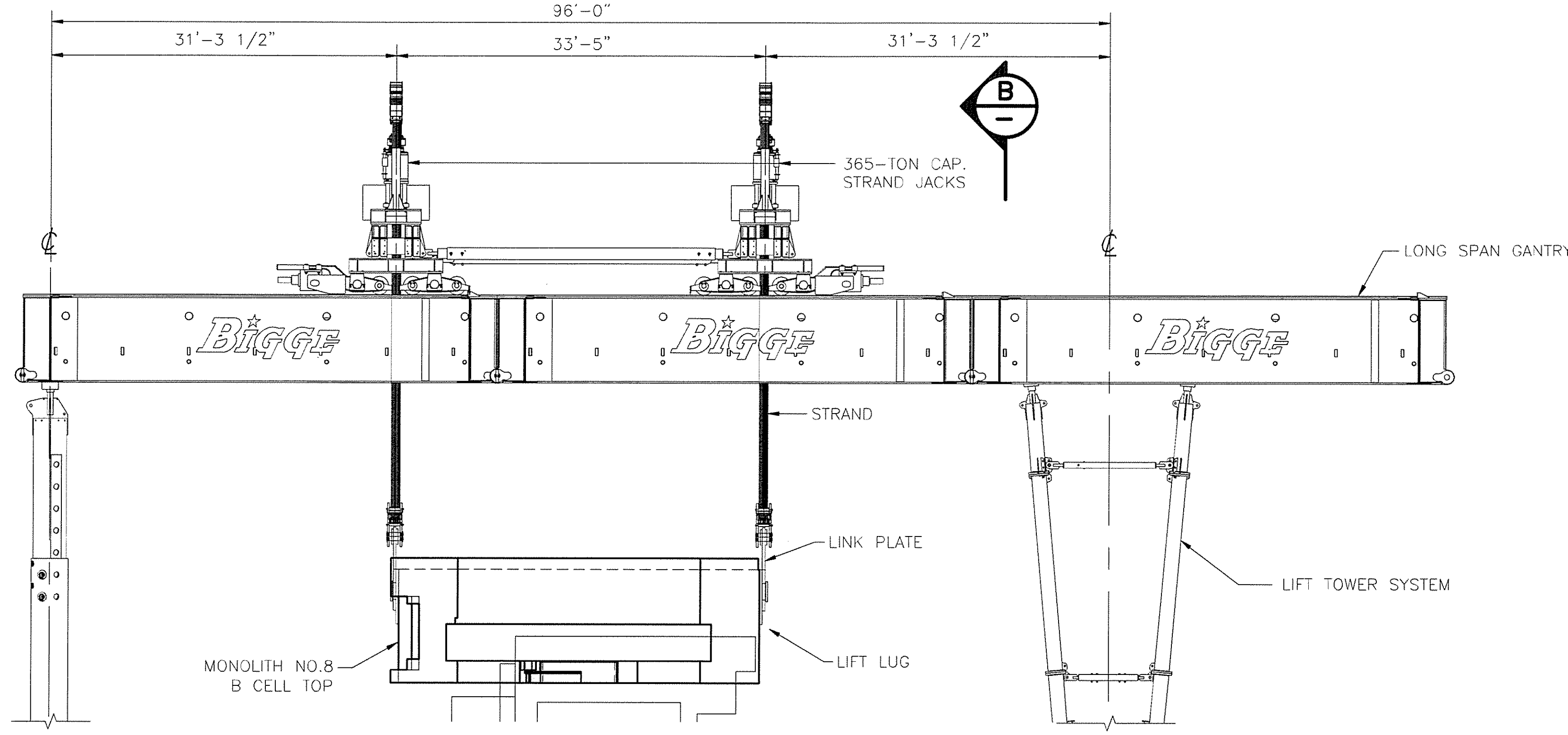
TASK	DRAWING NO.	REV. NO.
–	M8C2	A

RECORD INFORMATION

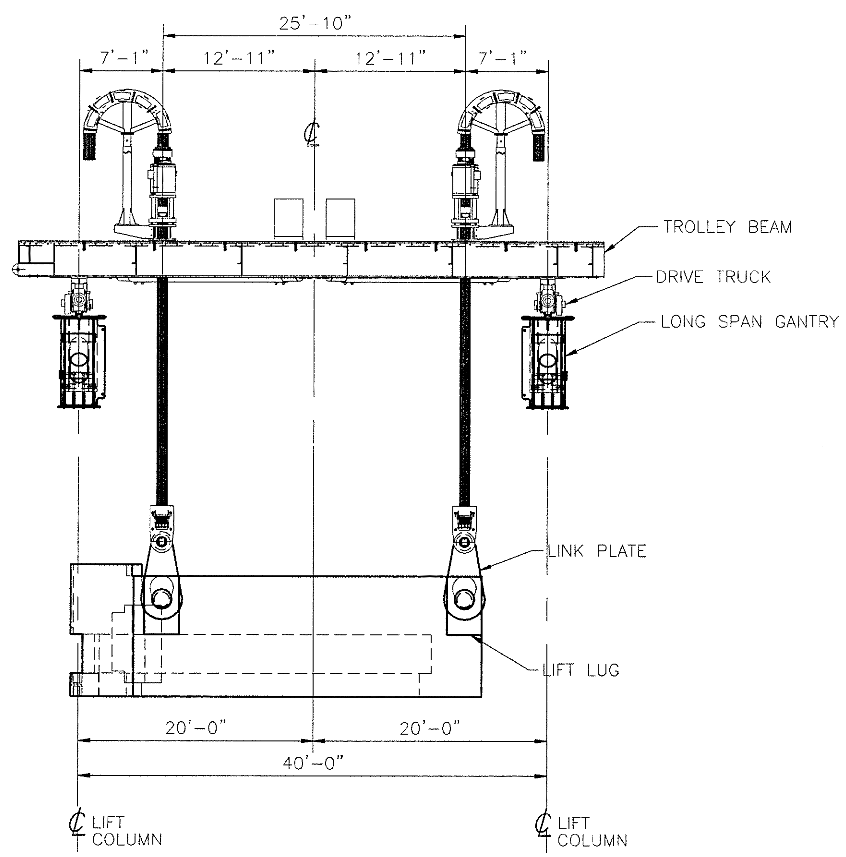
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract
Dedicated to Excellence

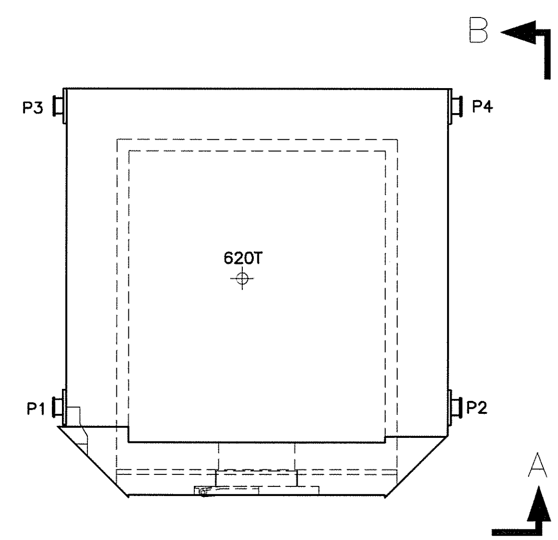
DRAWING NO.	REV. NO.
XX	A



SECTIONAL ELEVATION A / M8D
1/8" = 1'-0"



SECTIONAL ELEVATION B / M8D
1/8" = 1'-0"



PLAN
MONOLITH NO.8
B CELL TOP

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	DRIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
B CELL TOP SECTIONAL ELEVATIONS

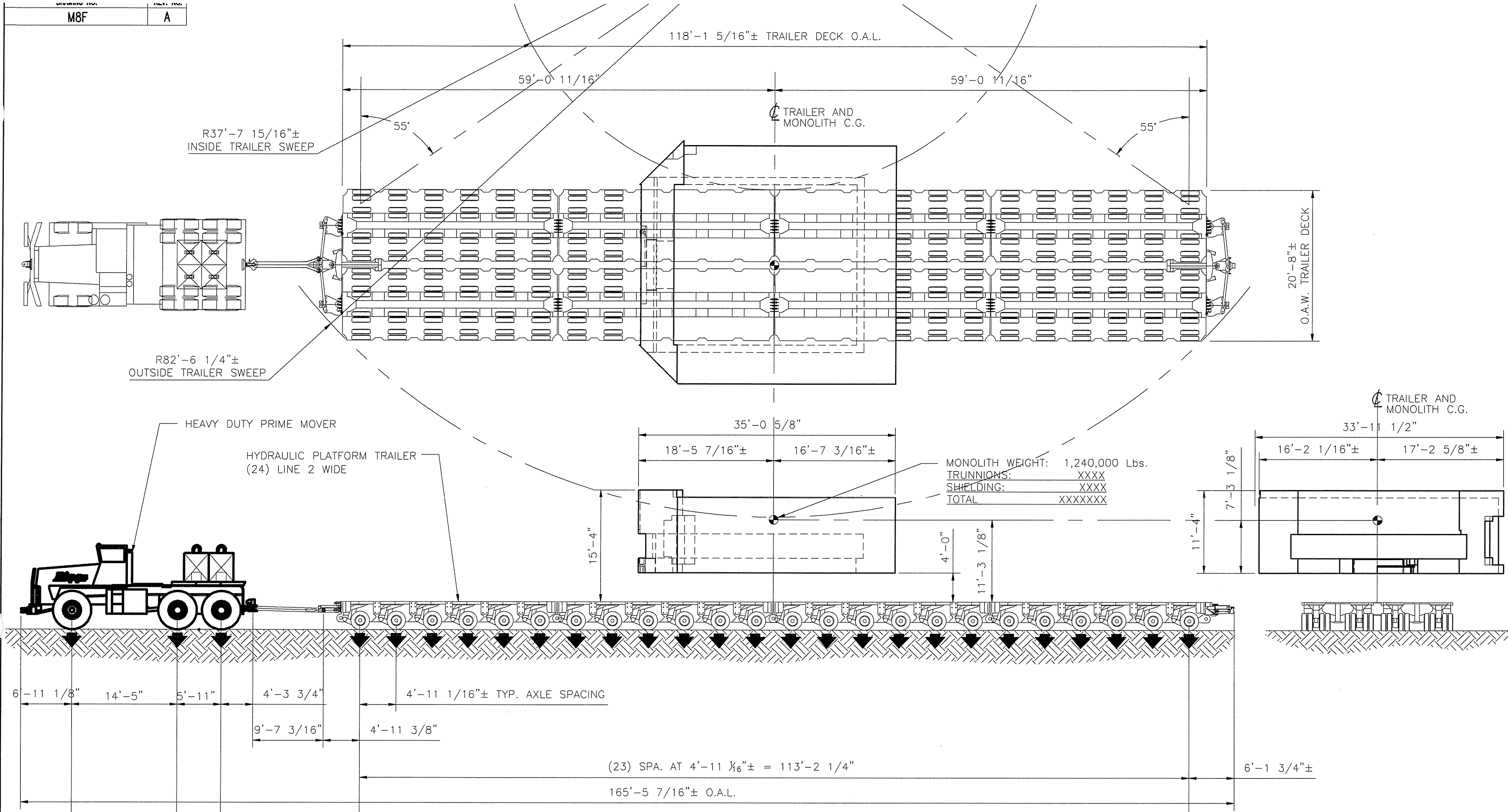
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M8D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M8F	A



AXLE No.	1	2	3	4 - 27
No. TIRES/AXLE	2	4	4	16
WIDTH	11'-9"	12'-7"	12-7"	20'-8"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 384)

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	348,960 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

B-CELL TOP
MONOLITH 8

ELEVATION VIEW — / M8F

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
B-CELL TOP TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M8F.DWG

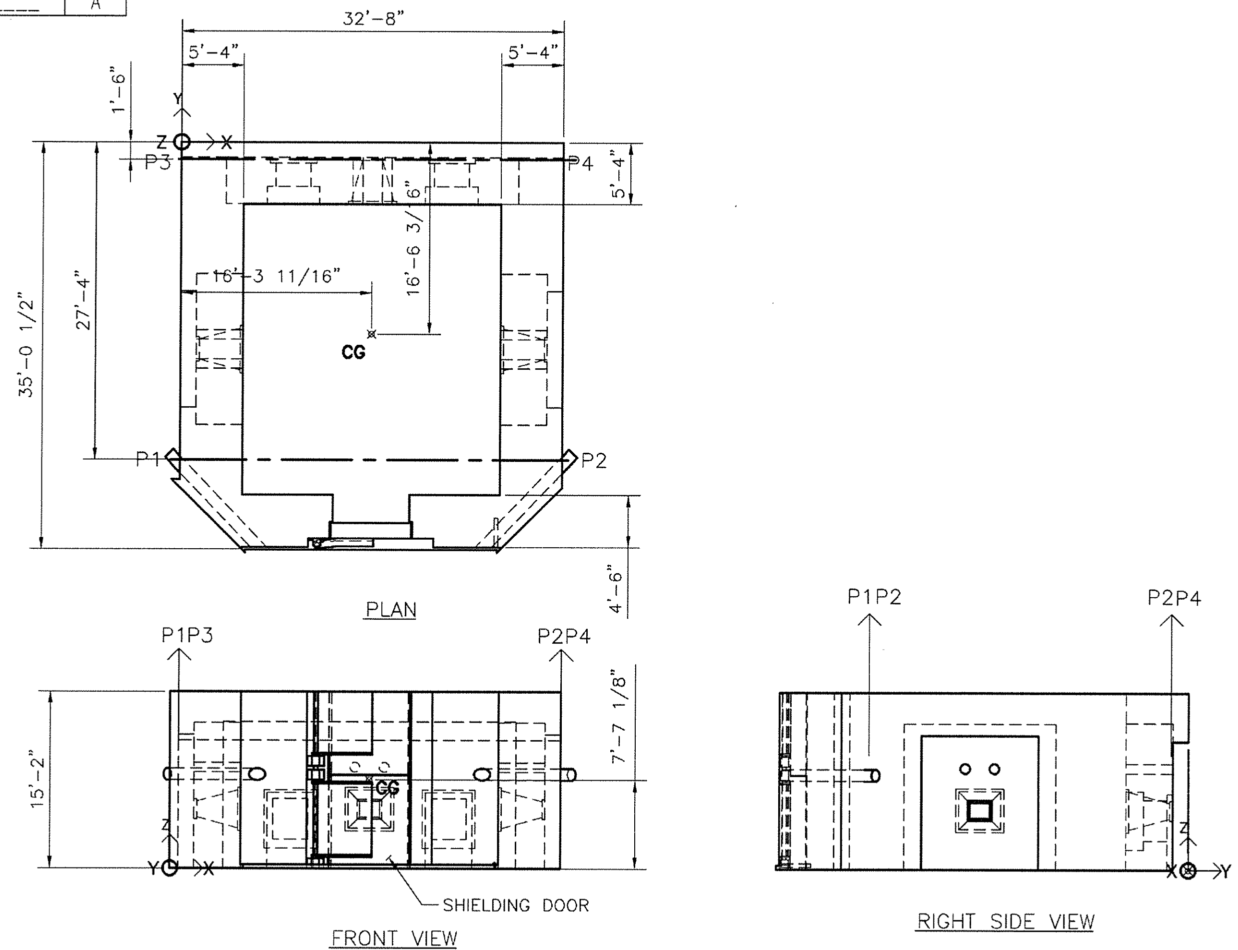
TASK	DRAWING NO.	REV. NO.
	M8F	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

G:\Engineer...obs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F-...30% Submit.dwg

DRAWING NO.	REV. NO.
_____-__-_______	A



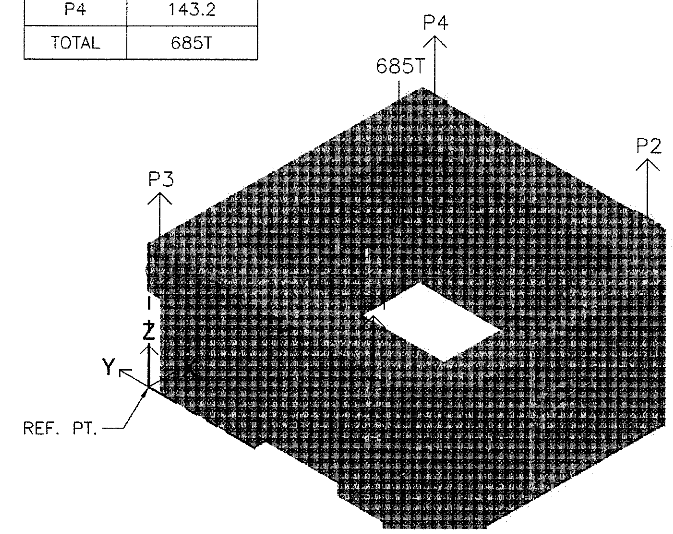
SCALE: 1/8" = 1'-0"

B-CELL MID-SECTION
MONOLITH NO. 9

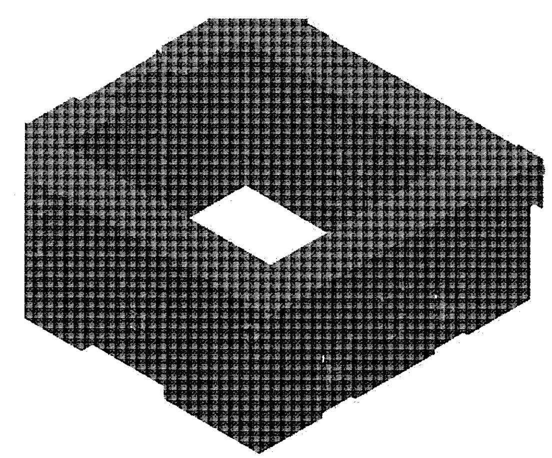
EST. WEIGHT: 685 TON

CENTROID: **X: 195.7 IN**
Y: −198.2 IN
Z: 91.1 IN

P1	199.4
P2	198.8
P3	143.6
P4	143.2
TOTAL	685T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
B-CELL MID-SECTION DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

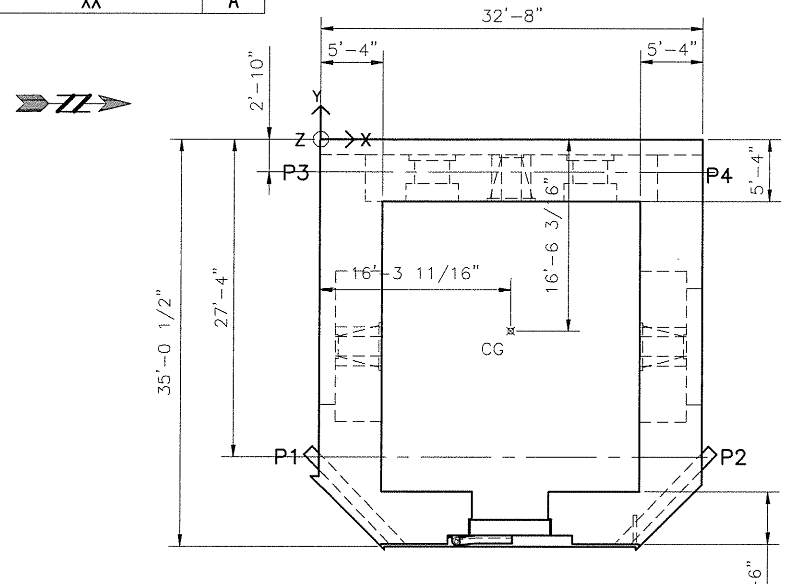
TASK	DRAWING NO.	REV. NO.
–	M9A	A

RECORD INFORMATION

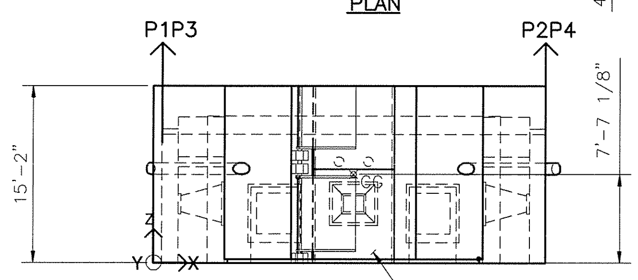
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated WCH Excellence

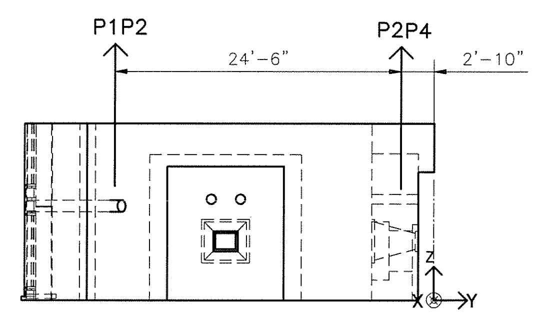
XX	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

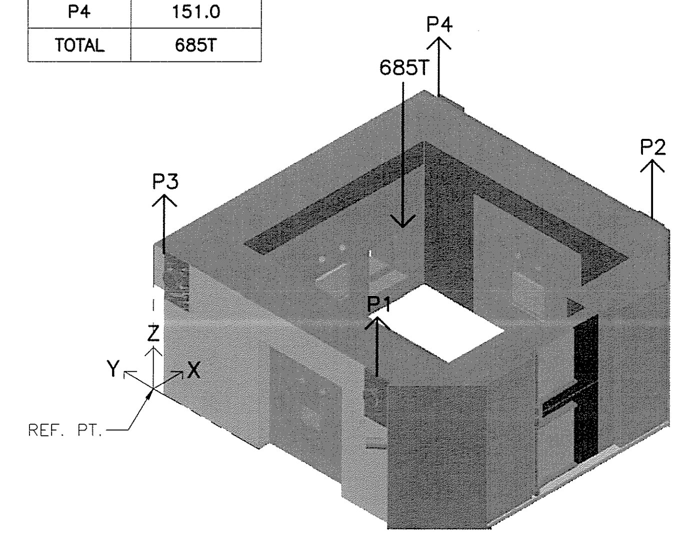
SCALE: 1/8" = 1'-0"

B-CELL MID-SECTION
MONOLITH NO. 9

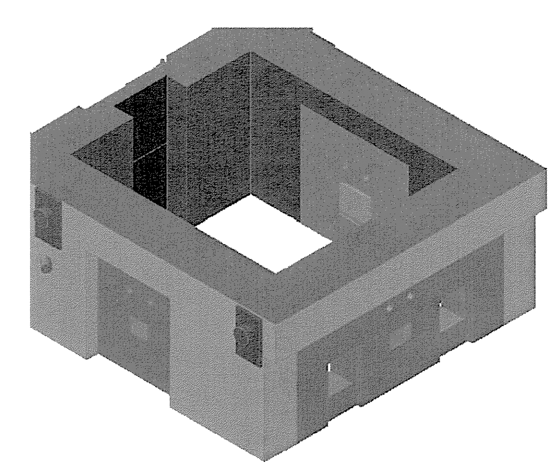
EST. WEIGHT: 685 TON

CENTROID: X: 195.7 IN
Y: -198.2 IN
Z: 91.1 IN

P1	191.6
P2	191.0
P3	151.4
P4	151.0
TOTAL	685T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARRAGEMENT
B-CELL MID-SECTION DETAIL PLAN/ISOMETRIC VIEW

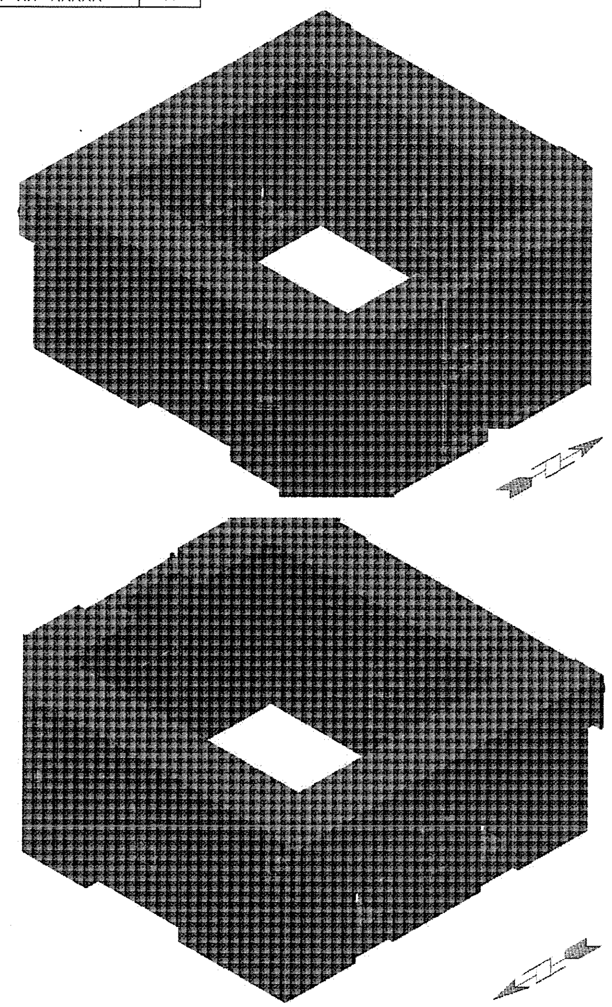
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M9B	A

RECORD INFORMATION

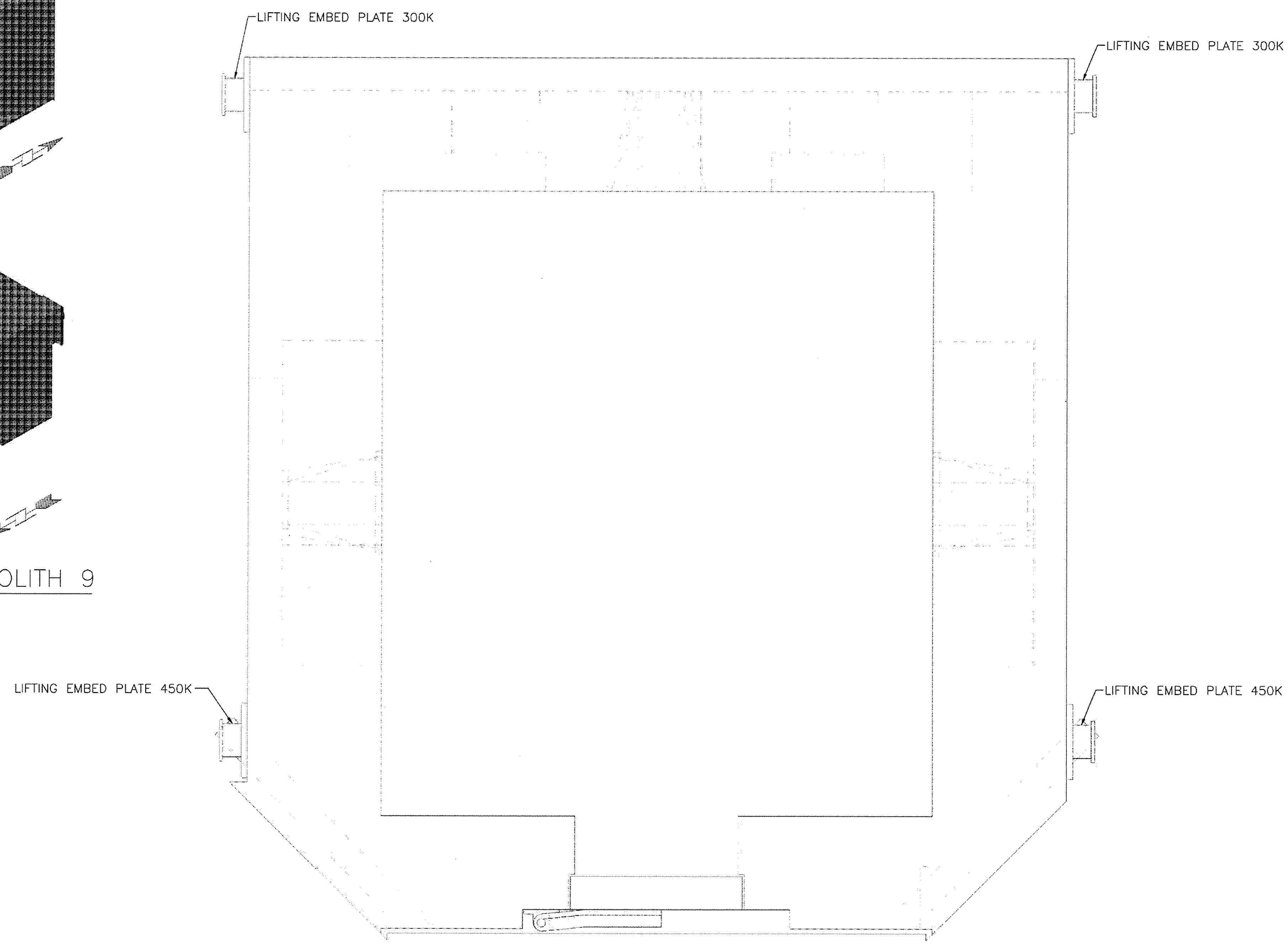
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M9C — ISOMETRIC VIEWS – MONOLITH 9

SCALE: NONE



2 / M9C — PLAN – MONOLITH 9

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
B-CELL MIDDLE – ISOMETRIC/PLAN VIEWS

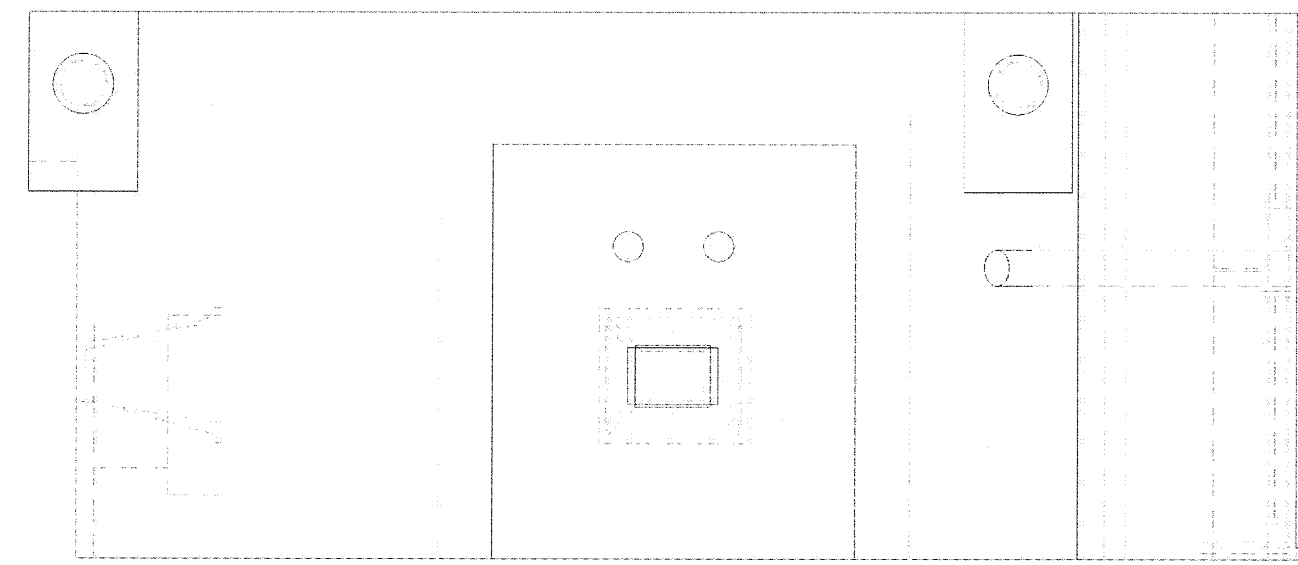
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M9C	A

RECORD INFORMATION

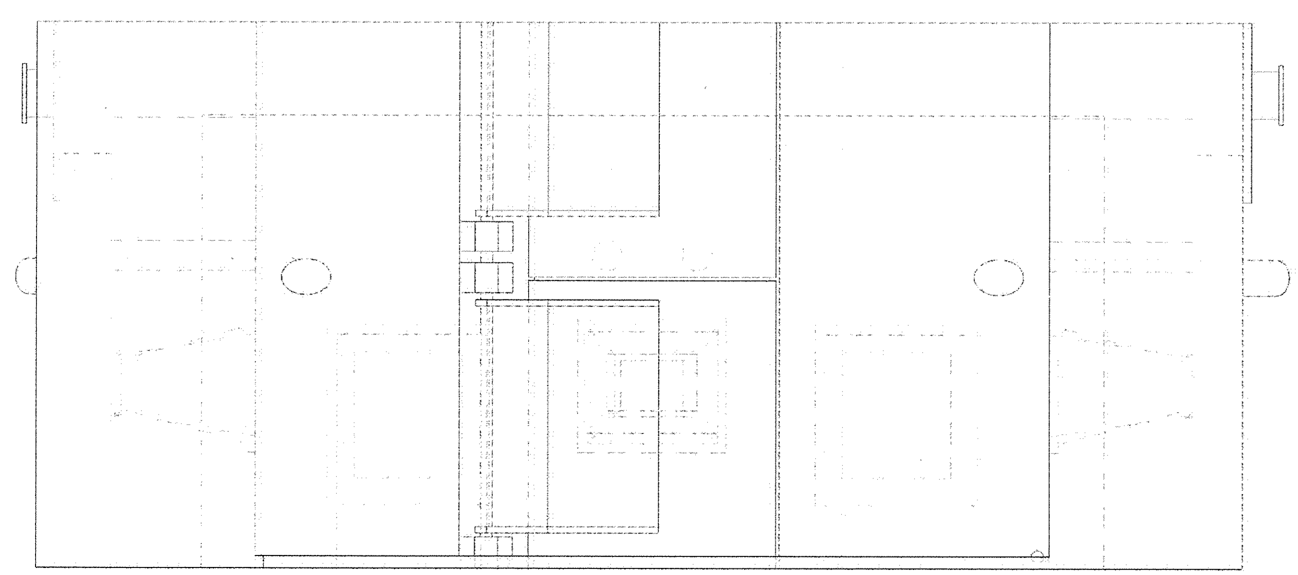
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M9C1 SOUTH ELEVATION – MONOLITH 9

SCALE: 3/8"=1'-0"



2 / M9C1 EAST ELEVATION – MONOLITH 9

SCALE: 3/8"=1'-0"

River Corridor Closure Contract — Dedicated to Safety, Excellence (WCH)

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
B-CELL MIDDLE – ELEVATION VIEWS

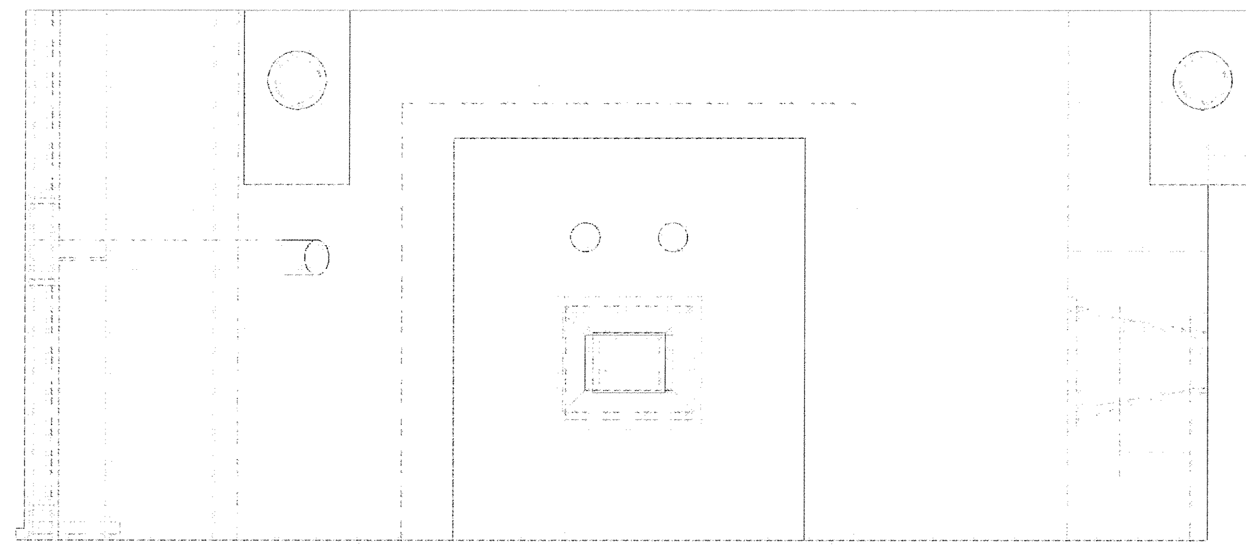
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M9C1	A

RECORD INFORMATION

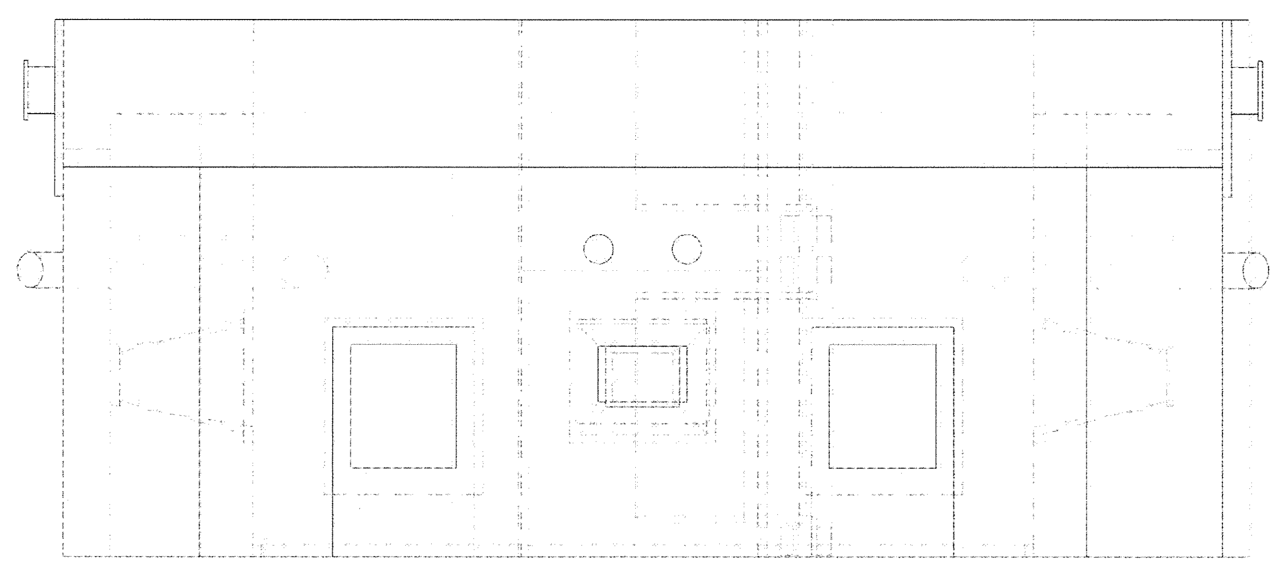
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 M9C2 NORTH ELEVATION – MONOLITH 9

SCALE: 3/8"=1'-0"



2 M9C2 WEST ELEVATION – MONOLITH 9

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
B-CELL MIDDLE – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

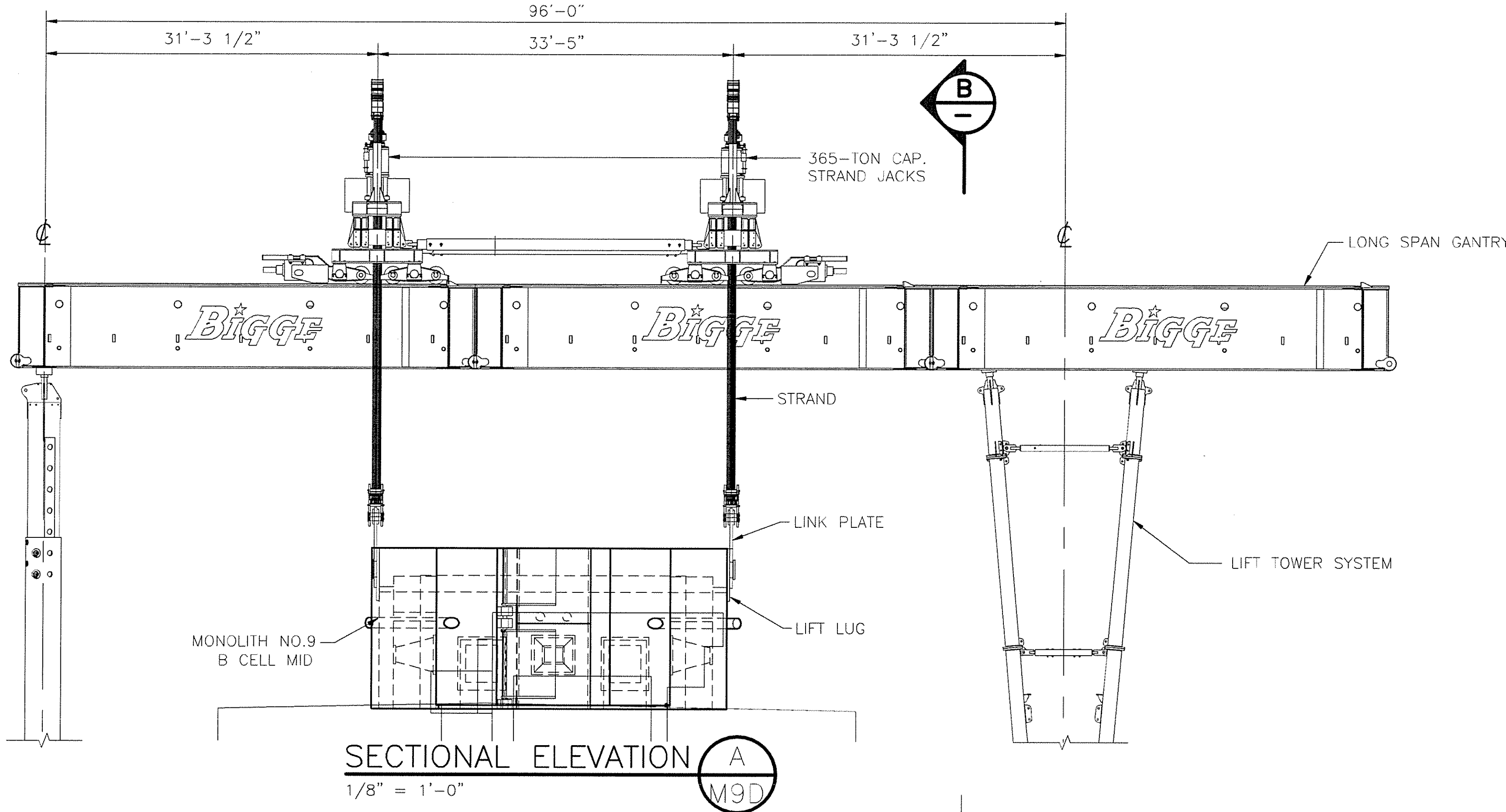
TASK	DRAWING NO.	REV. NO.
–	M9C2	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

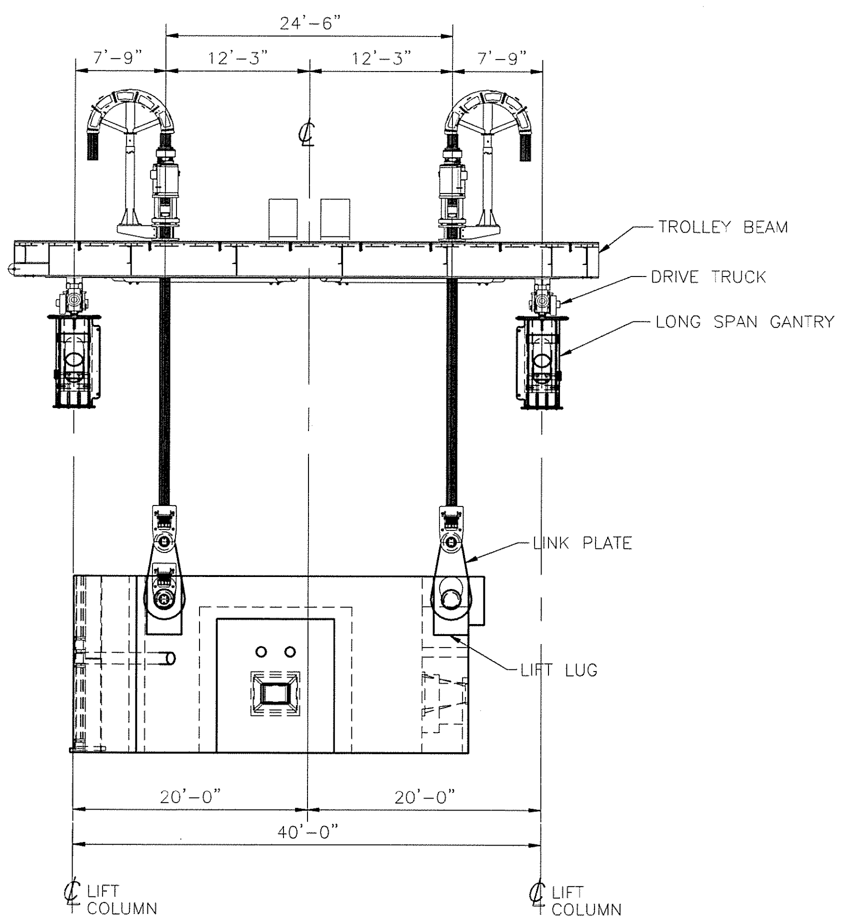
River Corridor Closure Contract
Dedicated to Safety, Excellence

DRAWING NO.	REV. NO.
XX	A



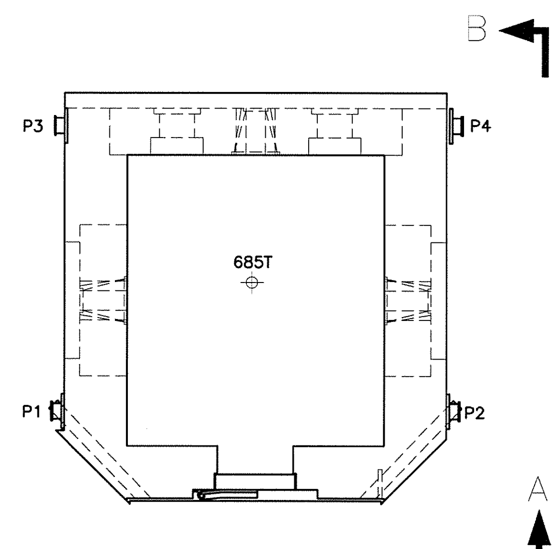
SECTIONAL ELEVATION (A / M9D)

1/8" = 1'-0"



SECTIONAL ELEVATION (B / M9D)

1/8" = 1'-0"



PLAN

MONOLITH NO.9
B CELL MID

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
B CELL MID SECTIONAL ELEVATIONS

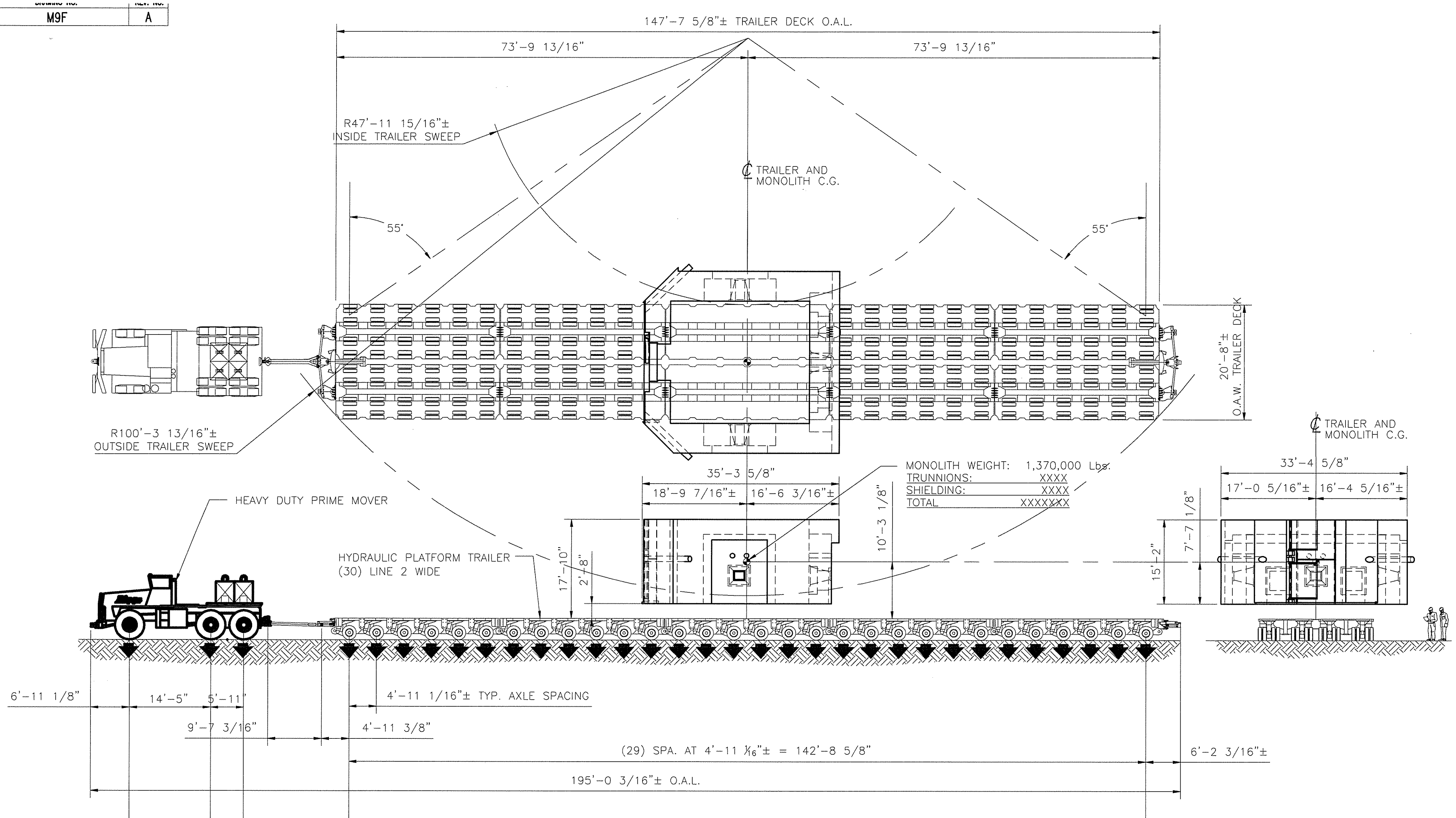
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M9D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M9F	A



AXLE No.	1	2	3	4	4 - 33	33
No. TIRES/AXLE	2	4	4		16	
WIDTH	11'-9"	12'-7"	12-7"		20'-8"	
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.		XXX Lbs.	
GROSS WT./TIRE					XXX Lbs. (TOTAL TIRES = 480)	

B-CELL MID
MONOLITH 9

ELEVATION VIEW — M9F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	436,200 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/32" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

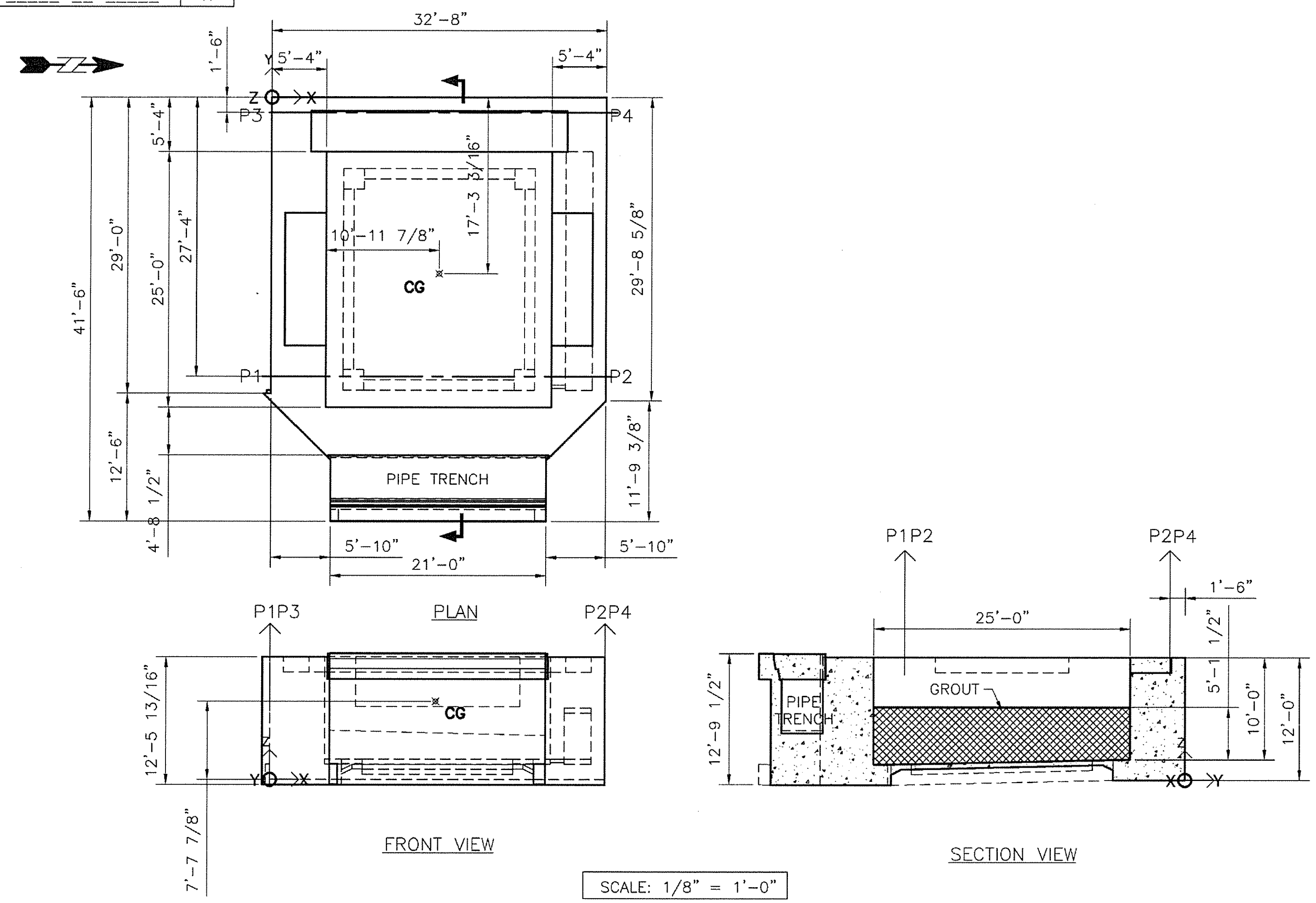
NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
B-CELL MID TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M9F.DWG

TASK	DRAWING NO.	REV. NO.
	M9F	A

DRAWING NO.	REV. NO.
____-__-____	A



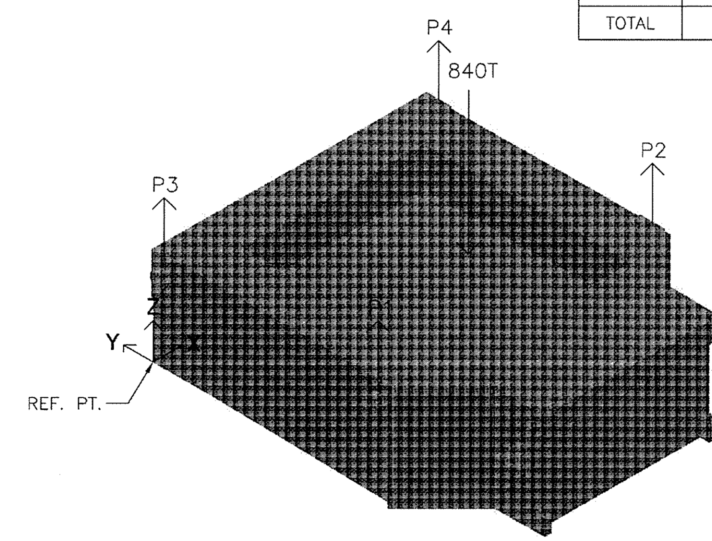
SCALE: 1/8" = 1'-0"

B-CELL BOTTOM
MONOLITH NO. 10

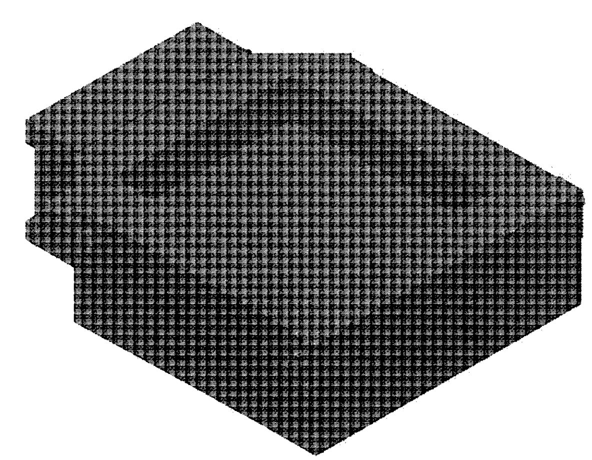
EST. WEIGHT: 840 TON

CENTROID: **X: 195.5 IN**
Y: −207.2 IN
Z: 91.9 IN

P1	256.5
P2	256.2
P3	163.8
P4	163.5
TOTAL	840T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
B-CELL BOTTOM DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

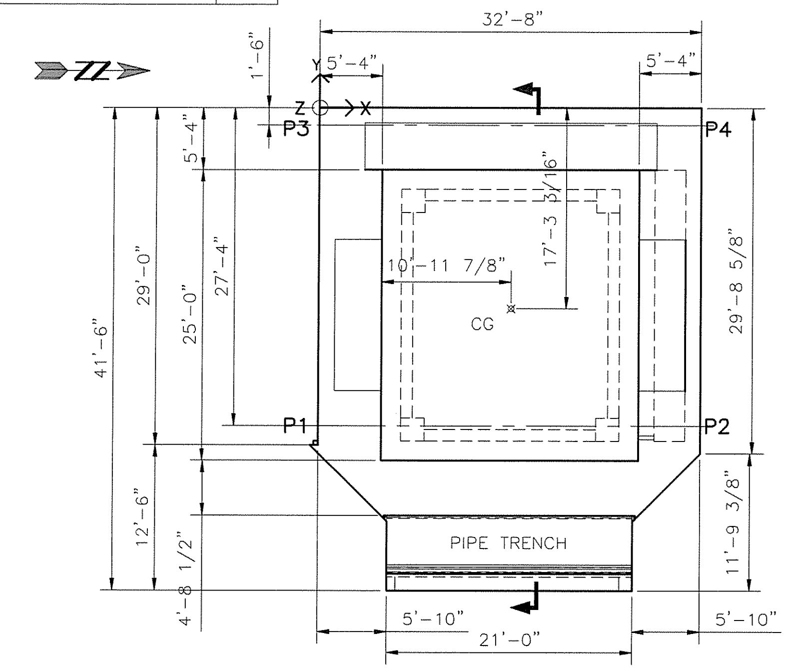
TASK	DRAWING NO.	REV. NO.
_	M10A	A

RECORD INFORMATION

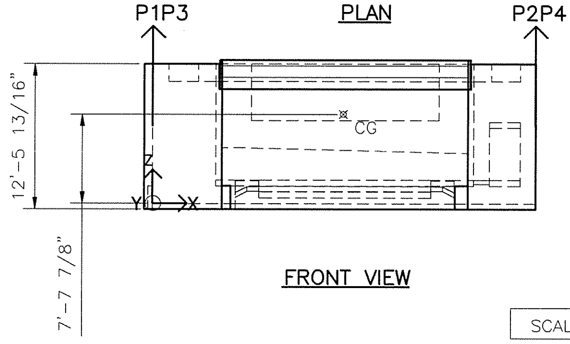
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated WCH Excellence

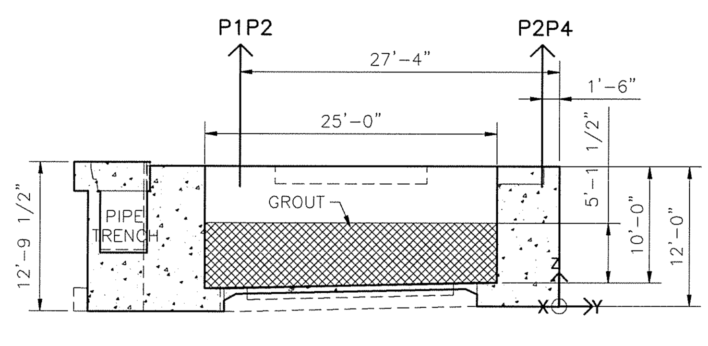
DRAWING NO.	REV. NO.
XX	A



PLAN



FRONT VIEW



SECTION VIEW

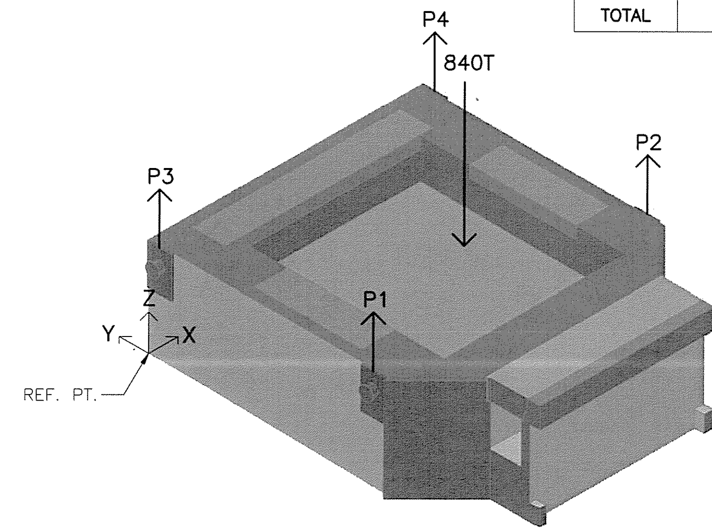
SCALE: 1/8" = 1'-0"

B-CELL BOTTOM
MONOLITH NO. 10

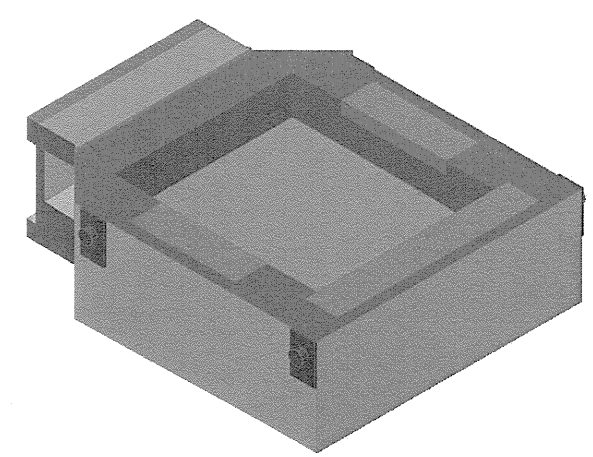
EST. WEIGHT: 840 TON

CENTROID: X: 195.5 IN
Y: -207.2 IN
Z: 91.9 IN

P1	256.5
P2	256.2
P3	163.8
P4	163.5
TOTAL	840T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARRAGEMENT
B-CELL BOTTOM DETAIL PLAN/ISOMETRIC VIEW

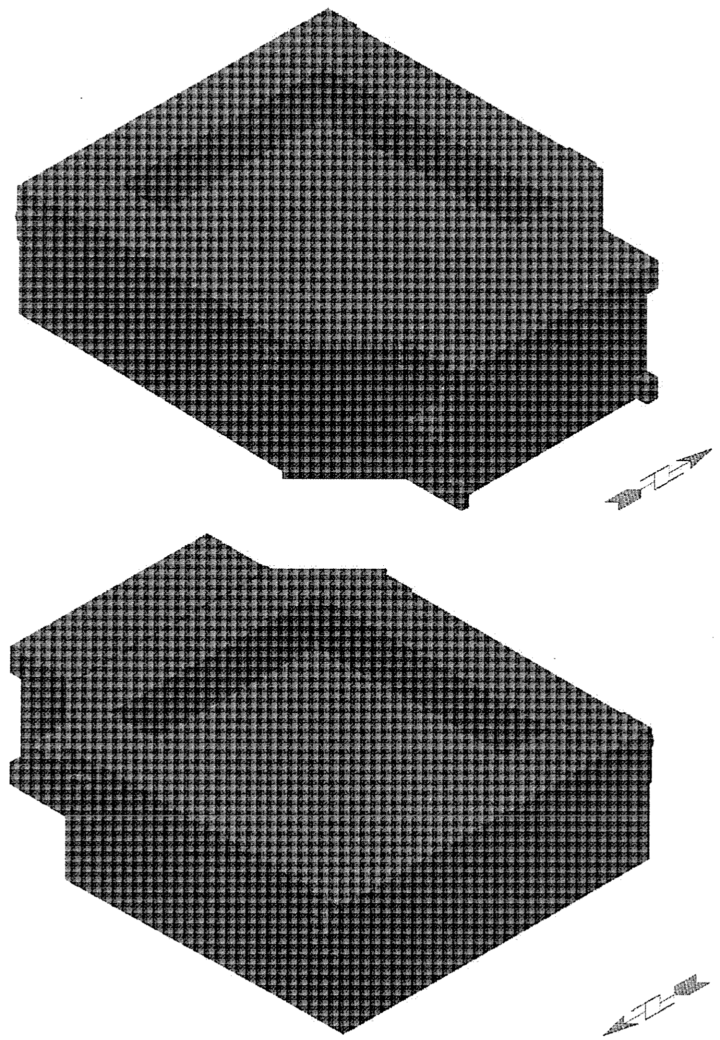
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M10B	A

RECORD INFORMATION

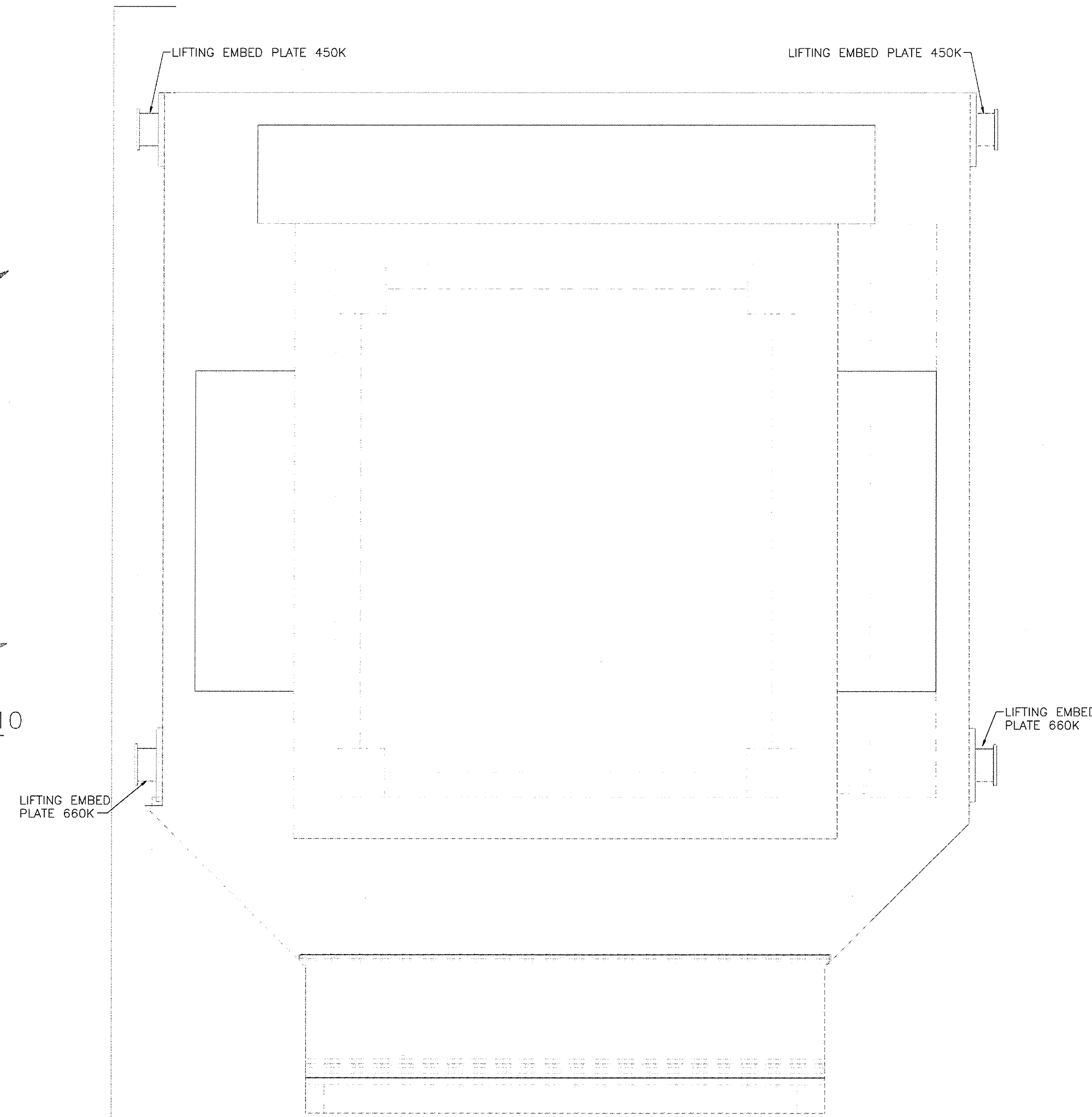
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M10C ISOMETRIC VIEWS – MONOLITH 10

SCALE: NONE



2 / M10C PLAN – MONOLITH 10

SCALE: 3/8"=1'-0"

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated to Excellence

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

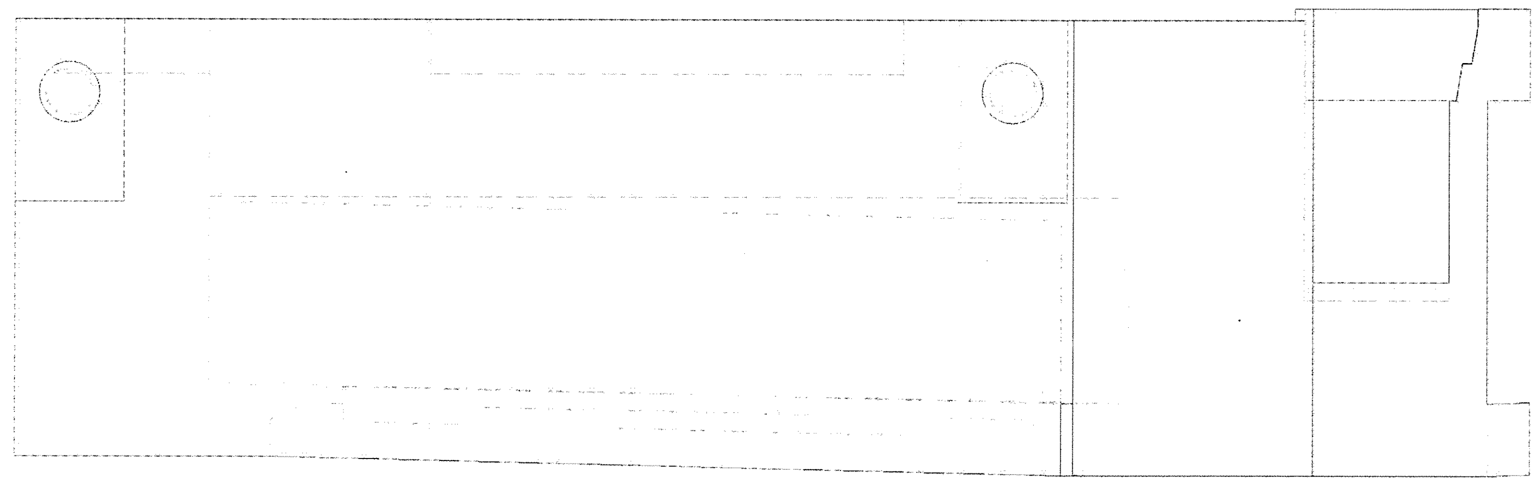
WASHINGTON CLOSURE HANFORD LLC. RICHLAND, WASHINGTON	DCI ENGINEERS 400 SW 6TH AVE PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
B-CELL BOTTOM/SLAB/TRENCH – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

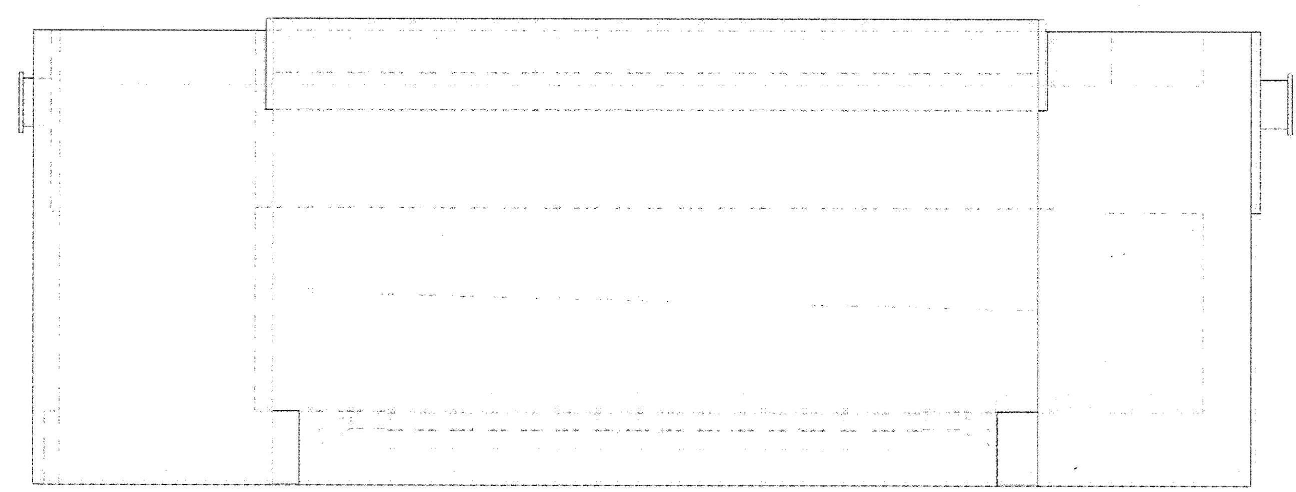
TASK	DRAWING NO.	REV. NO.
–	M10C	A

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



SOUTH ELEVATION – MONOLITH 10 (1 / M10C1)

SCALE: 3/8"=1'-0"



EAST ELEVATION – MONOLITH 10 (2 / M10C1)

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC. RICHLAND, WASHINGTON	DCI ENGINEERS 400 SW 6TH AVE PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
B-CELL BOTTOM/SLAB/TRENCH – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M10C1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

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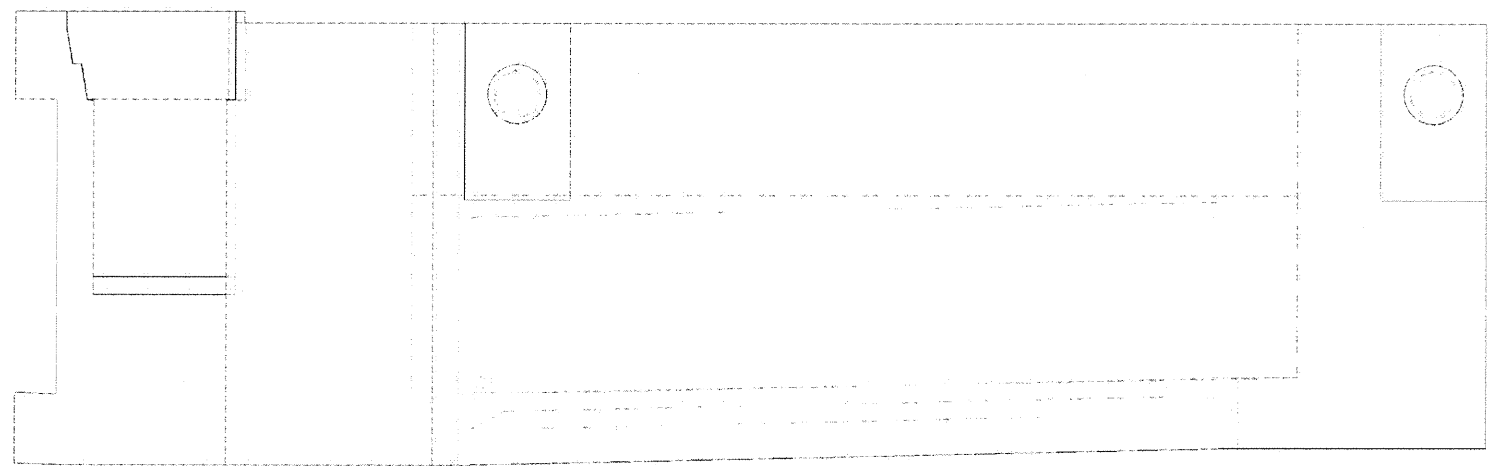
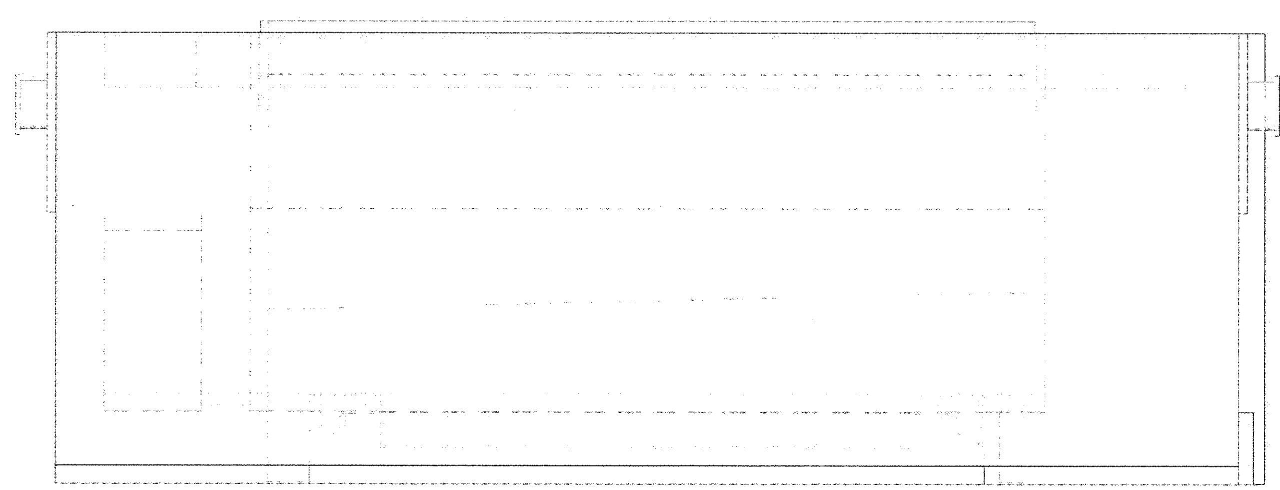
DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M10C2 NORTH ELEVATION – MONOLITH 10

SCALE: 3/8"=1'-0"



2 / M10C2 WEST ELEVATION – MONOLITH 10

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
B-CELL BOTTOM/SLAB/TRENCH – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

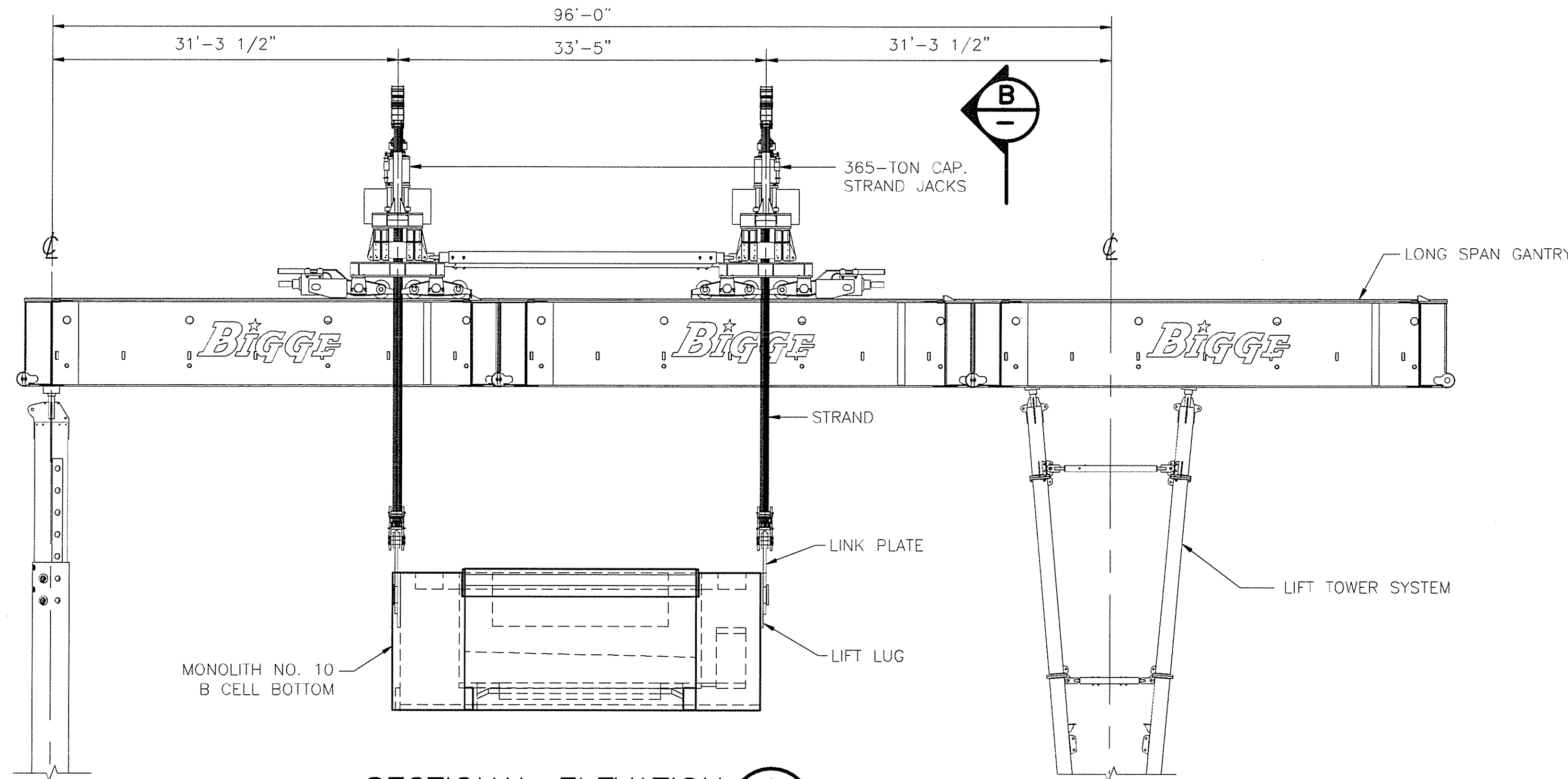
TASK	DRAWING NO.	REV. NO.
–	M10C2	A

RECORD INFORMATION

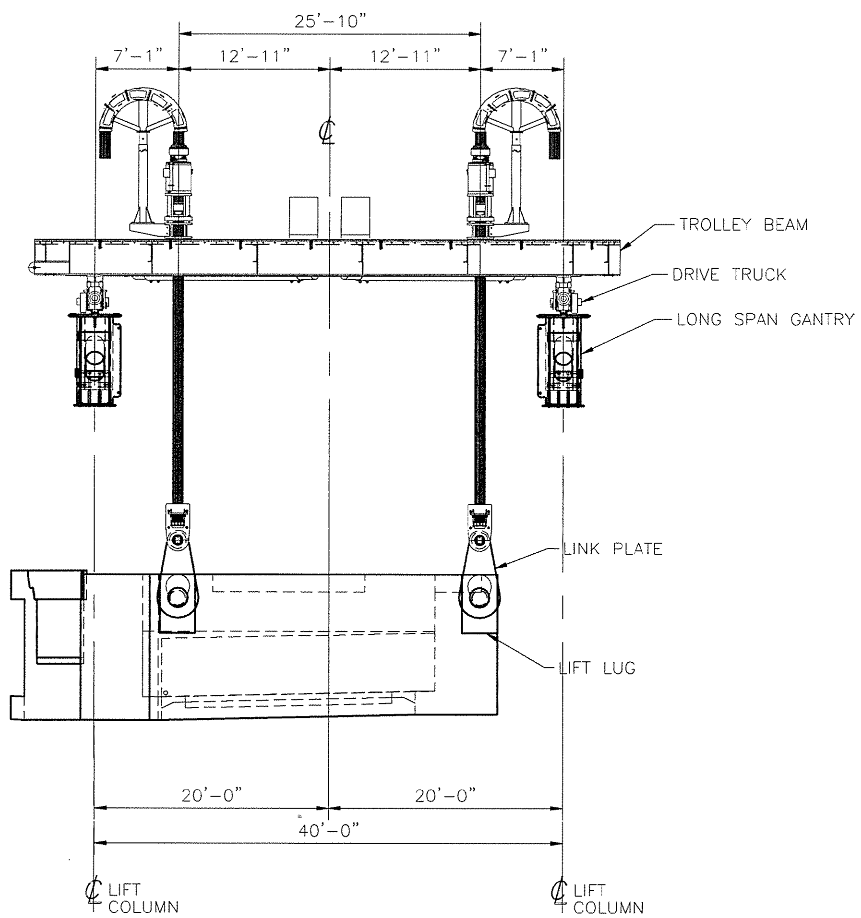
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract — Dedicated to Excellence

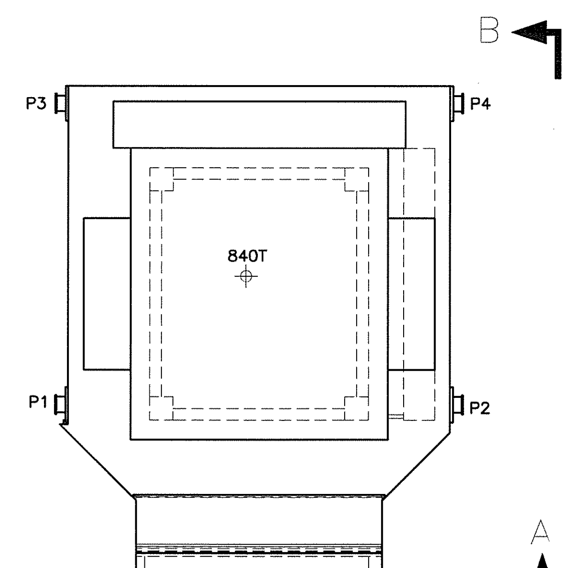
DRAWING NO.	REV. NO.
XX	A



SECTIONAL ELEVATION A / M10D
1/8" = 1'-0"



SECTIONAL ELEVATION B / M10D
1/8" = 1'-0"



PLAN
MONOLITH NO. 10
B CELL BOTTOM

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	DRIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
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BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
B CELL BOTTOM SECTIONAL ELEVATIONS

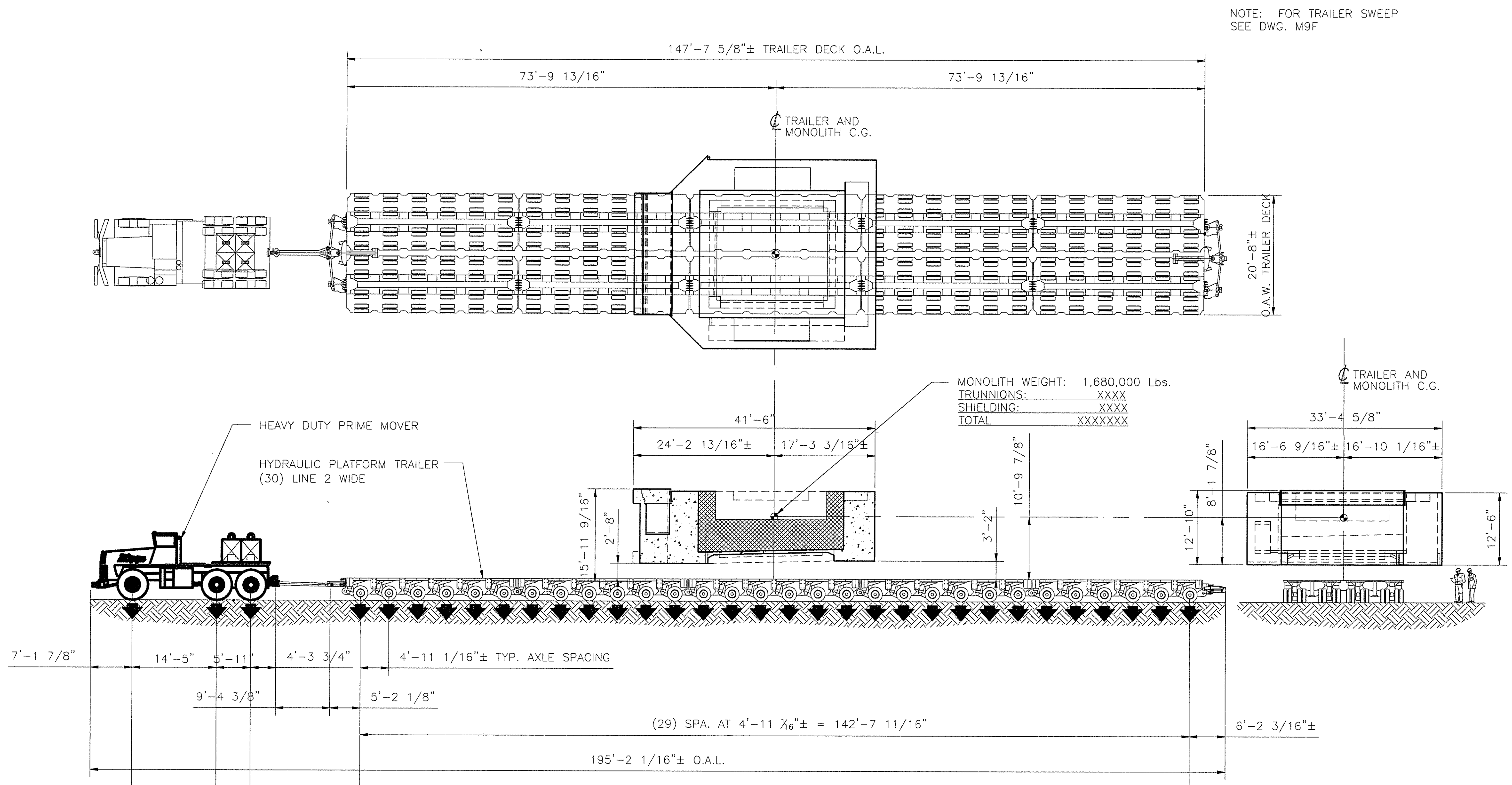
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M10D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M10F	A



AXLE No.	1	2	3	4	4 - 33	33
No. TIRES/AXLE	2	4	4		16	
WIDTH	11'-9"	12'-7"	12'-7"		20'-8"	
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.		XXX Lbs.	
GROSS WT./TIRE					XXX Lbs. (TOTAL TIRES = 480)	

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	436,200 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

B-CELL BOTTOM
MONOLITH 10

ELEVATION VIEW — M10F

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/32" = 1'-0"

U.S. DEPARTMENT OF ENERGY
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RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

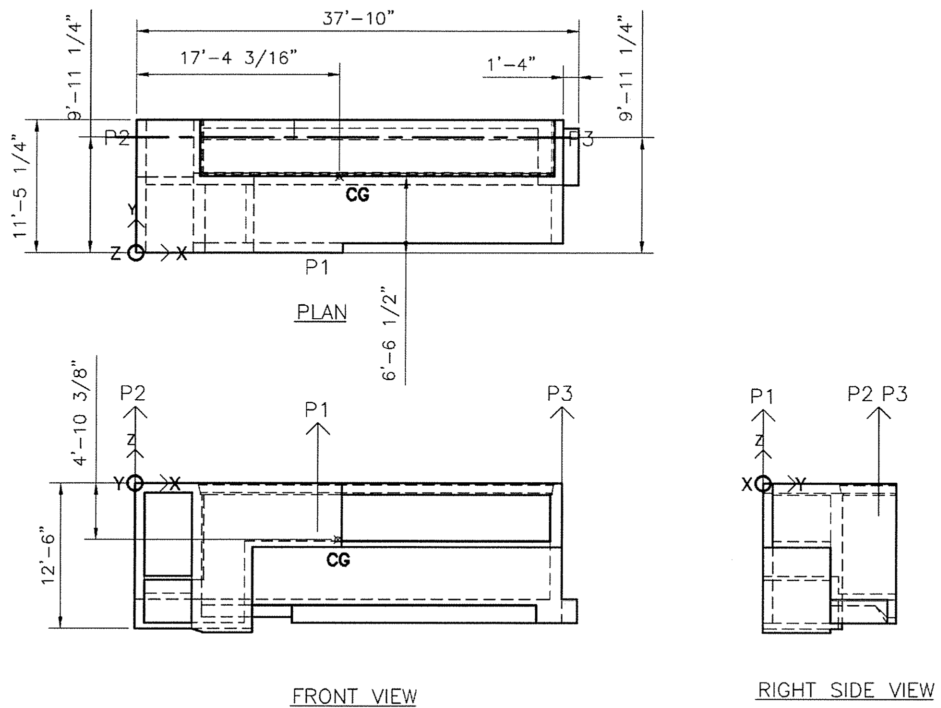
BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
B-CELL BOTTOM TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M10F.DWG

TASK	DRAWING NO.	REV. NO.
	M10F	A

G:\Engineering Jobs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F-30% Submit.dwg

DRAWING NO.	REV. NO.
_____-__-_____	A



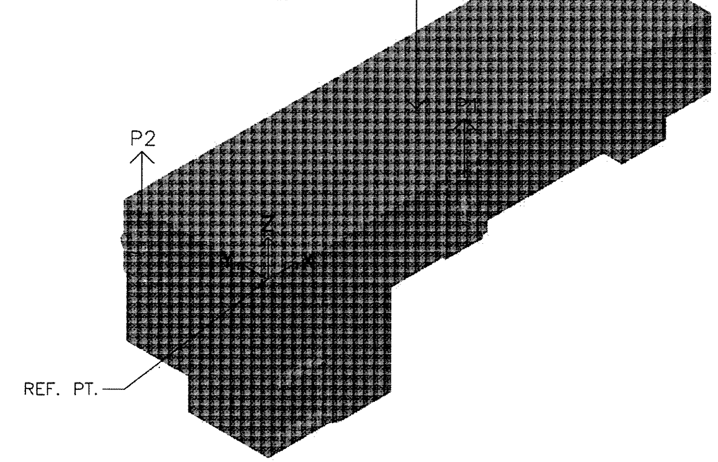
SCALE: 1/8" = 1'-0"

A-FRAME
MONOLITH NO. 11

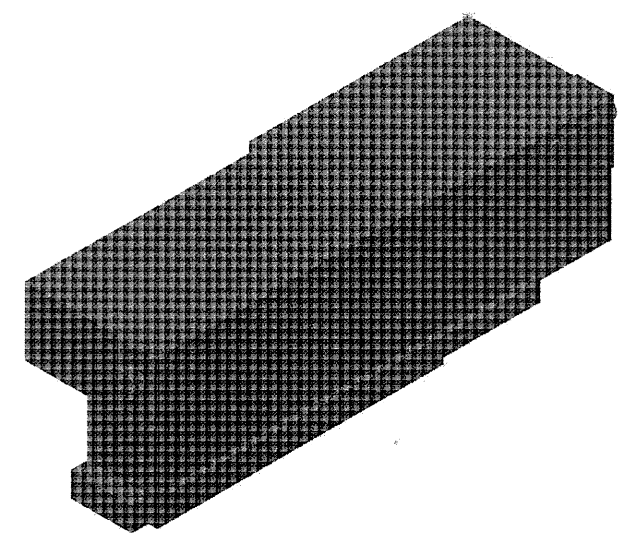
EST. WEIGHT: 310 TON

CENTROID: **X: 208.2 IN**
Y: 78.5 IN
Z: −58.4 IN

P1	105.9
P2	102.9
P3	101.2
TOTAL	310T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
A-FRAME DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

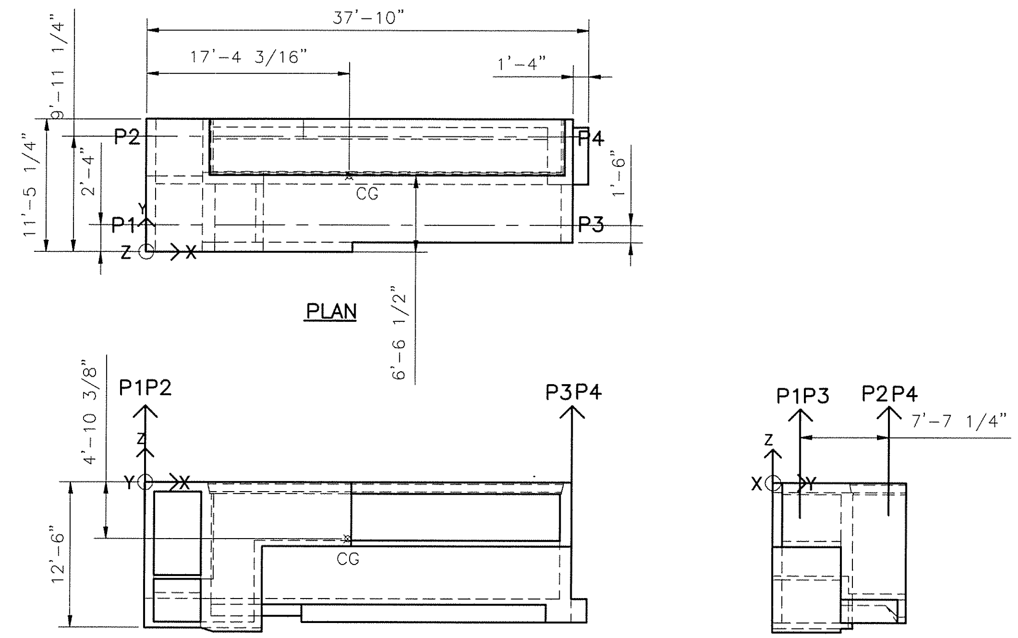
TASK	DRAWING NO.	REV. NO.
_	M11A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_______	324	___

River Corridor Closure Contract
Dedicated WCH Excellence

DRAWING NO.	REV. NO.
XX	A



PLAN

FRONT VIEW

RIGHT SIDE VIEW

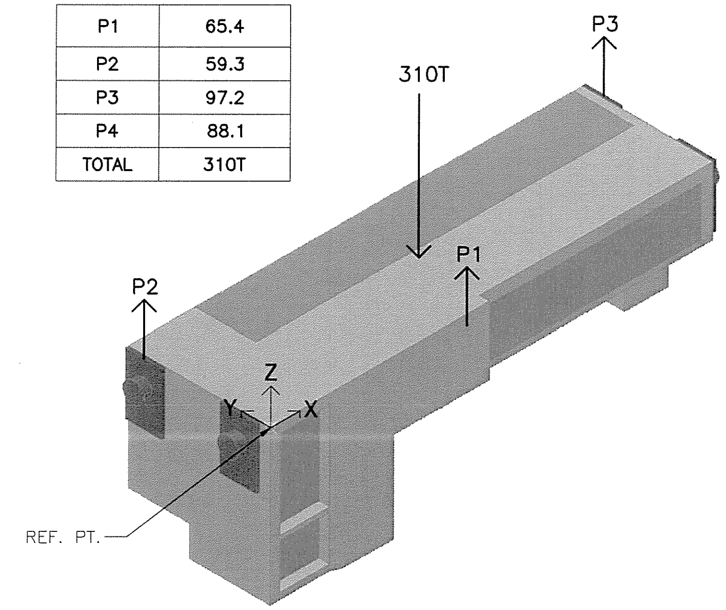
SCALE: 1/8" = 1'-0"

A-FRAME
MONOLITH NO. 11

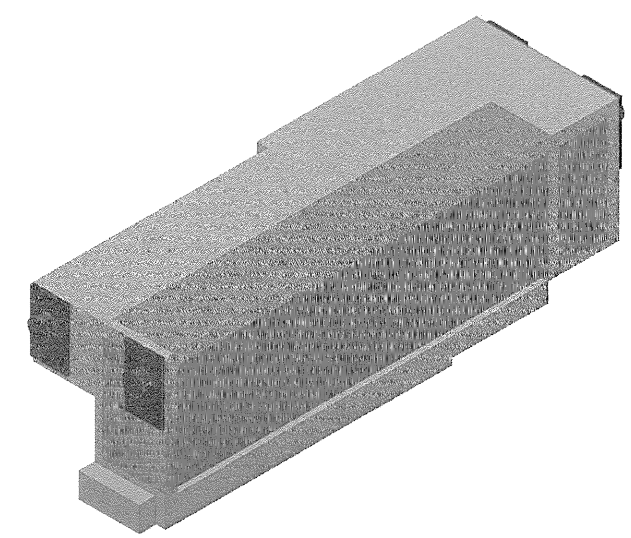
EST. WEIGHT: 310 TON

CENTROID: X: 208.2 IN
Y: 78.5 IN
Z: -58.4 IN

P1	65.4
P2	59.3
P3	97.2
P4	88.1
TOTAL	310T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARRAGEMENT
A-FRAME DETAIL PLAN/ISOMETRIC VIEW

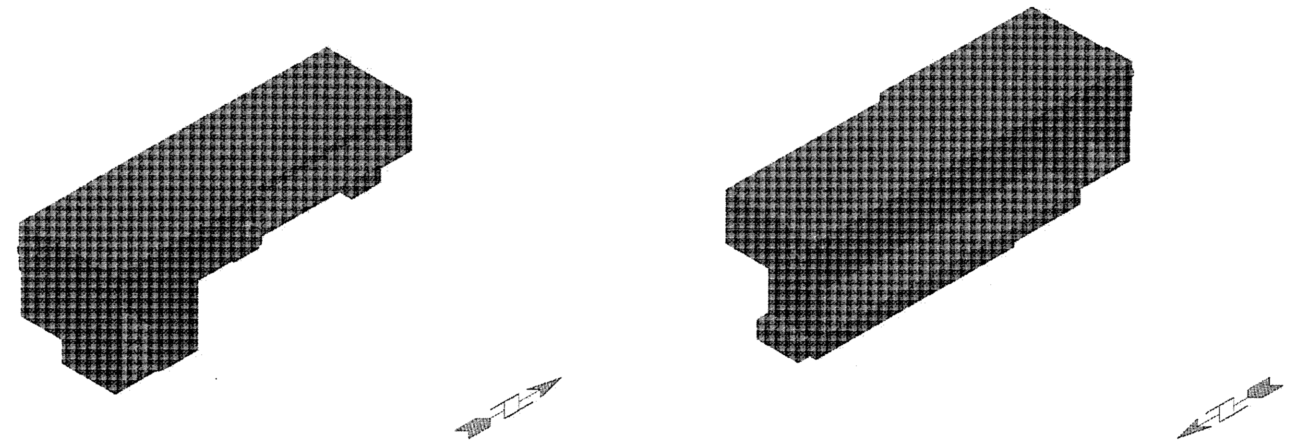
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M11B	A

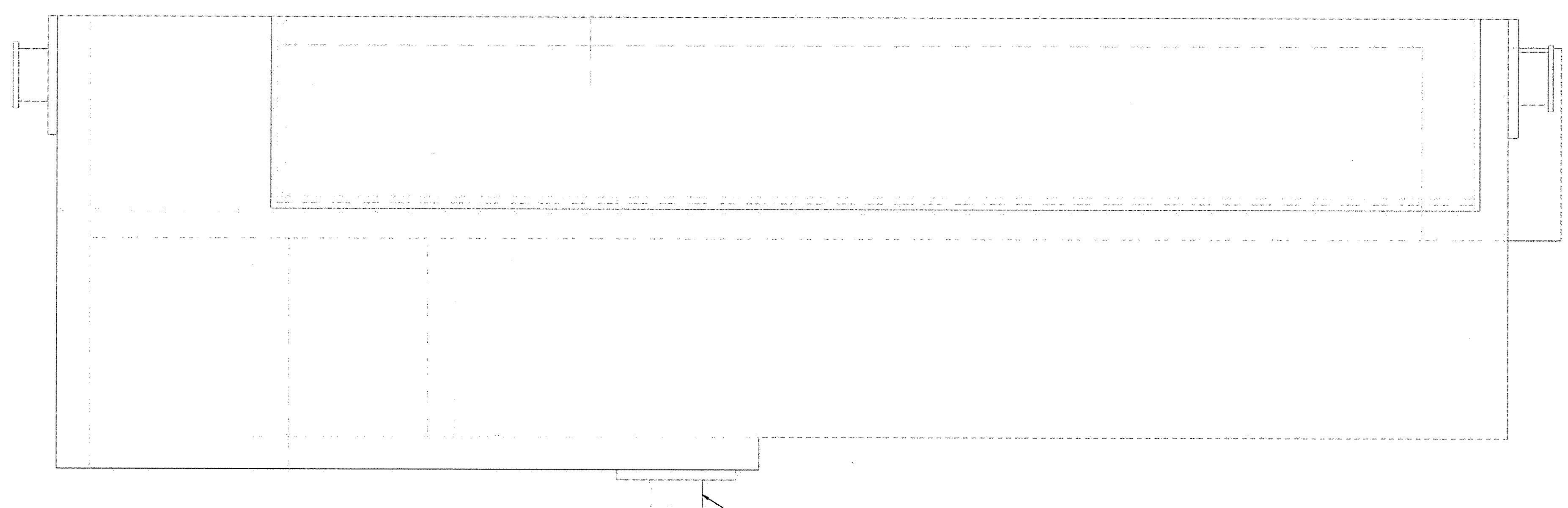
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M11C — ISOMETRIC VIEWS – MONOLITH 11
SCALE: NONE



2 / M11C — PLAN – MONOLITH 11
SCALE: 1/2"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
A-FRAME – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

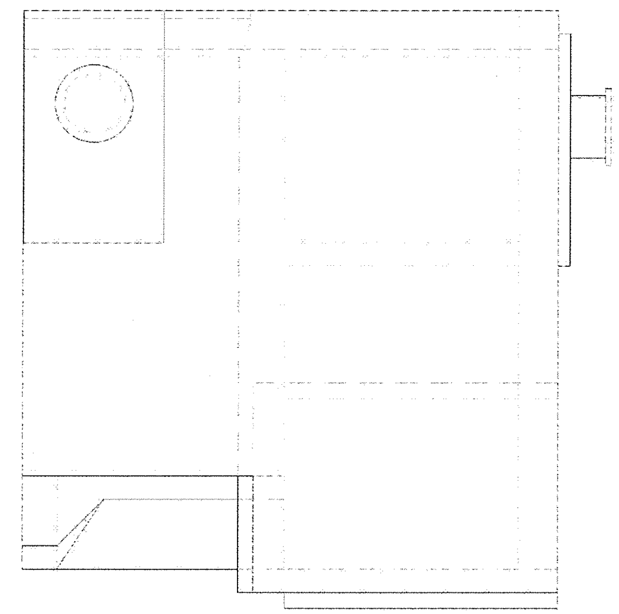
TASK	DRAWING NO.	REV. NO.
–	M11C	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

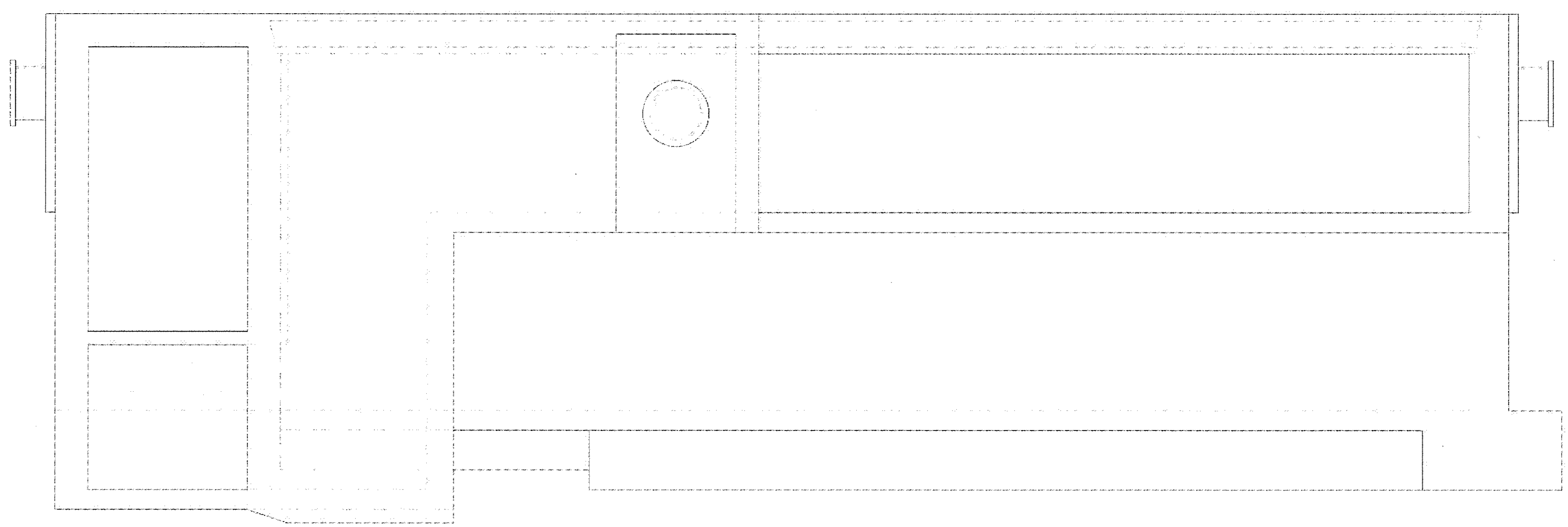
River Corridor Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M11C1 SOUTH ELEVATION – MONOLITH 11

SCALE: 1/2"=1'-0"



2 / M11C1 EAST ELEVATION – MONOLITH 11

SCALE: 1/2"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
A-FRAME – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

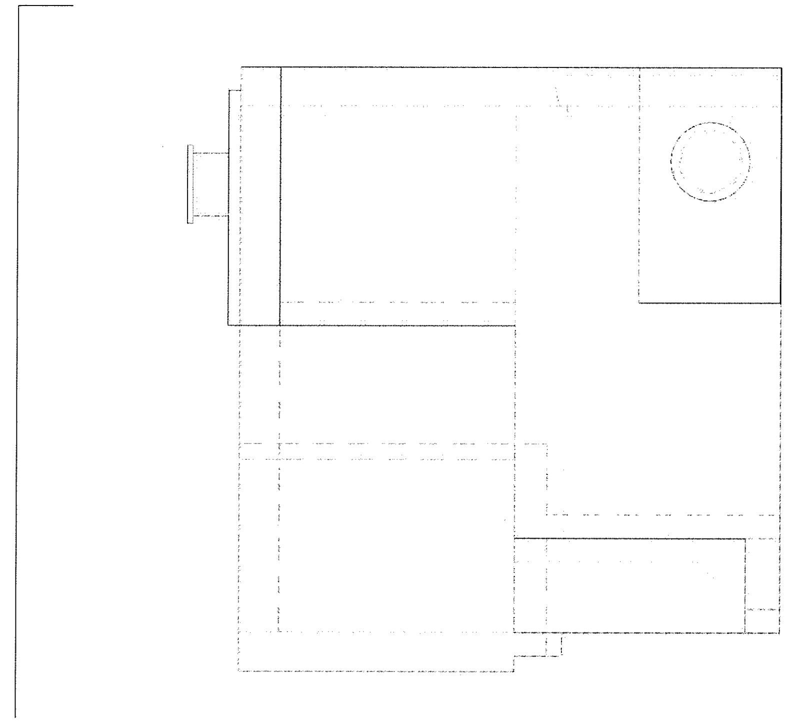
TASK	DRAWING NO.	REV. NO.
–	M11C1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

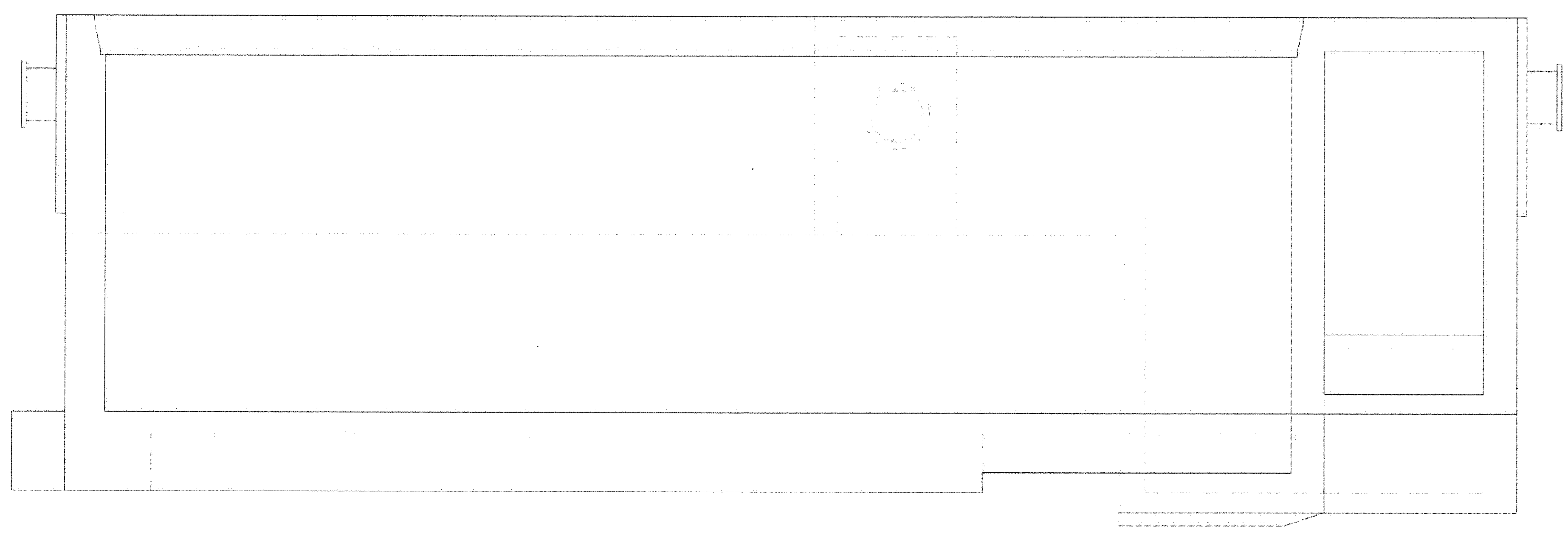
DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 / M11C2 — NORTH ELEVATION – MONOLITH 11

SCALE: 1/2"=1'-0"



2 / M11C2 — WEST ELEVATION – MONOLITH 11

SCALE: 1/2"=1'-0"

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
A-FRAME – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

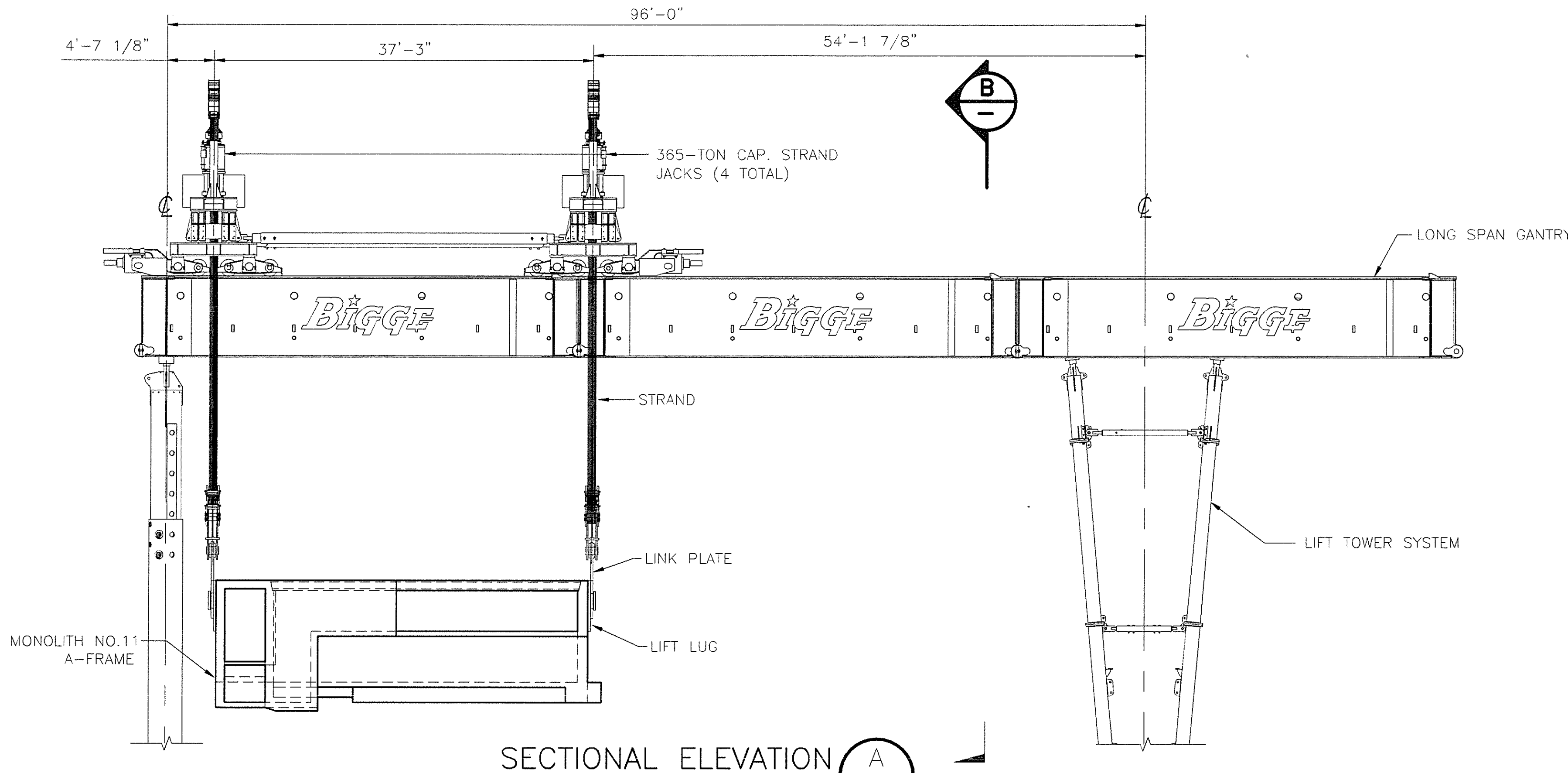
TASK	DRAWING NO.	REV. NO.
–	M11C2	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

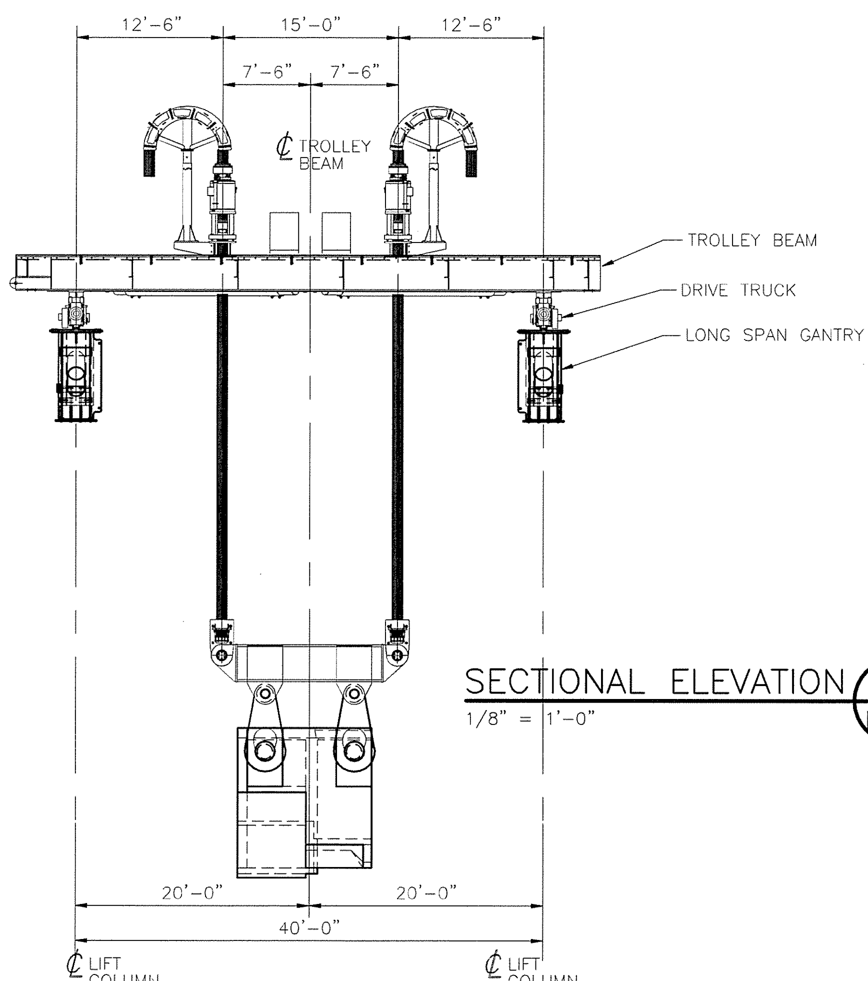
River Corridor Closure Contract — Dedicated to Safety & Excellence — WCH

DRAWING NO.	REV. NO.
XX	A



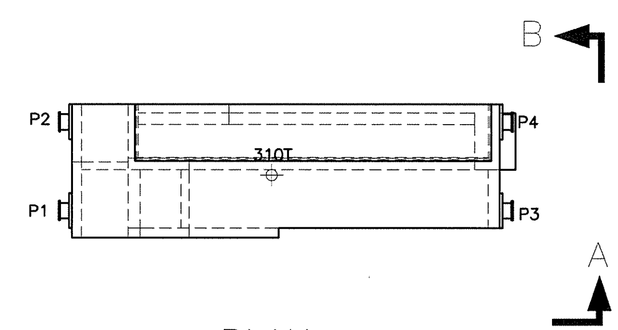
SECTIONAL ELEVATION (A / M11D)

1/8" = 1'-0"



SECTIONAL ELEVATION (B / M1D)

1/8" = 1'-0"



PLAN

MONOLITH NO.11 A-FRAME

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	DRIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
△								
△								
△								
△								
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
A-FRAME SECTIONAL ELEVATIONS

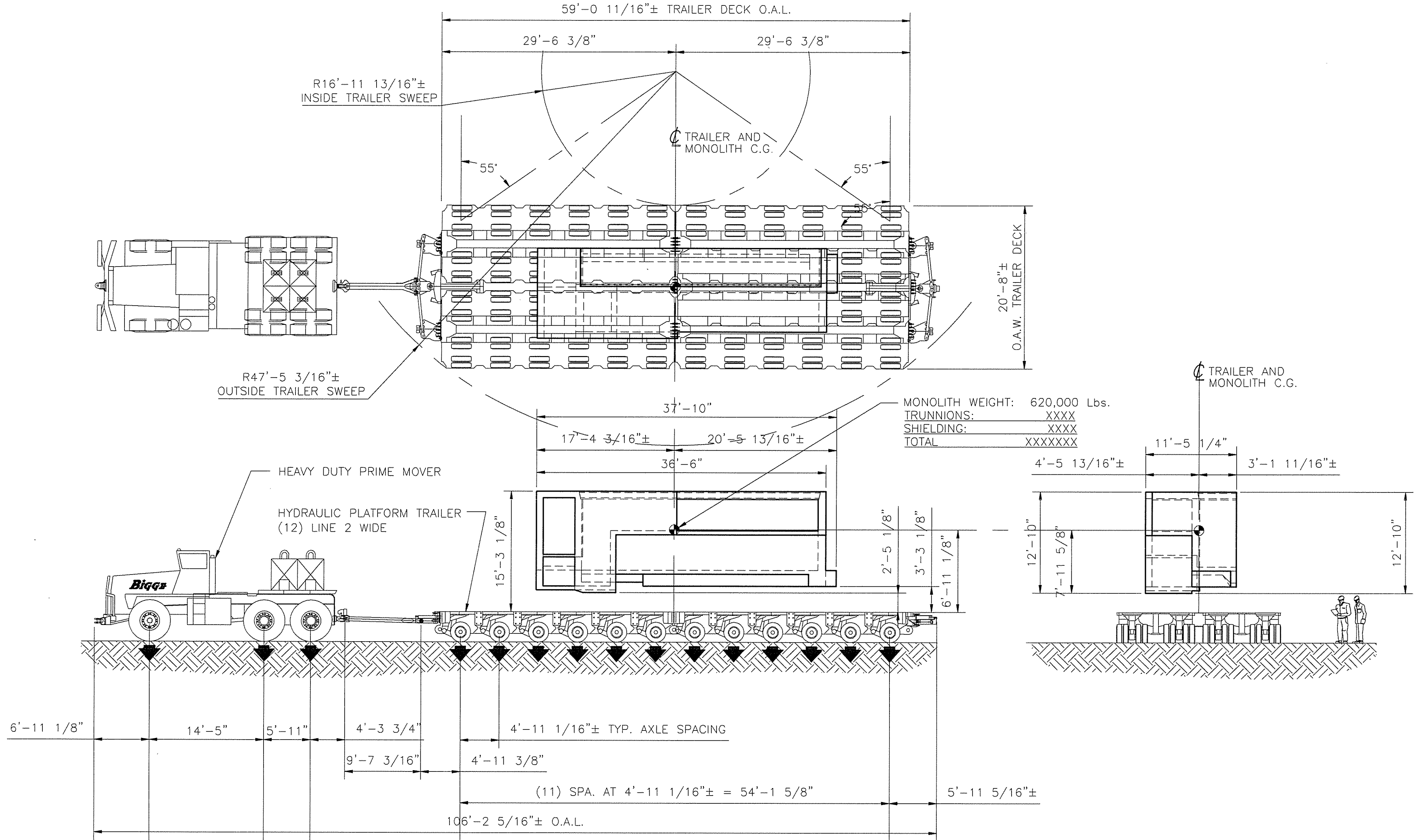
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M11D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M11F	A



AXLE No.	1	2	3	4 – 15
No. TIRES/AXLE	2	4	4	16
WIDTH	11'-9"	12'-7"	12-7"	20'-8"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./AXLE				XXX Lbs. (TOTAL TIRES = 192)

TRAILER DATA

NET WGT.:	145,400 Lbs.	MAX.
TARE WGT.:	XXX Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

A–FRAME
MONOLITH 11
ELEVATION VIEW (– / M11F)

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
A-FRAME TRANSPORT ARRANGEMENT

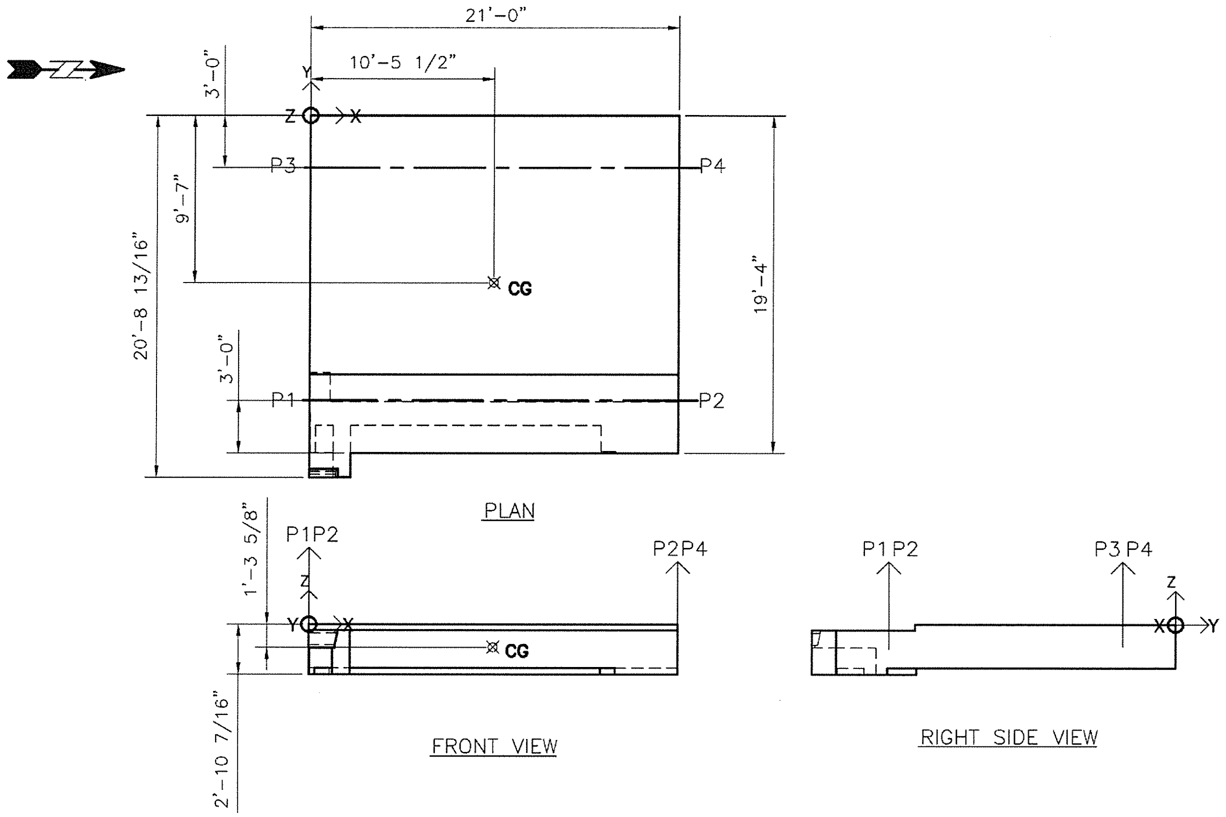
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M11F.DWG

TASK	DRAWING NO.	REV. NO.
	M11F	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
____-__-____	A



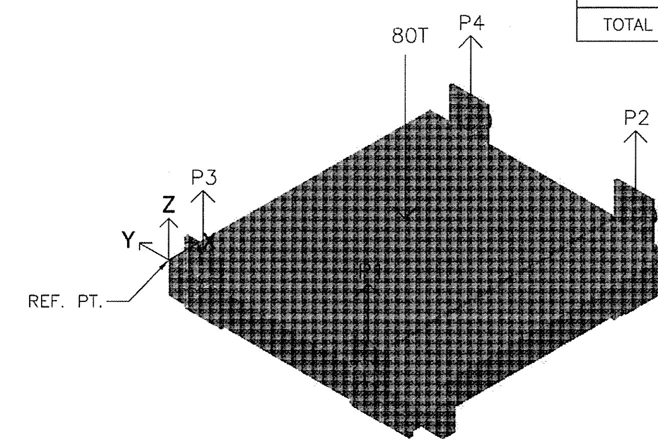
SCALE: 3/16" = 1'-0"

AIRLOCK SLAB
MONOLITH NO. 12

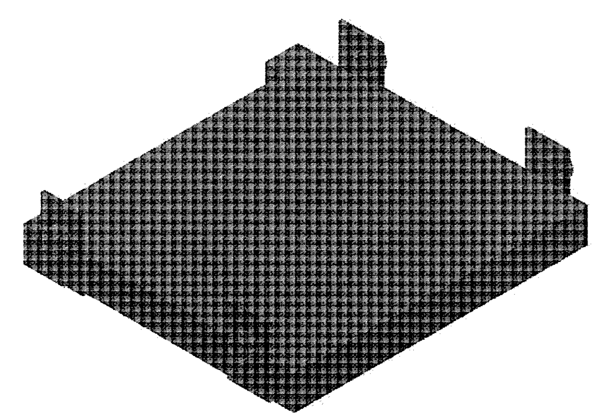
EST. WEIGHT: 80 TON

CENTROID: **X: 125.6 IN**
Y: −115.1 IN
Z: −15.7 IN

P1	19.9
P2	19.8
P3	20.2
P4	20.1
TOTAL	80T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

Dedicated River Corridor Closure Contract Excellence

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

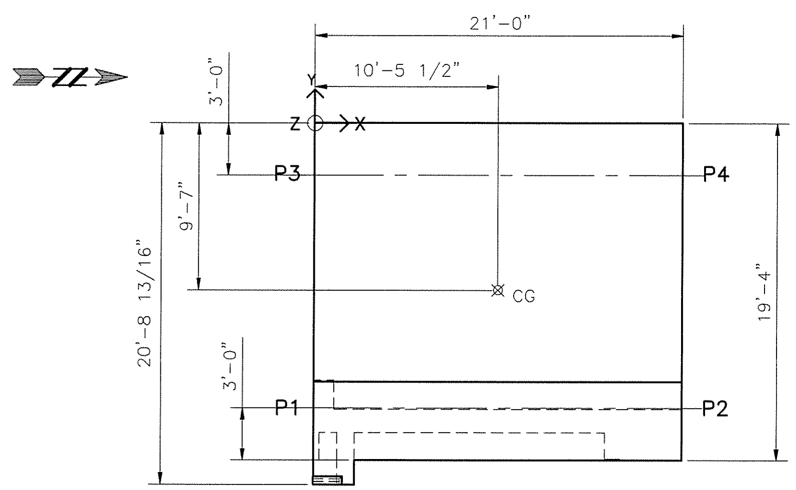
DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
AIRLOCK SLAB DETAIL PLAN/ISOMETRIC VIEW

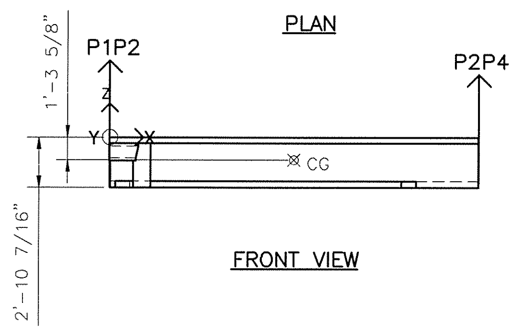
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

TASK	DRAWING NO.	REV. NO.
_	M12A	A

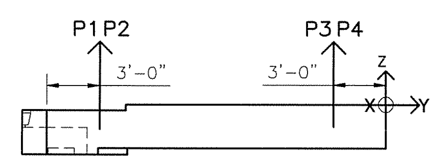
DRAWING NO.	REV. NO.
XX	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

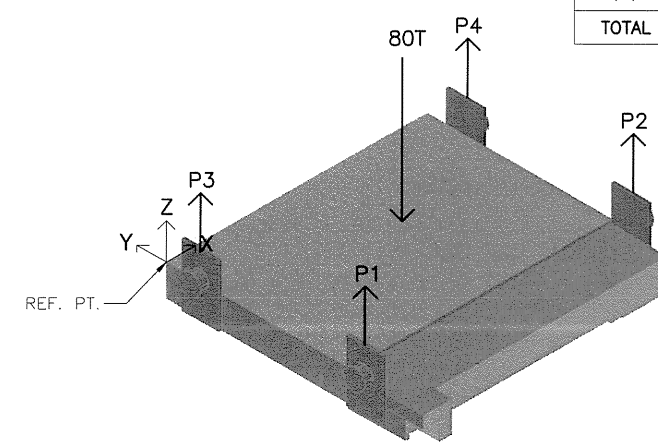
SCALE: 3/16" = 1'-0"

AIRLOCK SLAB
MONOLITH NO. 12

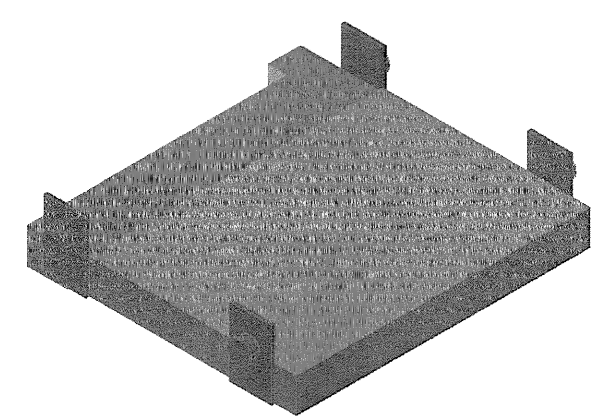
EST. WEIGHT: 80 TON

CENTROID: X: 125.6 IN
Y: −115.1 IN
Z: −15.7 IN

P1	19.9
P2	19.8
P3	20.2
P4	20.1
TOTAL	80T



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"



ISOMETRIC VIEW
SCALE: 3/16" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ARRAGEMENT
AIRLOCK SLAB DETAIL PLAN/ISOMETRIC VIEW

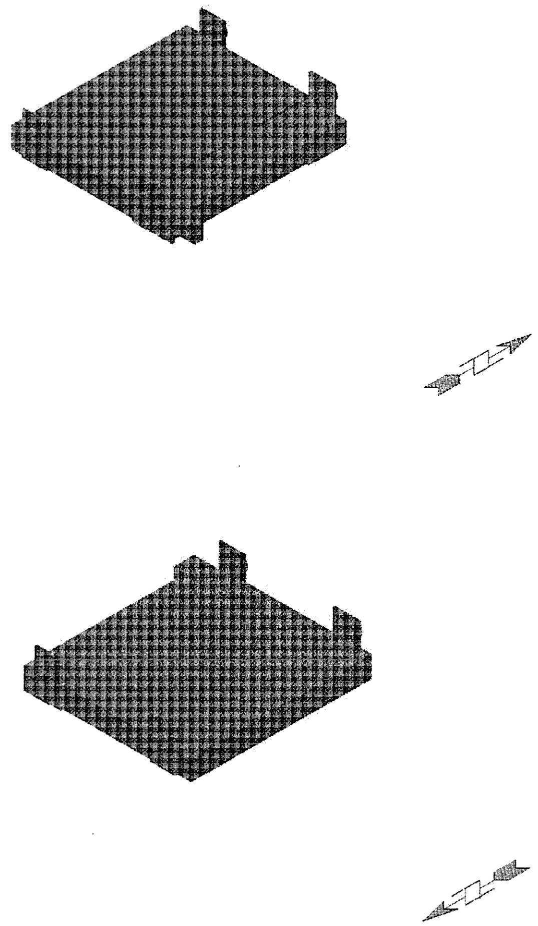
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M12B	A

RECORD INFORMATION

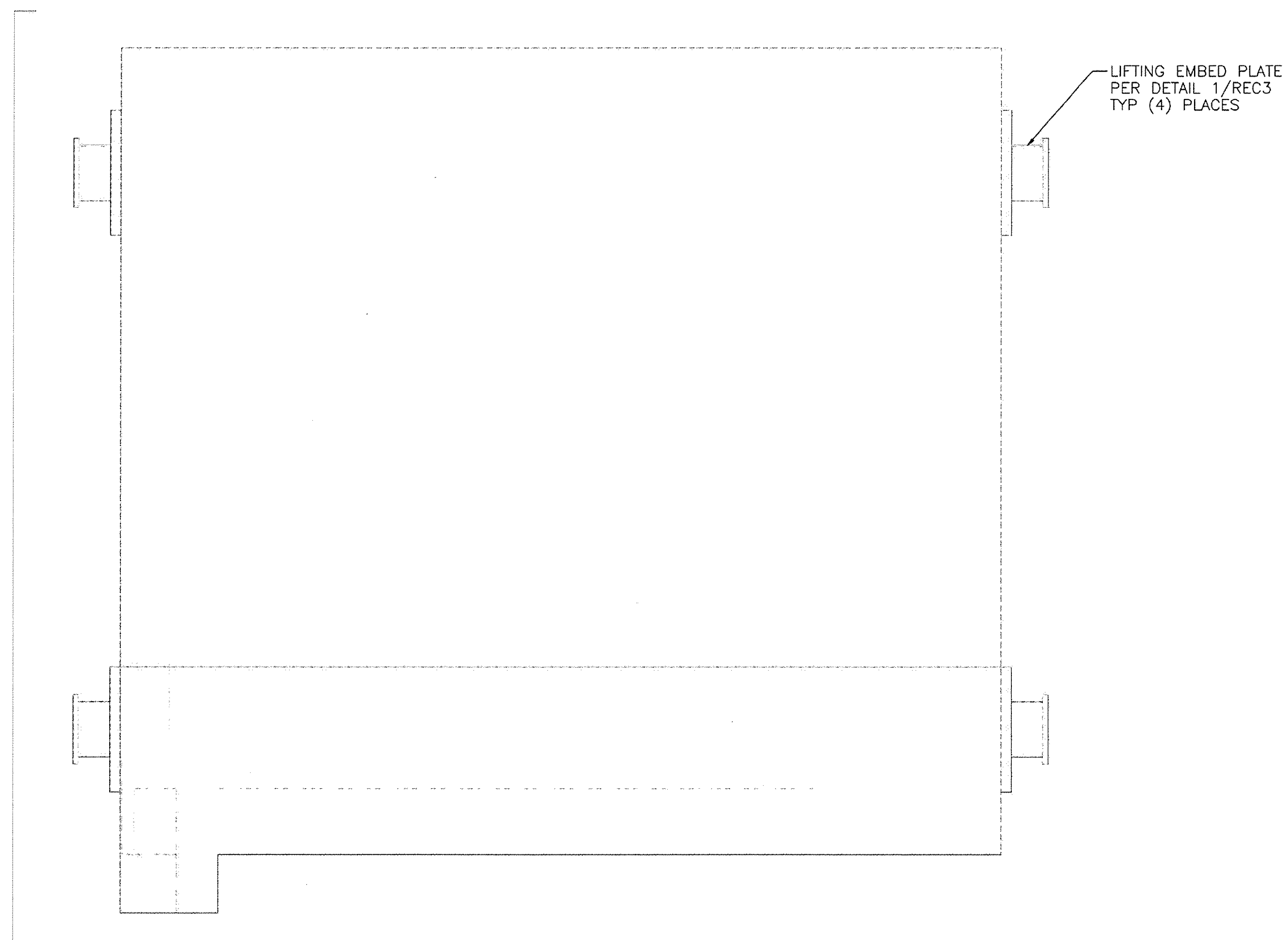
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M12C — ISOMETRIC VIEWS – MONOLITH 12

SCALE: NONE



2 / M12C — PLAN – MONOLITH 12

SCALE: 1/2"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK SLAB – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M12C	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

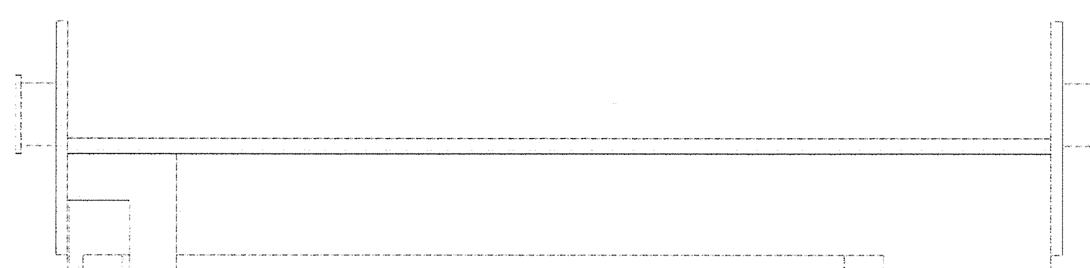
River Corridor Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES

1 / M12C1 SOUTH ELEVATION – MONOLITH 12

SCALE: 1/2"=1'-0"



2 / M12C1 EAST ELEVATION – MONOLITH 12

SCALE: 1/2"=1'-0"

River Corridor Closure Contract — Dedicated WCH Excellence

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK SLAB – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

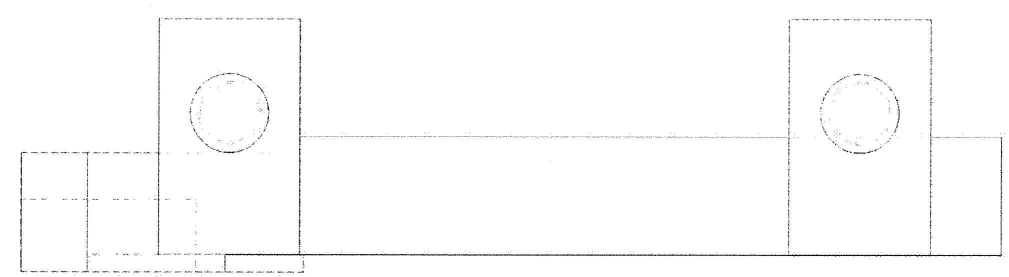
TASK	DRAWING NO.	REV. NO.
–	M12C1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

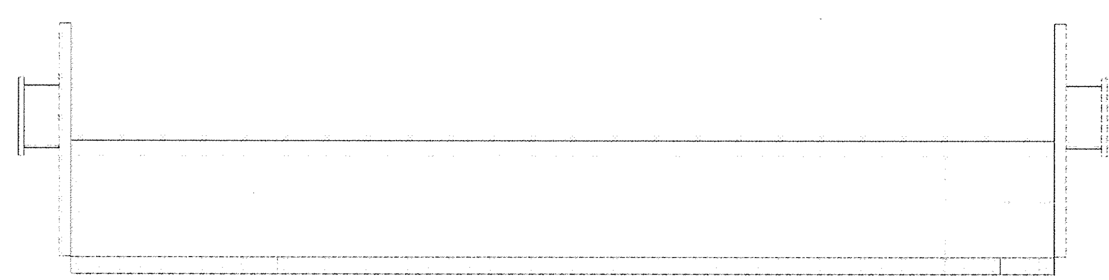
DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 / M12C2 NORTH ELEVATION – MONOLITH 12

SCALE: 1/2"=1'-0"



2 / M12C2 WEST ELEVATION – MONOLITH 12

SCALE: 1/2"=1'-0"

River Corridor Closure Contract — Dedicated WCH Excellence

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
REC MONOLITH LIFTING ATTACHMENTS
AIRLOCK SLAB – ELEVATION VIEWS

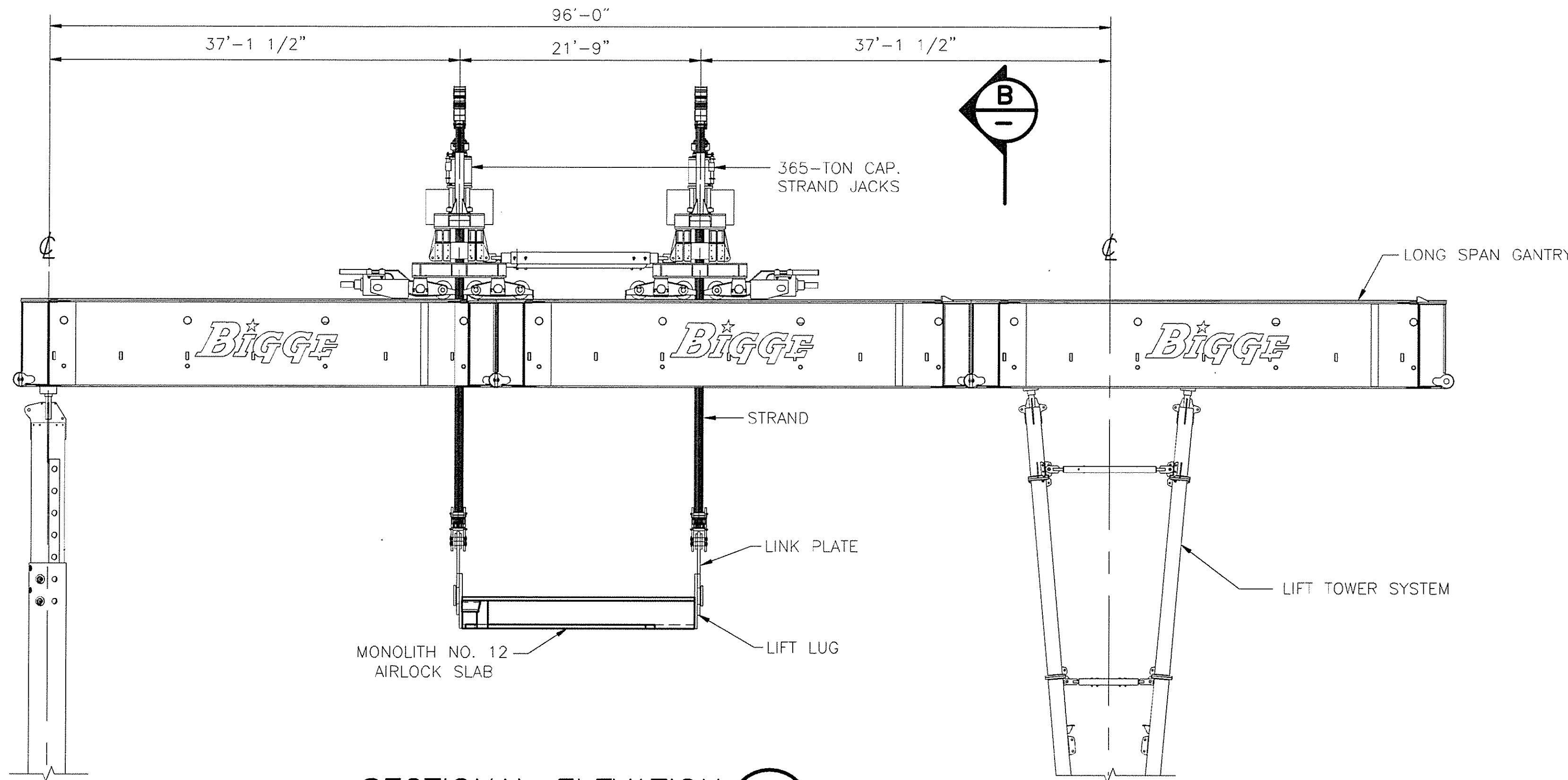
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M12C2	A

RECORD INFORMATION

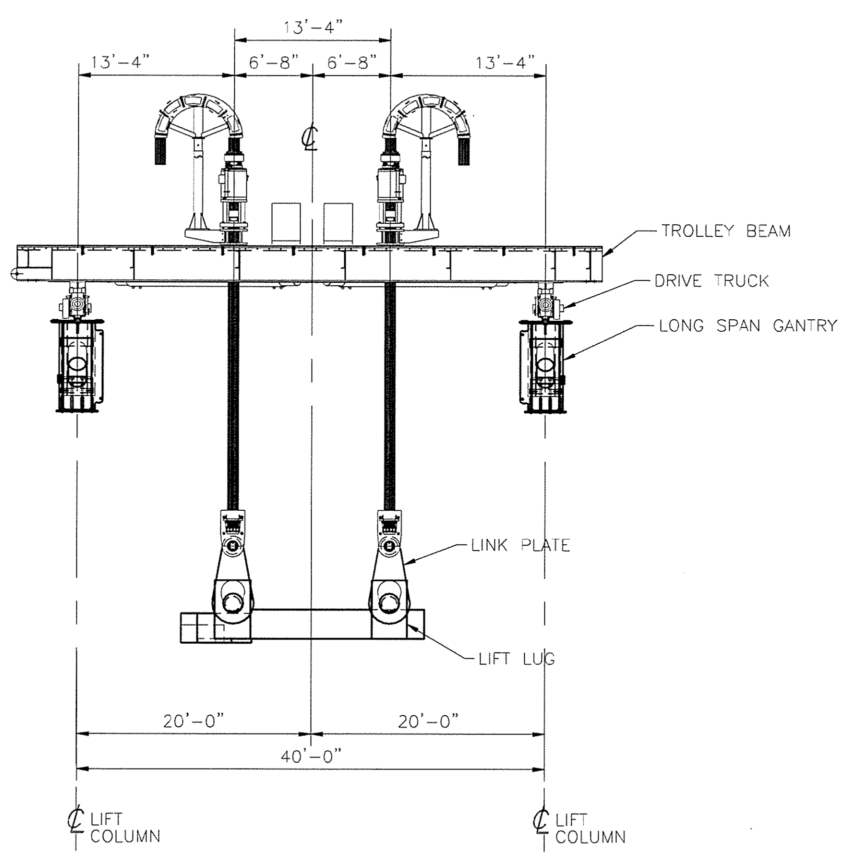
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

DRAWING NO.	REV. NO.
XX	A



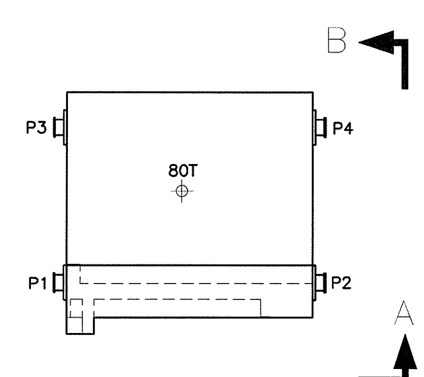
SECTIONAL ELEVATION (A / M12D)

1/8" = 1'-0"



SECTIONAL ELEVATION (B / M12D)

1/8" = 1'-0"



PLAN

MONOLITH NO. 12 AIRLOCK SLAB

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ. ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
AIRLOCK SLAB SECTIONAL ELEVATIONS

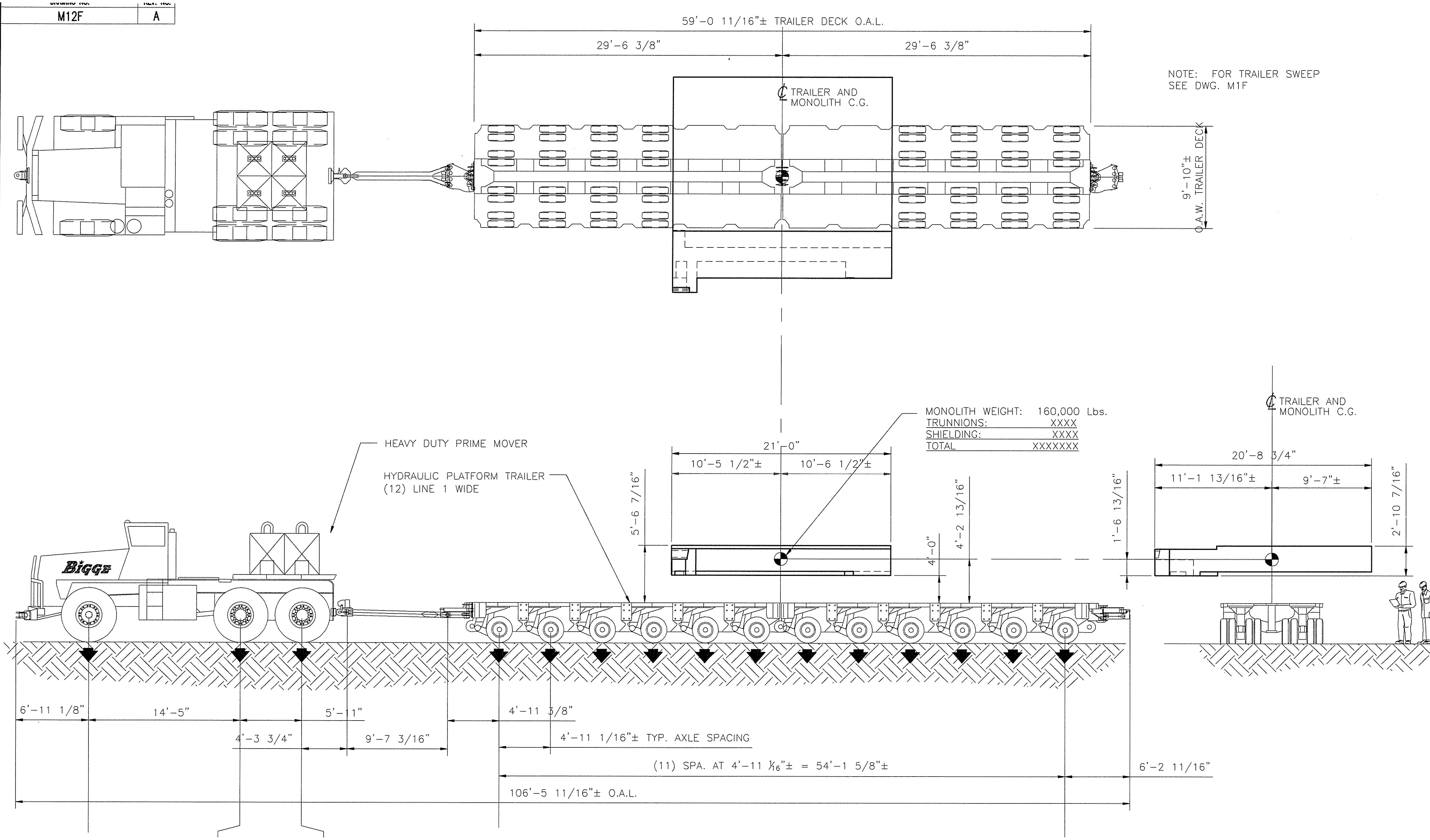
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M12D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M12F	A



AXLE No.	1	2	3	4 – 15
No. TIRES/AXLE	2	4	4	8
WIDTH	11'-9"	12'-7"	12-7"	9'-10"
	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	
GROSS WT./AXLE				XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 96)

NOTE: FOR TRAILER SWEEP SEE DWG. M1F

AIR LOCK SLAB
MONOLITH 12
ELEVATION VIEW — / M12F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	145,400 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/16" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

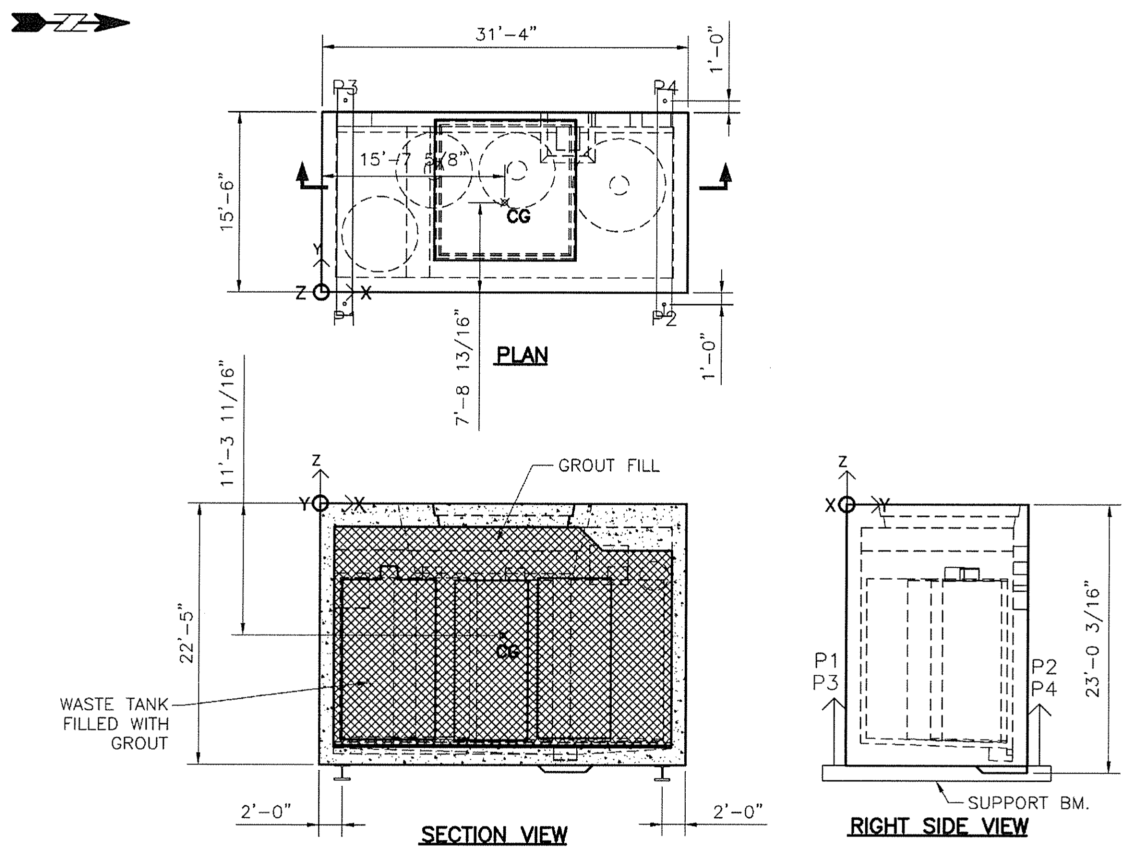
BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
AIR LOCK SLAB TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M12F.DWG

TASK	DRAWING NO.	REV. NO.
	M12F	A

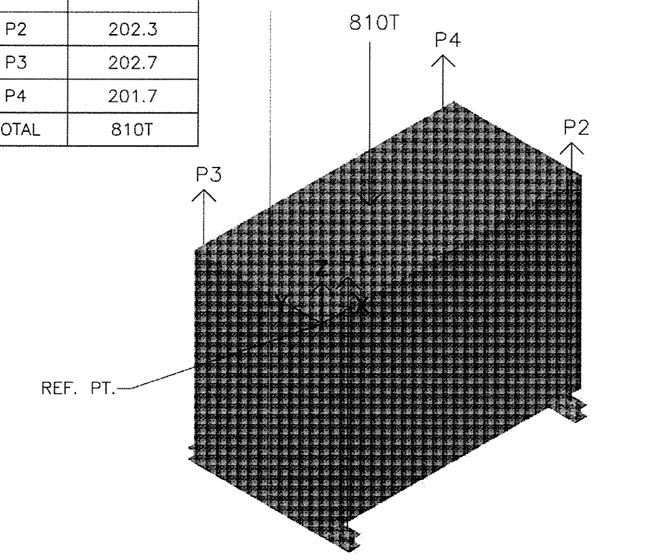
G:\Engineeri...\Jobs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F-...30% Submit.dwg

DRAWING NO.	REV. NO.
_-_-_	A

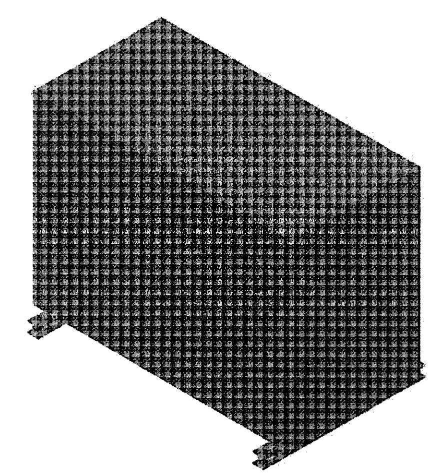


SCALE: 1/8" = 1'-0"

P1	203.3
P2	202.3
P3	202.7
P4	201.7
TOTAL	810T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

LLV
MONOLITH NO. 13

EST. WEIGHT: 810 TON

CENTROID: X: 187.6 IN
Y: 92.8 IN
Z: -135.7 IN

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
LLV MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
LLV DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

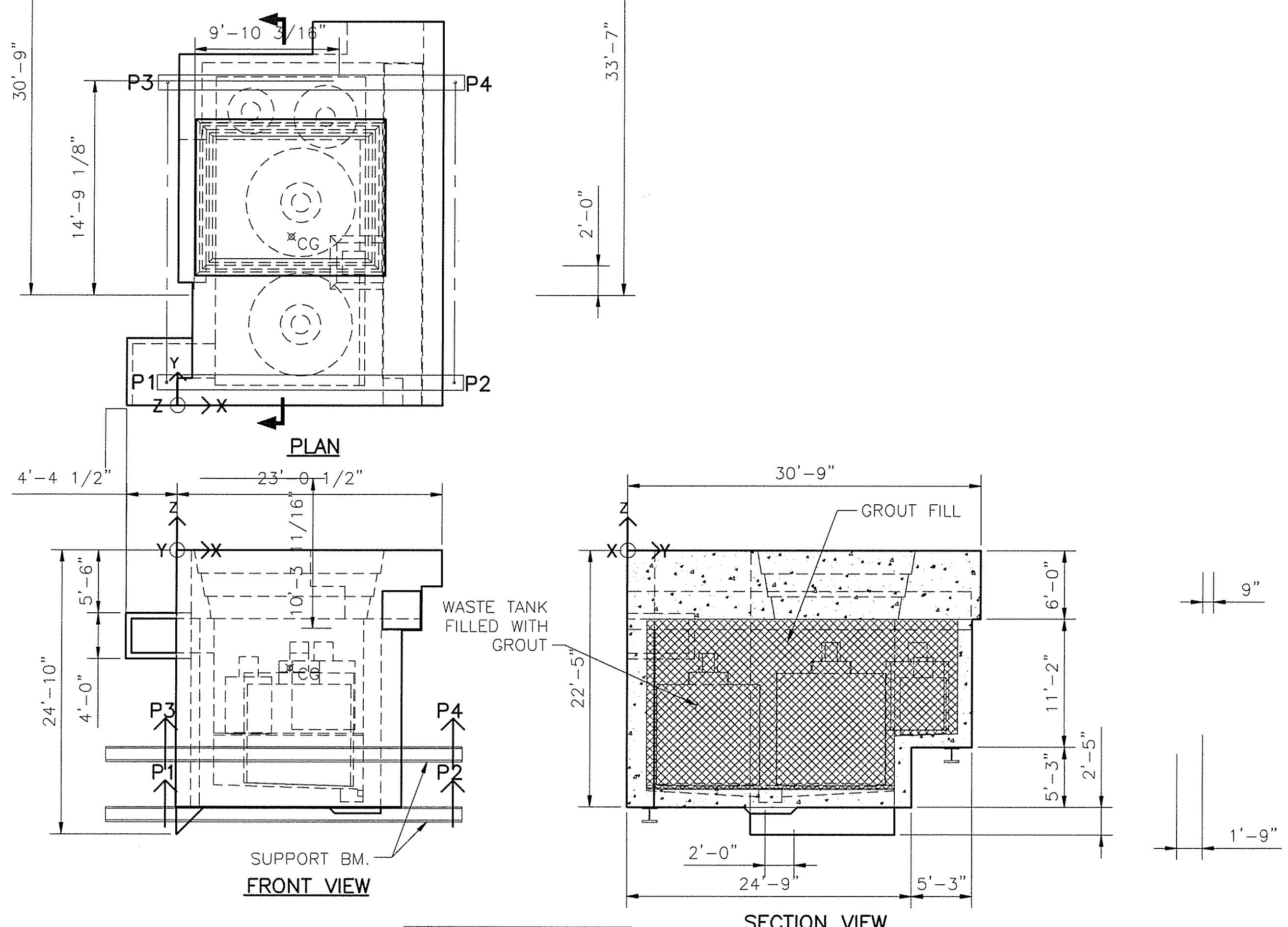
TASK	DRAWING NO.	REV. NO.
–	M13A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_	324	___

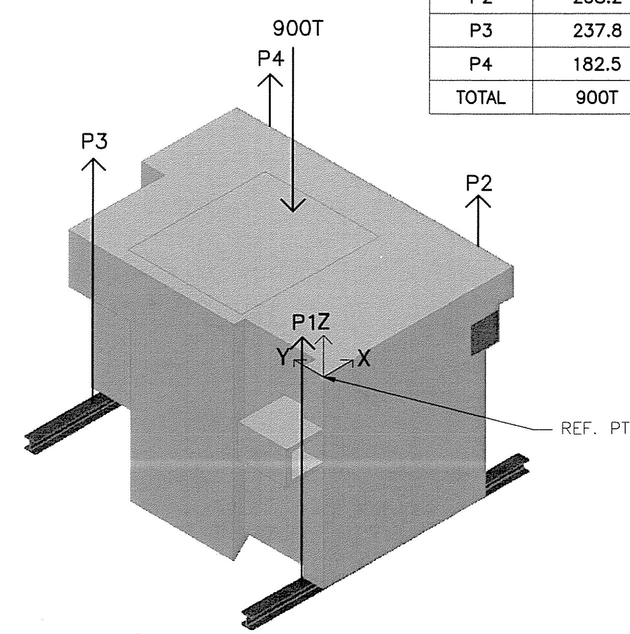
River Corridor Closure Contract
Dedicated WCH Excellence

DRAWING NO.	REV. NO.
XX	A

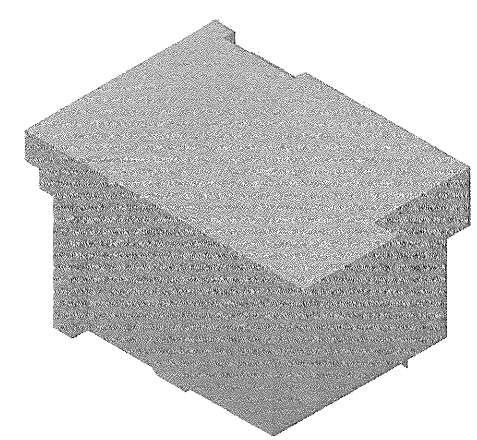


SCALE: 1/8" = 1'-0"

P1	271.5
P2	208.2
P3	237.8
P4	182.5
TOTAL	900T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

HLV
MONOLITH NO. 13

EST. WEIGHT: 900 TON

CENTROID: X: 11.8 IN
Y: 177.1 IN
Z: -123.7 IN

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
△								
△								
△								
△								
A	5/20/10	PRELIMINARY	XX		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
HLV MONOLITH LIFTING ARRAGEMENT
HLV DETAIL PLAN/ISOMETRIC VIEW

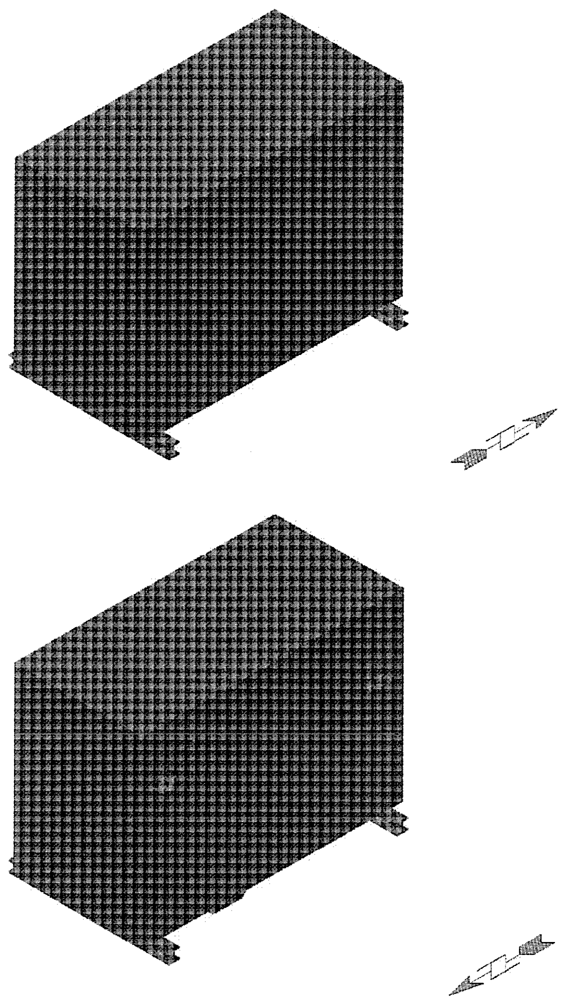
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M13B	A

RECORD INFORMATION

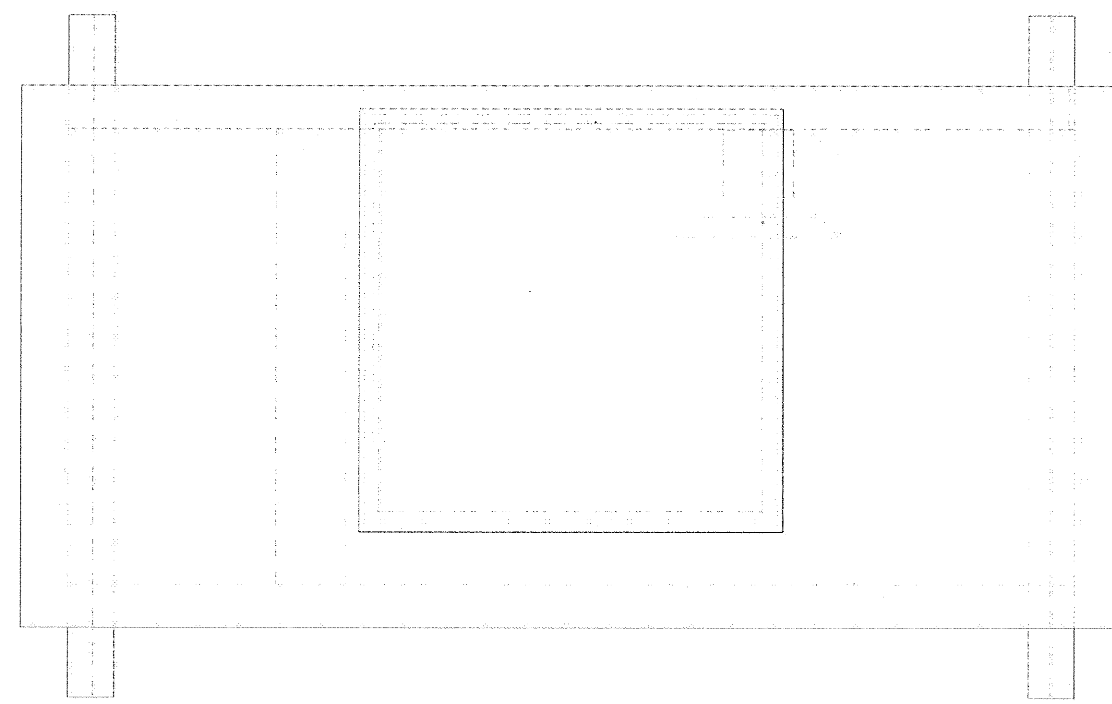
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M13C ISOMETRIC VIEWS – LLV MONOLITH 13

SCALE: NONE



2 / M13C PLAN – LLV MONOLITH 13

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
LLV MONOLITH LIFTING ATTACHMENTS
LLV – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

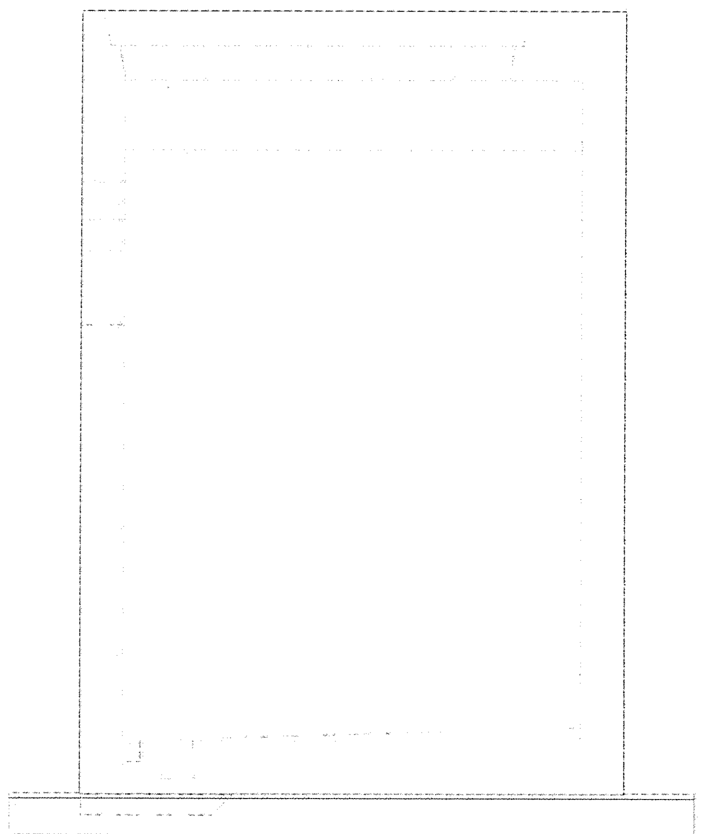
TASK	DRAWING NO.	REV. NO.
–	M13C	A

RECORD INFORMATION

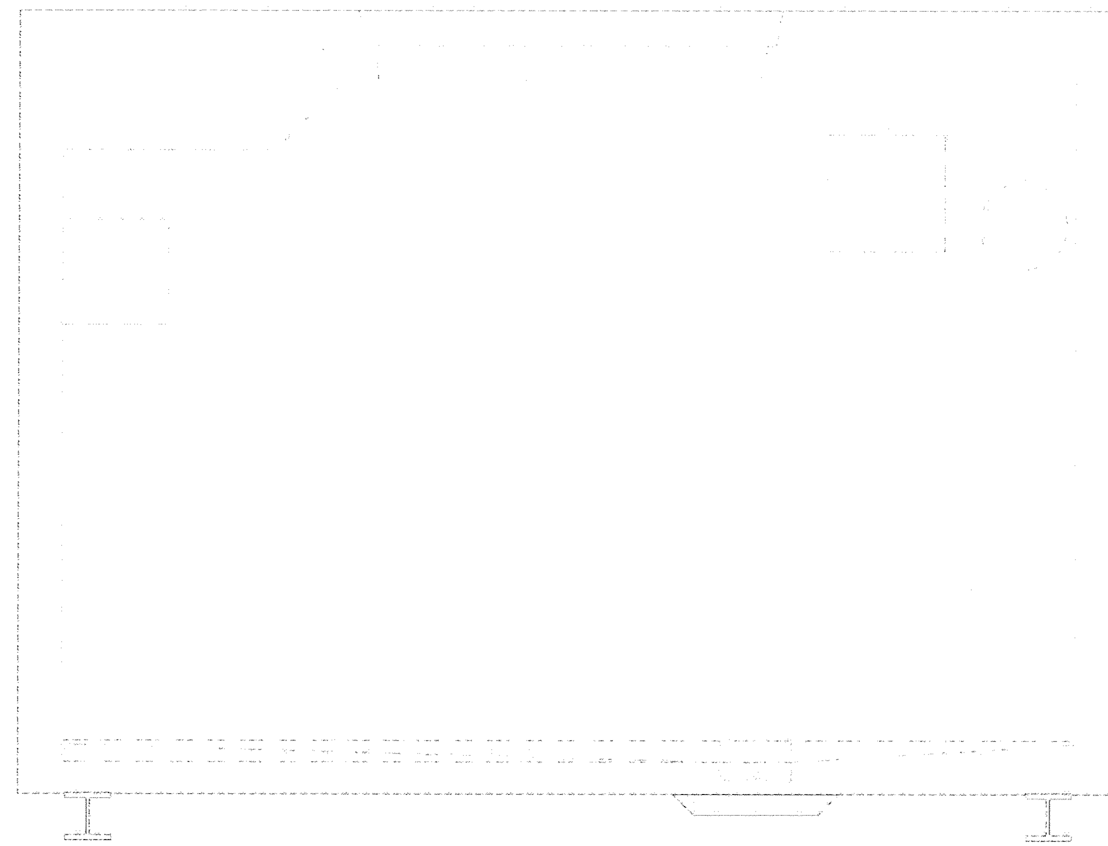
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M13C1 SOUTH ELEVATION – LLV MONOLITH 13
SCALE: 3/8"=1'-0"



2 / M13C1 EAST ELEVATION – LLV MONOLITH 13
SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE.

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
LLV MONOLITH LIFTING ATTACHMENTS
LLV – ELEVATION VIEWS

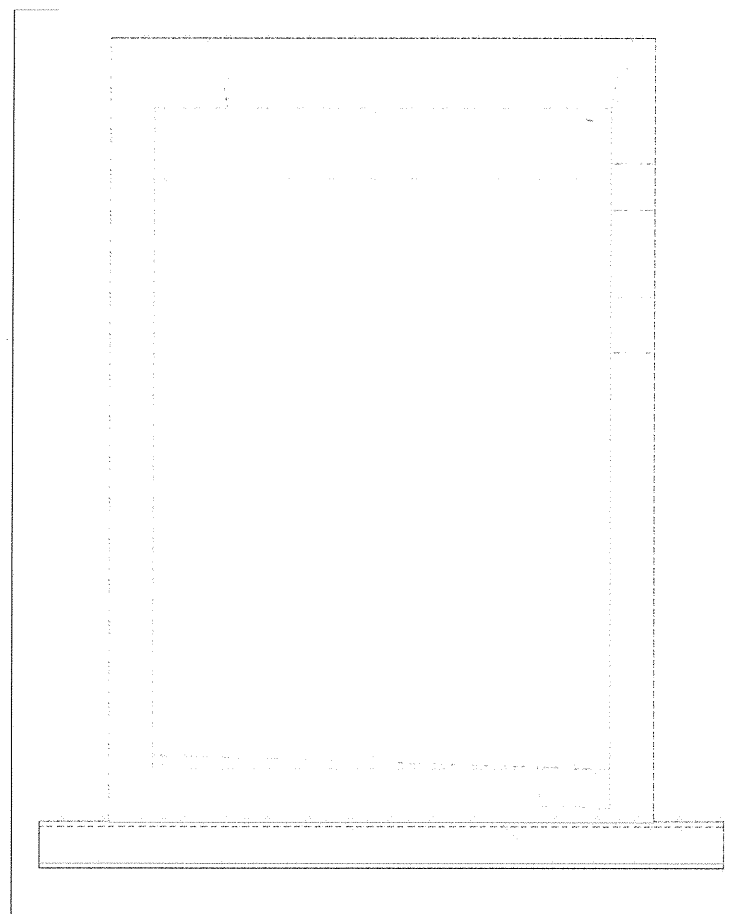
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M13C1	A

RECORD INFORMATION

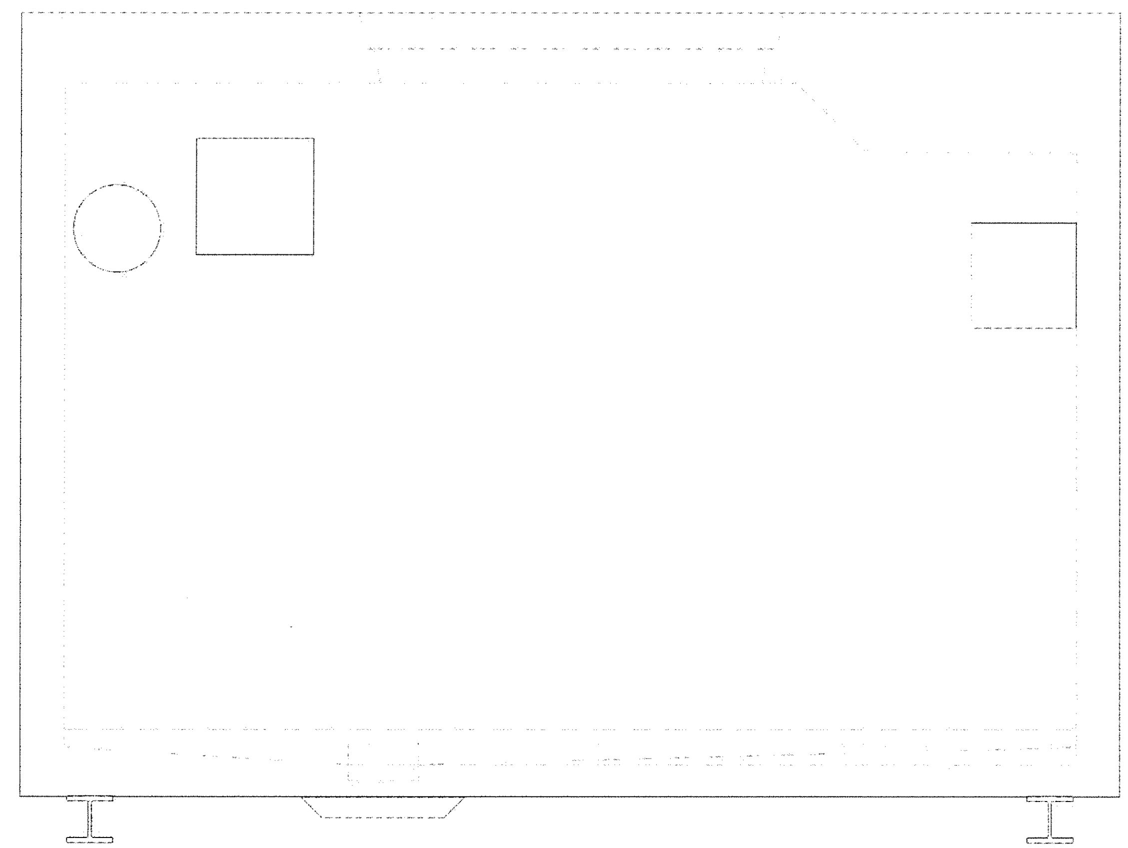
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M13C2 NORTH ELEVATION – LLV MONOLITH 13

SCALE: 3/8"=1'-0"



2 / M13C2 WEST ELEVATION – LLV MONOLITH 13

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
LLV MONOLITH LIFTING ATTACHMENTS
LLV – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

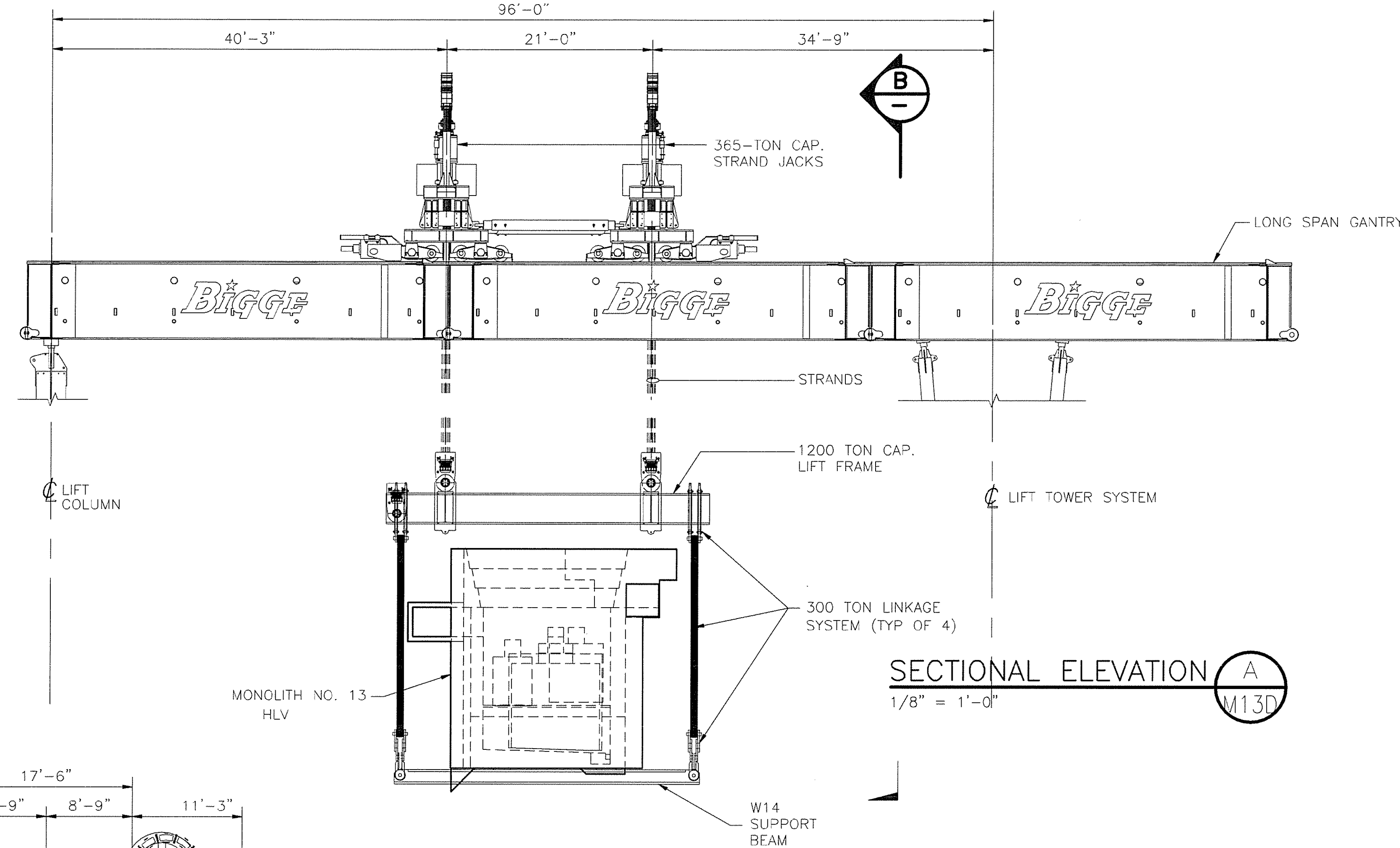
TASK	DRAWING NO.	REV. NO.
_	M13C2	A

RECORD INFORMATION

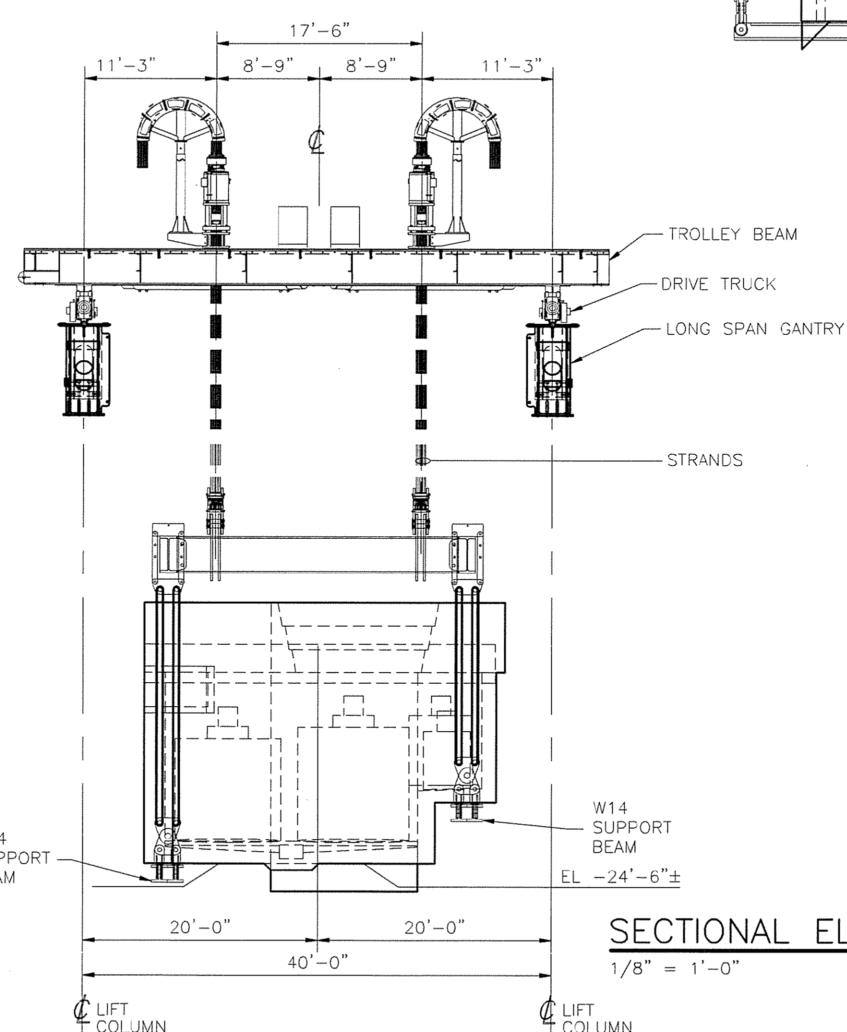
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract
Dedicated to Excellence

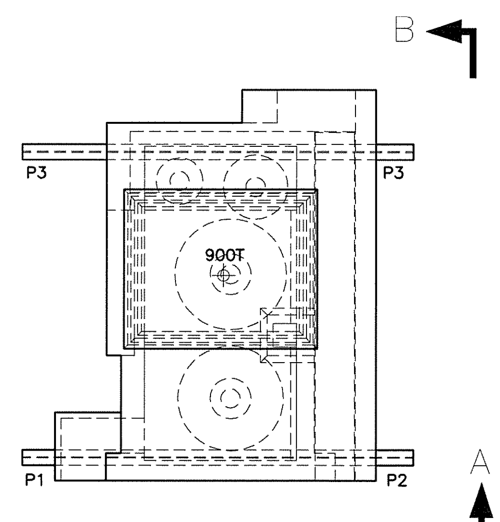
DRAWING NO.	REV. NO.
XX	A



SECTIONAL ELEVATION (A / M13D)
1/8" = 1'-0"



SECTIONAL ELEVATION (B / M13D)
1/8" = 1'-0"



PLAN
MONOLITH NO. 13
HLV

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
HLV SECTIONAL ELEVATIONS

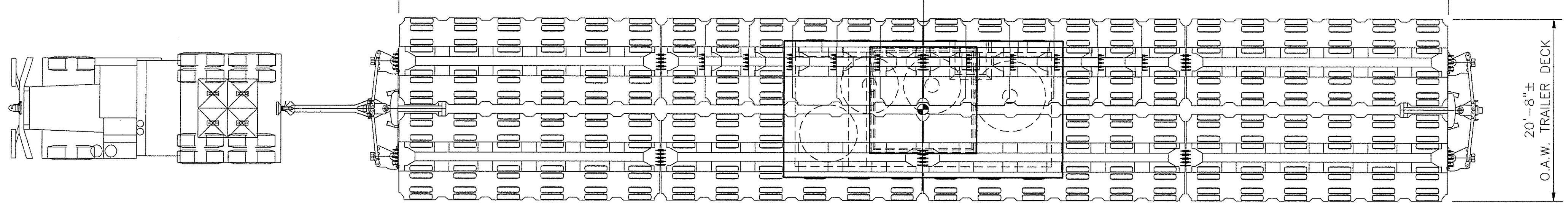
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M13D	A

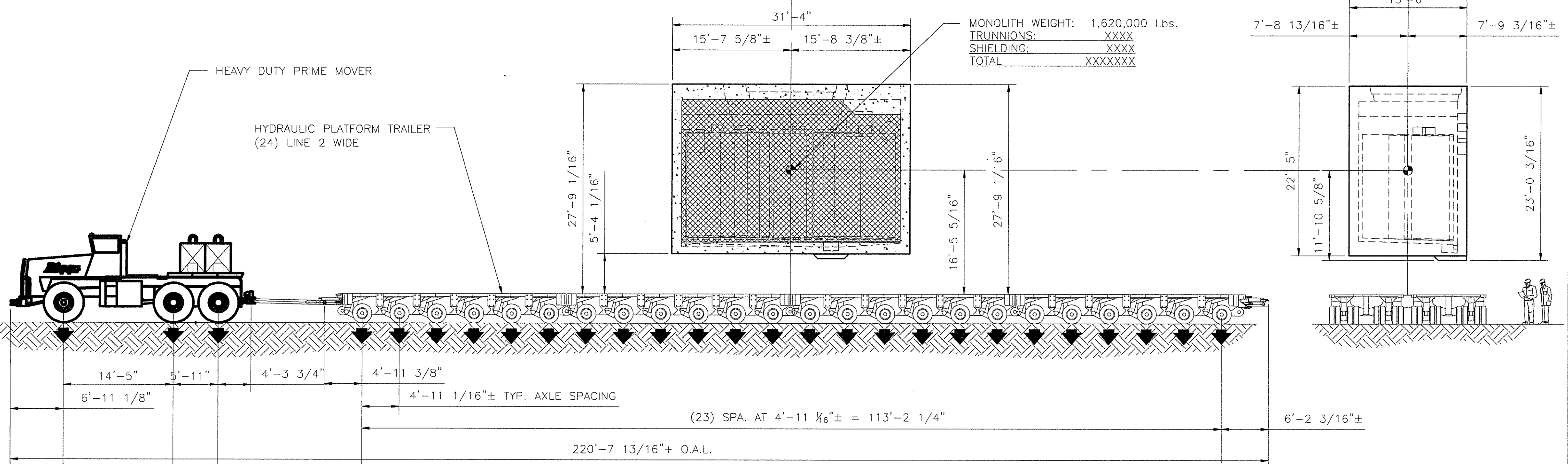
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M13F	A



NOTE: FOR TRAILER SWEEP SEE DWG. M8F



AXLE No.	1	2	3	4 – 27
No. TIRES/AXLE	2	4	4	16
WIDTH	11'-9"	12'-7"	12-7"	20'-8"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 384)

HLV
MONOLITH 13
ELEVATION VIEW – / M13F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	348,960 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
HLV TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M13F.DWG

TASK	DRAWING NO.	REV. NO.
	M13F	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

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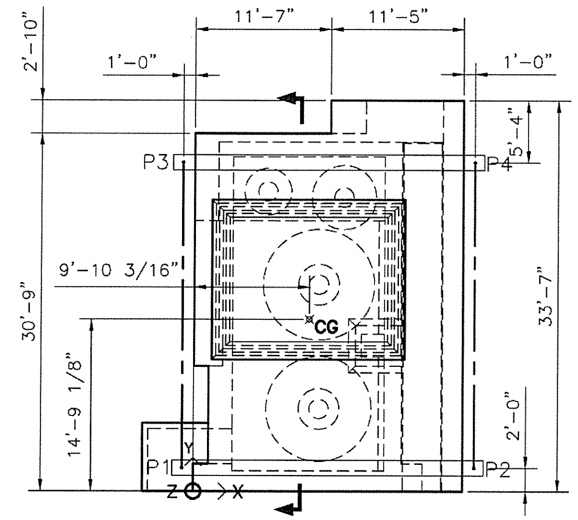
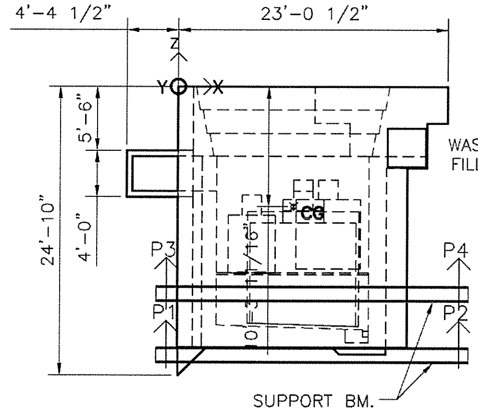
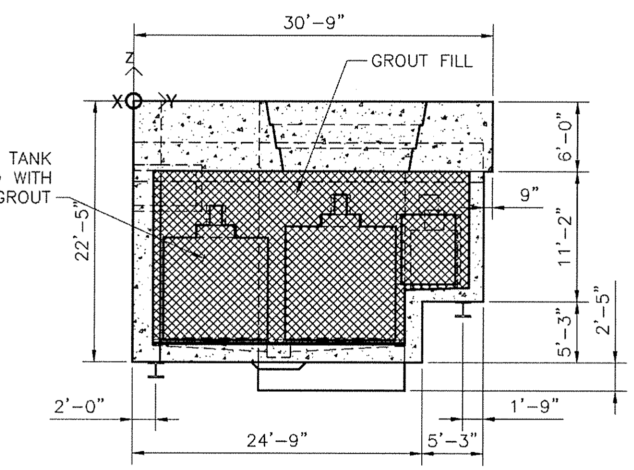
DRAWING NO.	REV. NO.
_____-__-______	A



PLAN



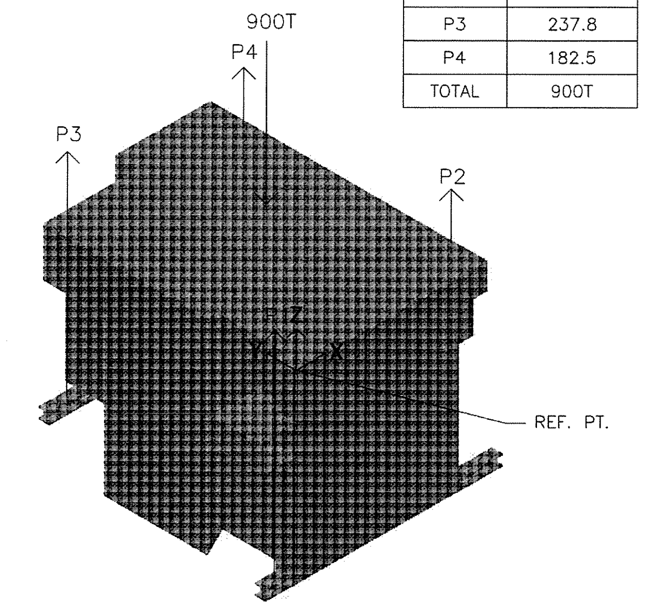
FRONT VIEW



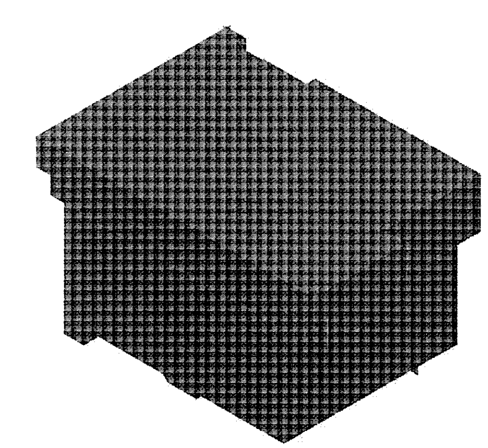
SECTION VIEW

SCALE: 1/8" = 1'-0"

P1	271.5
P2	208.2
P3	237.8
P4	182.5
TOTAL	900T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

HLV
MONOLITH NO. 14

EST. WEIGHT: 900 TON

CENTROID: X: 11.8 IN
Y: 177.1 IN
Z: −123.7 IN

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
HLV MONOLITH DIMENSION, WEIGHT, AND RAD INFORMATION
HLV DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	________.DWG

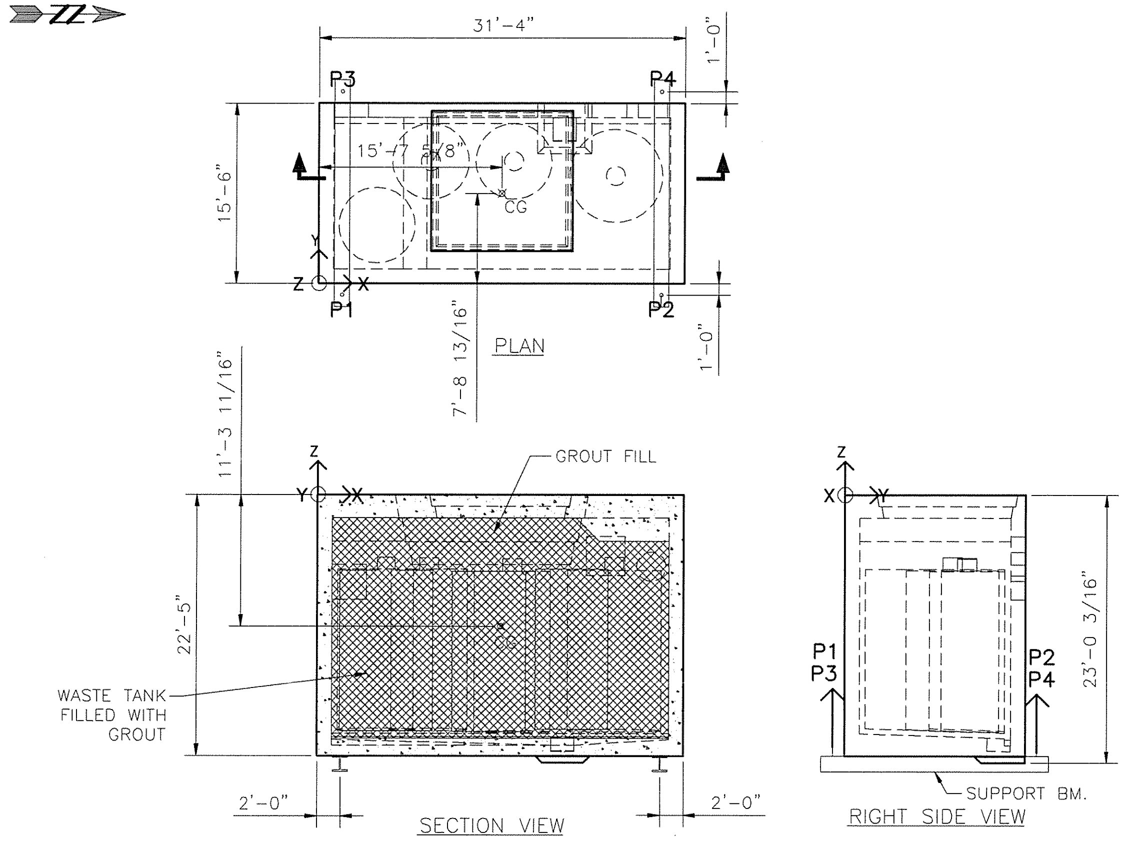
TASK	DRAWING NO.	REV. NO.
–	M14A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

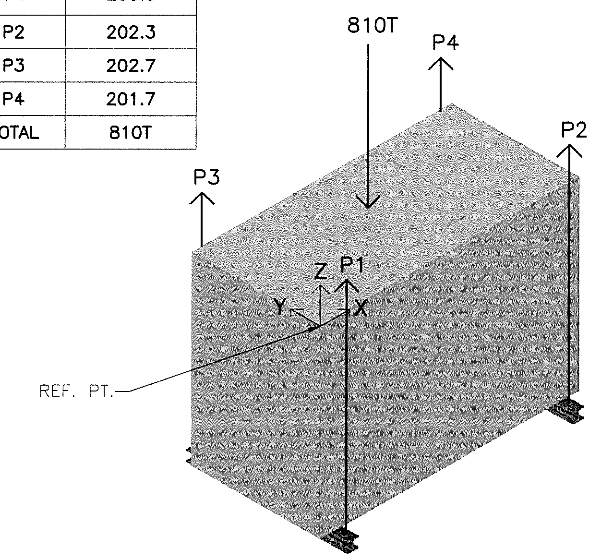
River Corridor Closure Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XX	A



SCALE: 1/8" = 1'-0"

P1	203.3
P2	202.3
P3	202.7
P4	201.7
TOTAL	810T

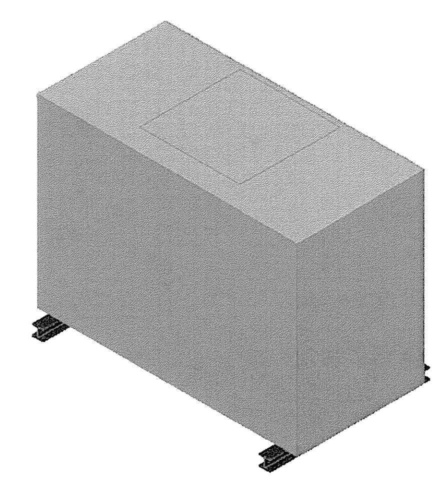


ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

LLV
MONOLITH NO. 14

EST. WEIGHT: 810 TON

CENTROID: X: 187.6 IN
Y: 92.8 IN
Z: -135.7 IN



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	5/20/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
LLV MONOLITH LIFTING ARRAGEMENT
LLV DETAIL PLAN/ISOMETRIC VIEW

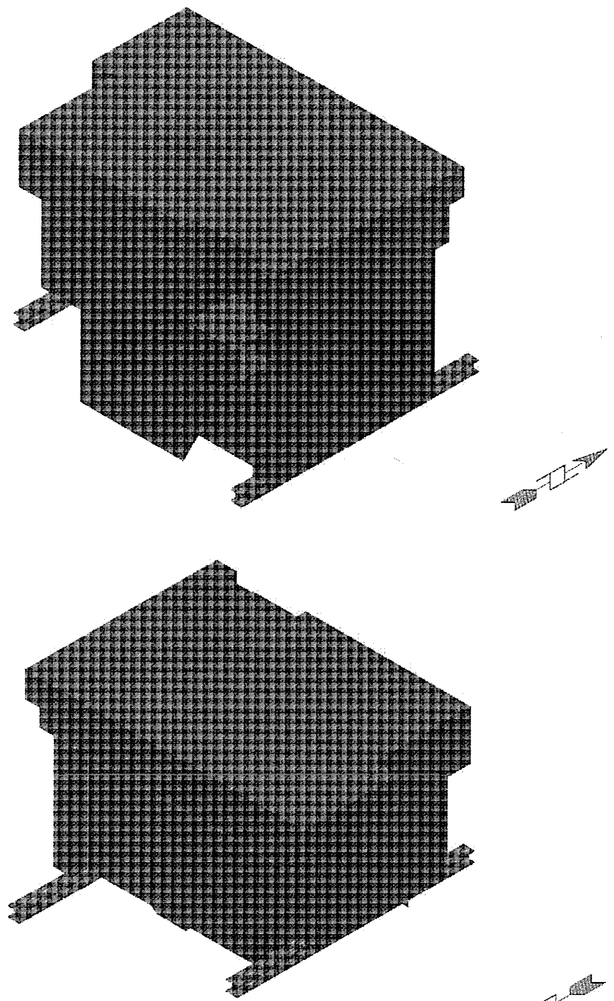
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M14B	A

RECORD INFORMATION

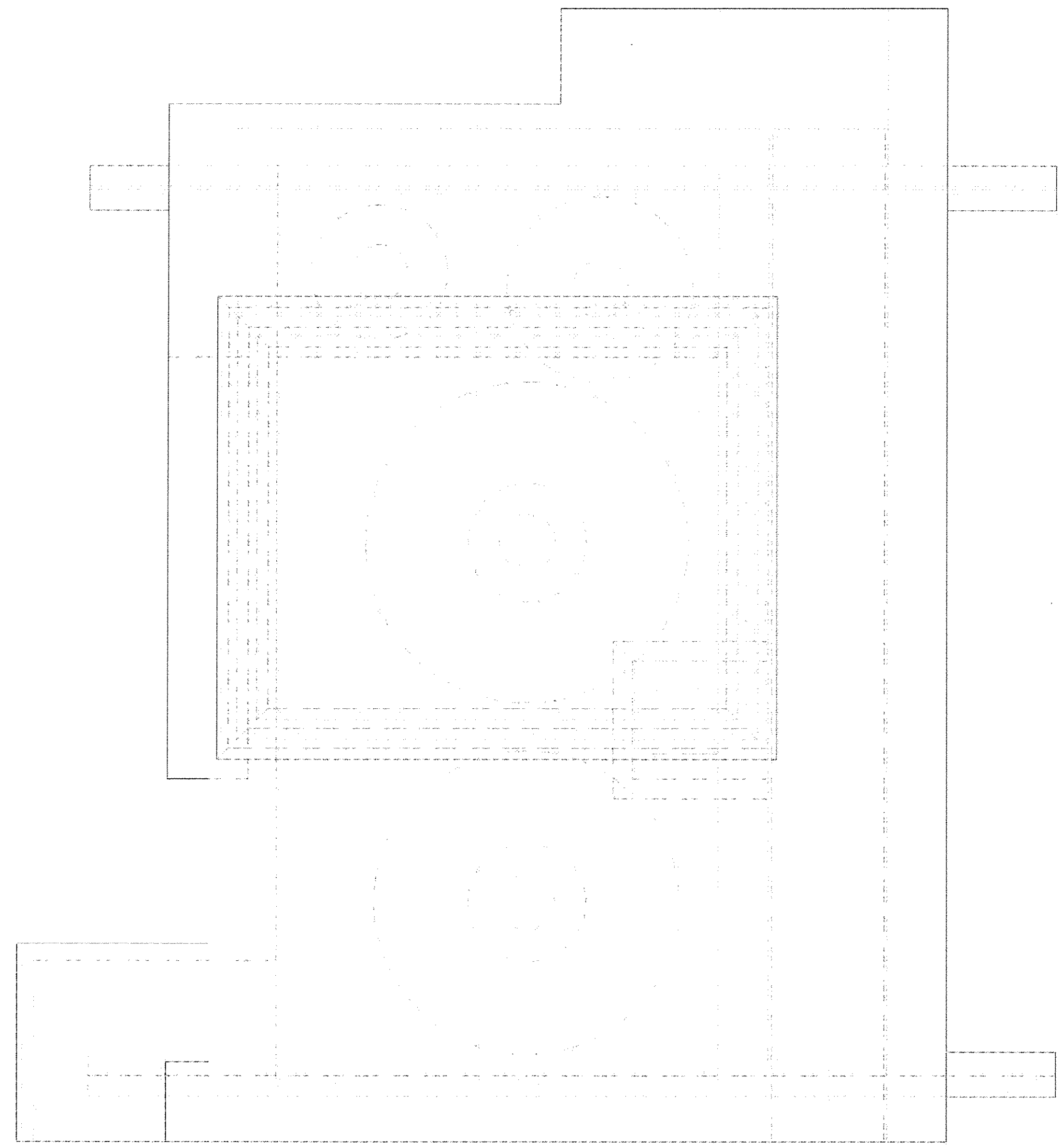
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M14C ISOMETRIC VIEWS – HLV MONOLITH 14

SCALE: NONE



2 / M14C PLAN – HLV MONOLITH 14

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
HLV MONOLITH LIFTING ATTACHMENTS
HLV – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

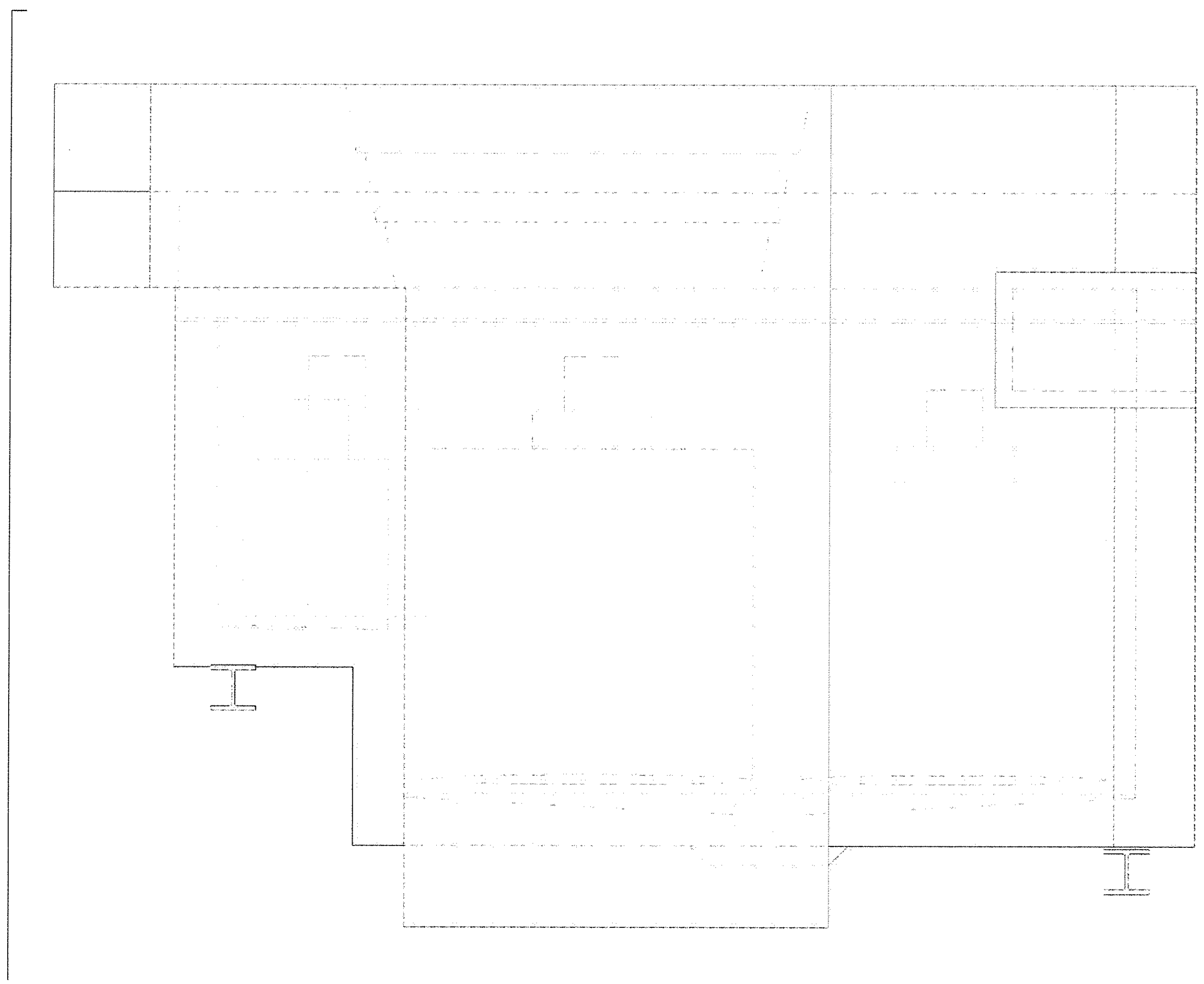
TASK	DRAWING NO.	REV. NO.
–	M14C	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M14C1 SOUTH ELEVATION – HLV MONOLITH 14

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
HLV MONOLITH LIFTING ATTACHMENTS
HLV – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

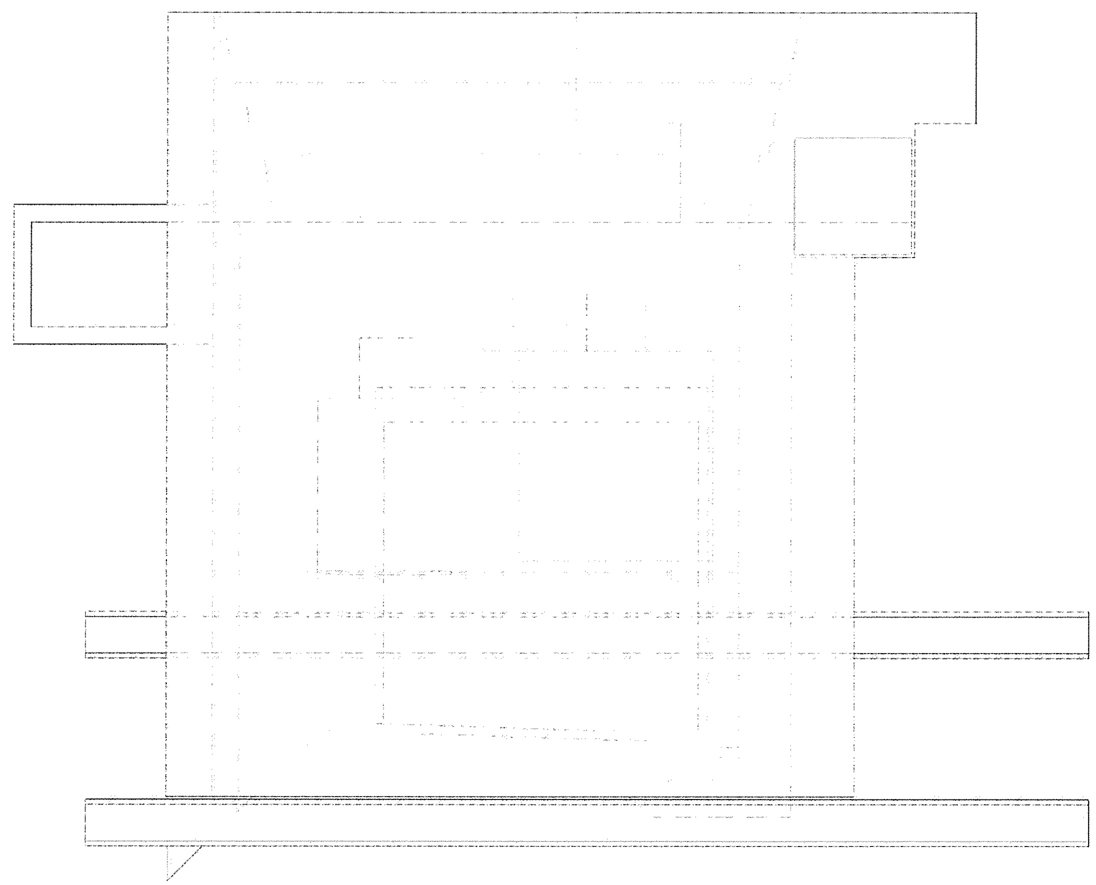
TASK	DRAWING NO.	REV. NO.
–	M14C1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M14C2 EAST ELEVATION – HLV MONOLITH 14

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
HLV MONOLITH LIFTING ATTACHMENTS
HLV – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

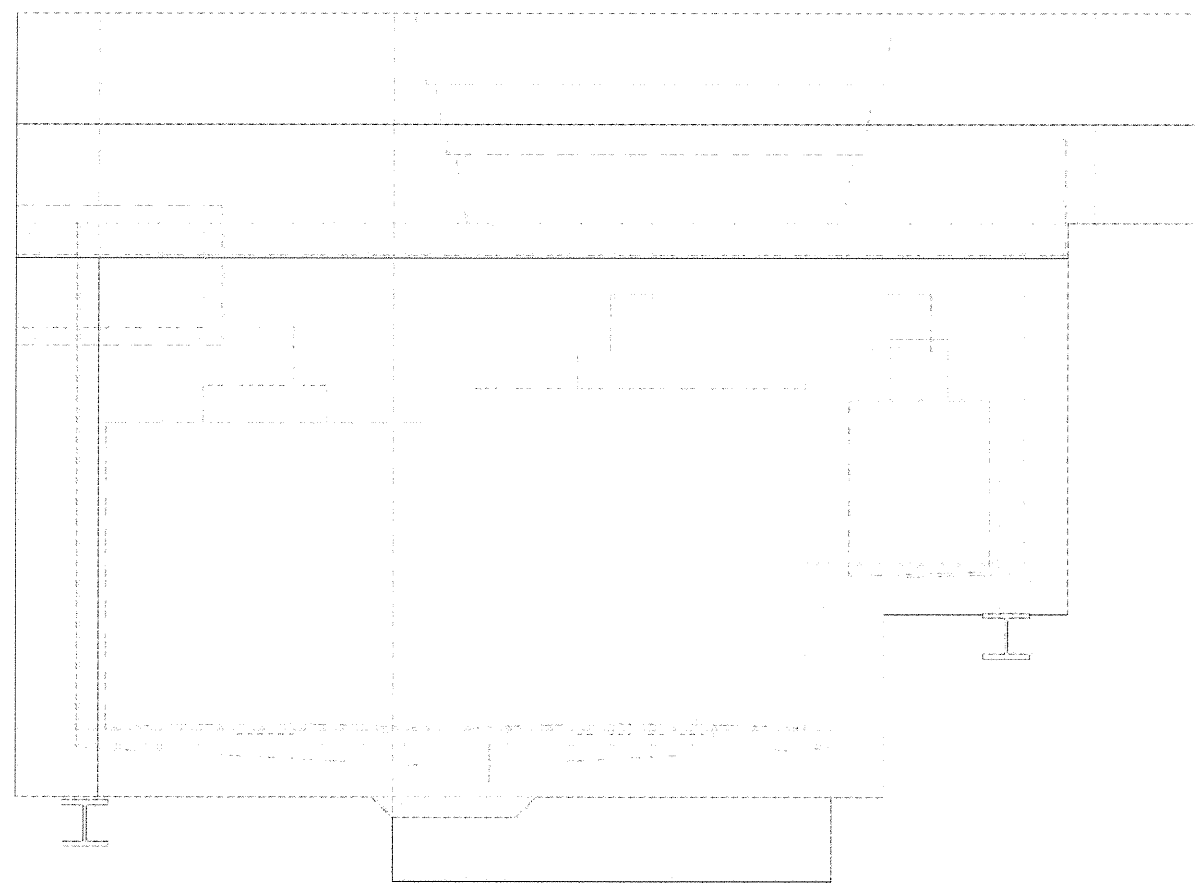
TASK	DRAWING NO.	REV. NO.
–	M14C2	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated WCH Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M14C3 — NORTH ELEVATION – HLV MONOLITH 14

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
HLV MONOLITH LIFTING ATTACHMENTS
HLV – ELEVATION VIEWS

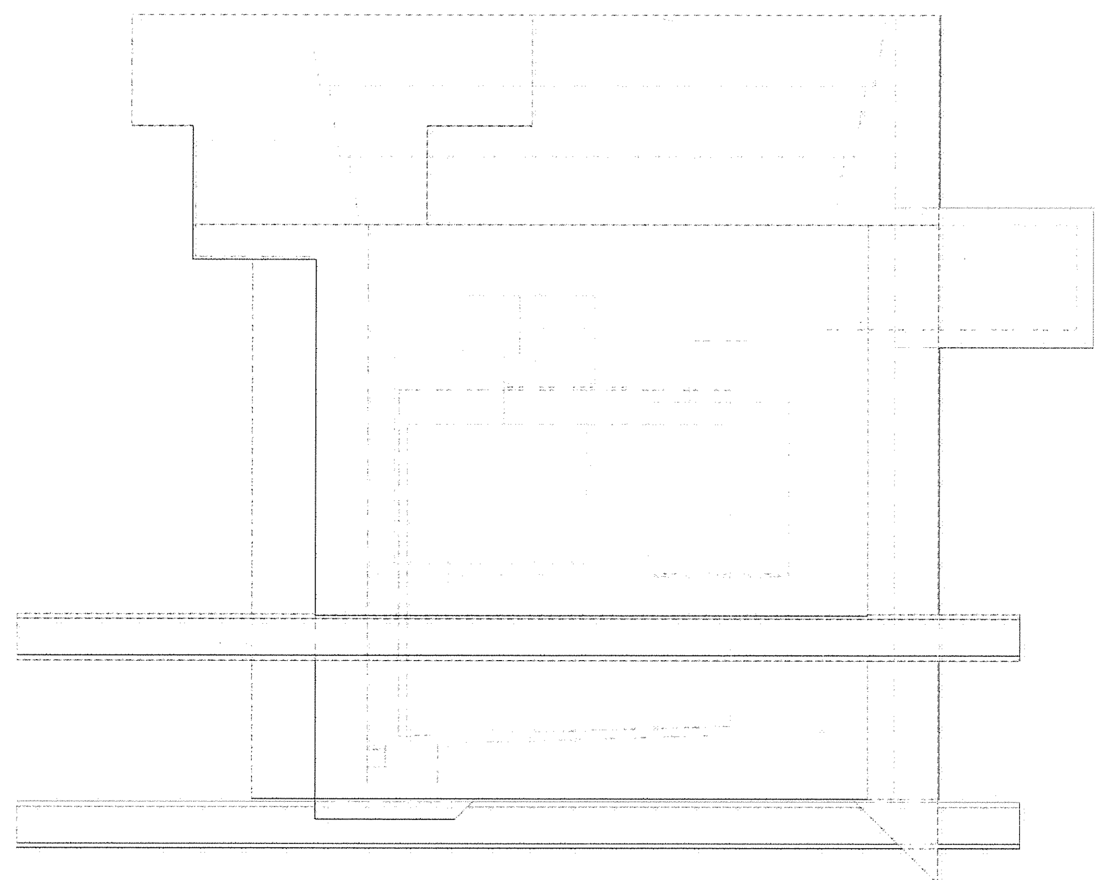
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M14C3	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M14C4 — WEST ELEVATION – HLV MONOLITH 14

SCALE: 3/8"=1'-0"

NOTES

A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X
REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
HLV MONOLITH LIFTING ATTACHMENTS
HLV – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

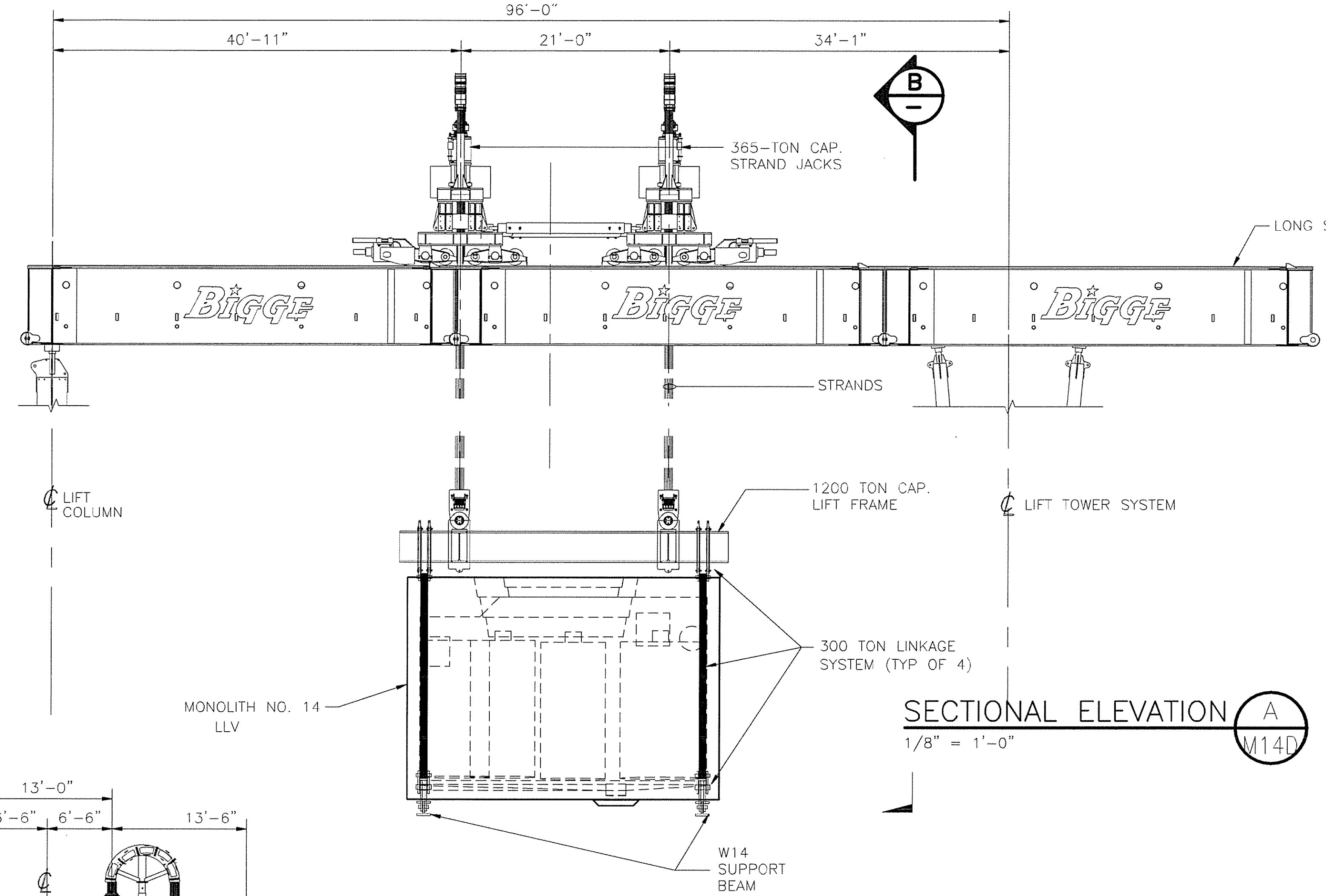
TASK	DRAWING NO.	REV. NO.
–	M14C4	A

RECORD INFORMATION

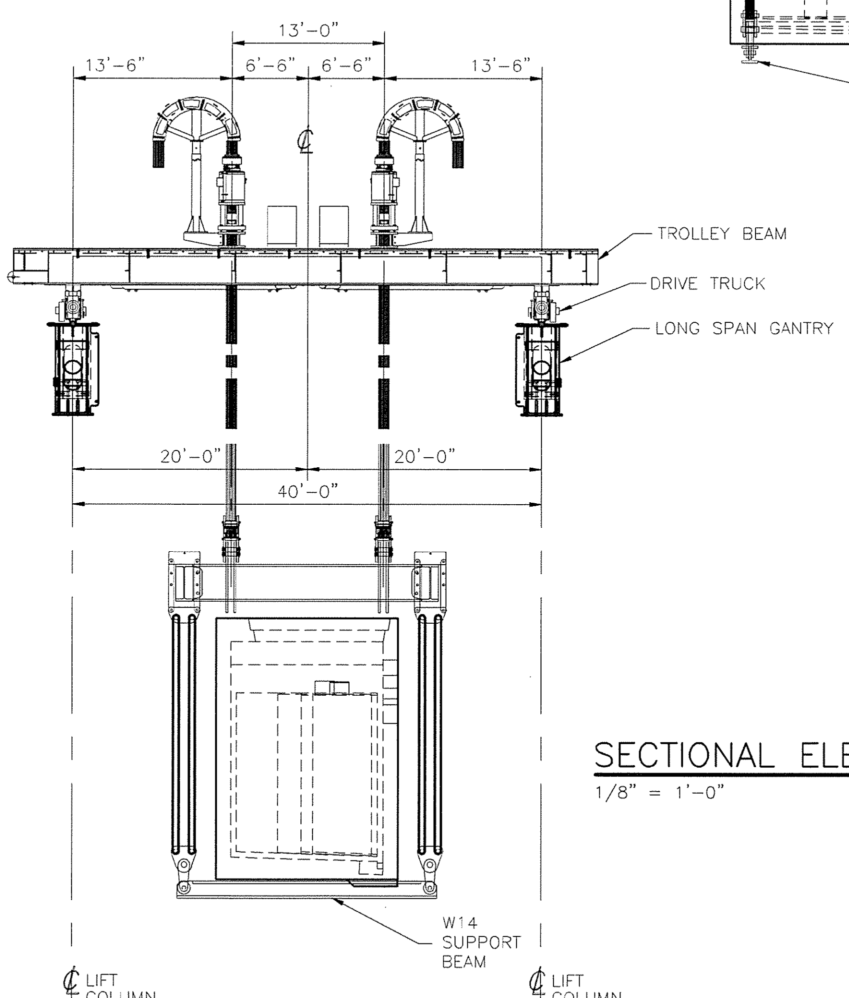
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract — Dedicated to Excellence — WCH

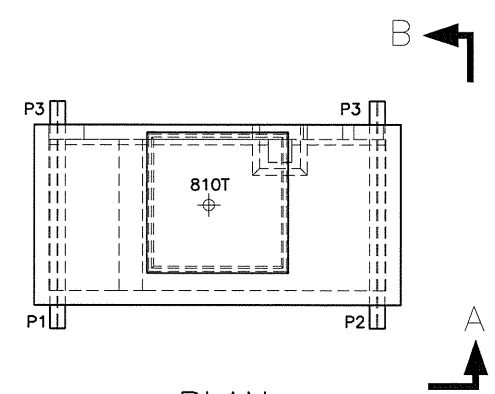
DRAWING NO.	REV. NO.
XX	A



SECTIONAL ELEVATION (A / M14D)
1/8" = 1'-0"



SECTIONAL ELEVATION (B / M14D)
1/8" = 1'-0"



PLAN
MONOLITH NO. 14
LLV

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
MONOLITH RIGGING DETAILS
LLV SECTIONAL ELEVATIONS

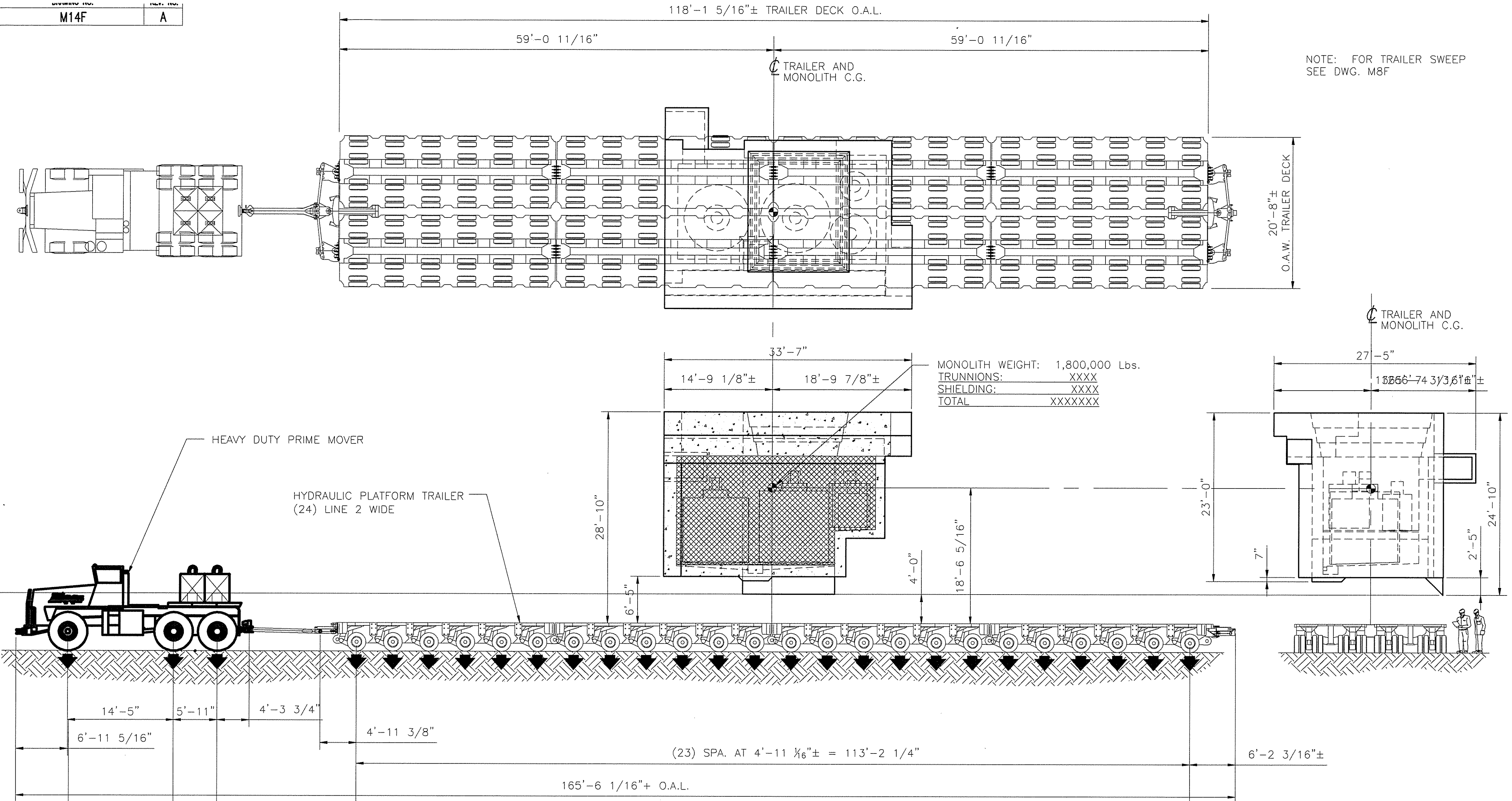
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M14D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
M14F	A

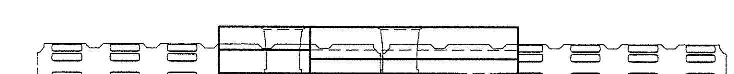


AXLE No.	1	2	3	4 – 27
No. TIRES/AXLE	2	4	4	16
WIDTH	11'-9"	12'-7"	12-7"	20'-8"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 384)

LLV
MONOLITH 14
ELEVATION VIEW – / M14F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	348,960 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	



RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

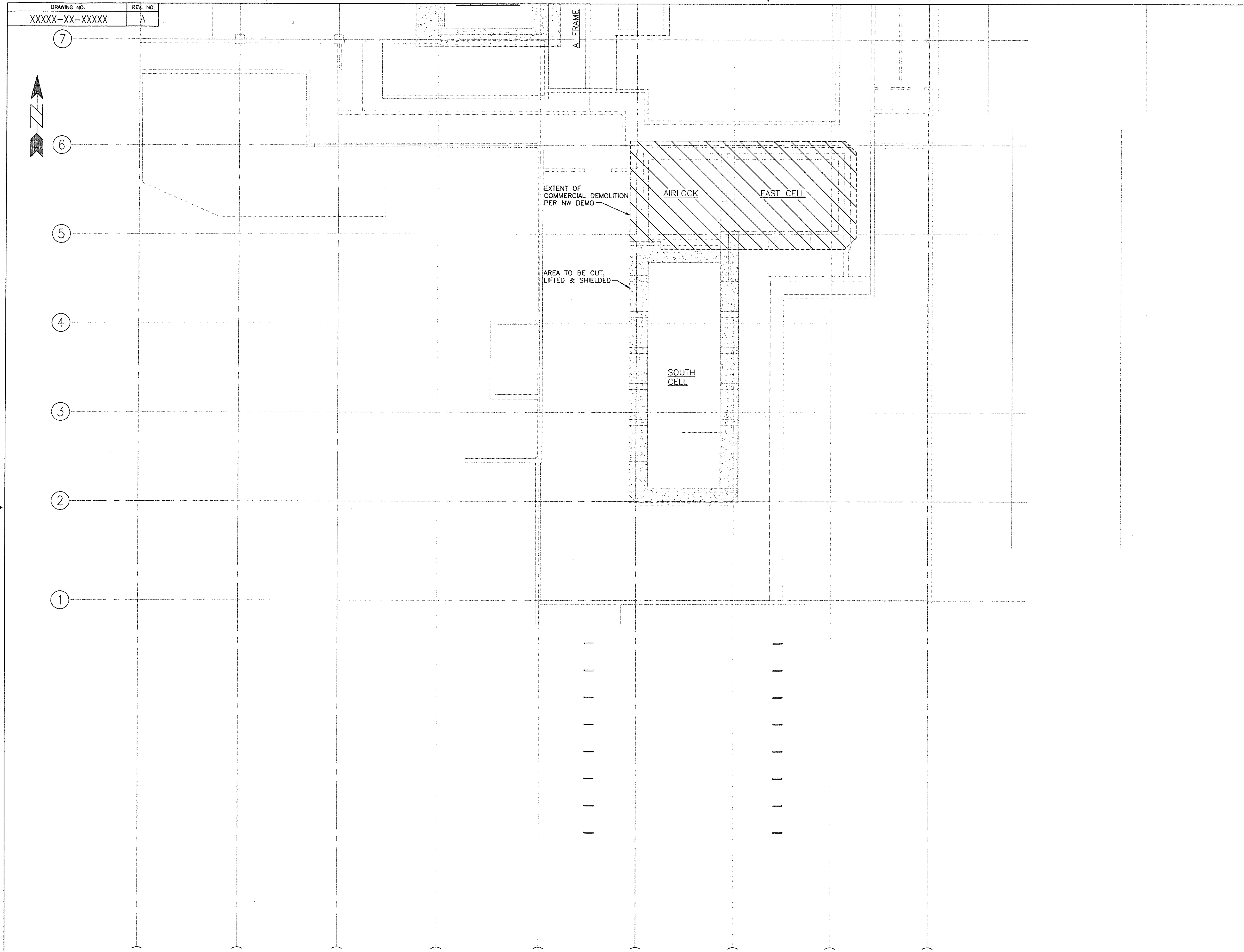
BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
LLV TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M14F.DWG

TASK	DRAWING NO.	REV. NO.
	M14F	A

G:\Engineer...\Jobs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F-...F 30% Submit.dwg

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



River Corridor Closure Contract — Dedicated to Safety Excellence — WCH

NOTES

X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X
REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC. RICHLAND, WASHINGTON	DCI ENGINEERS 400 SW 6TH AVE PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF PRE-DEMOLITION WORK
SMF

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

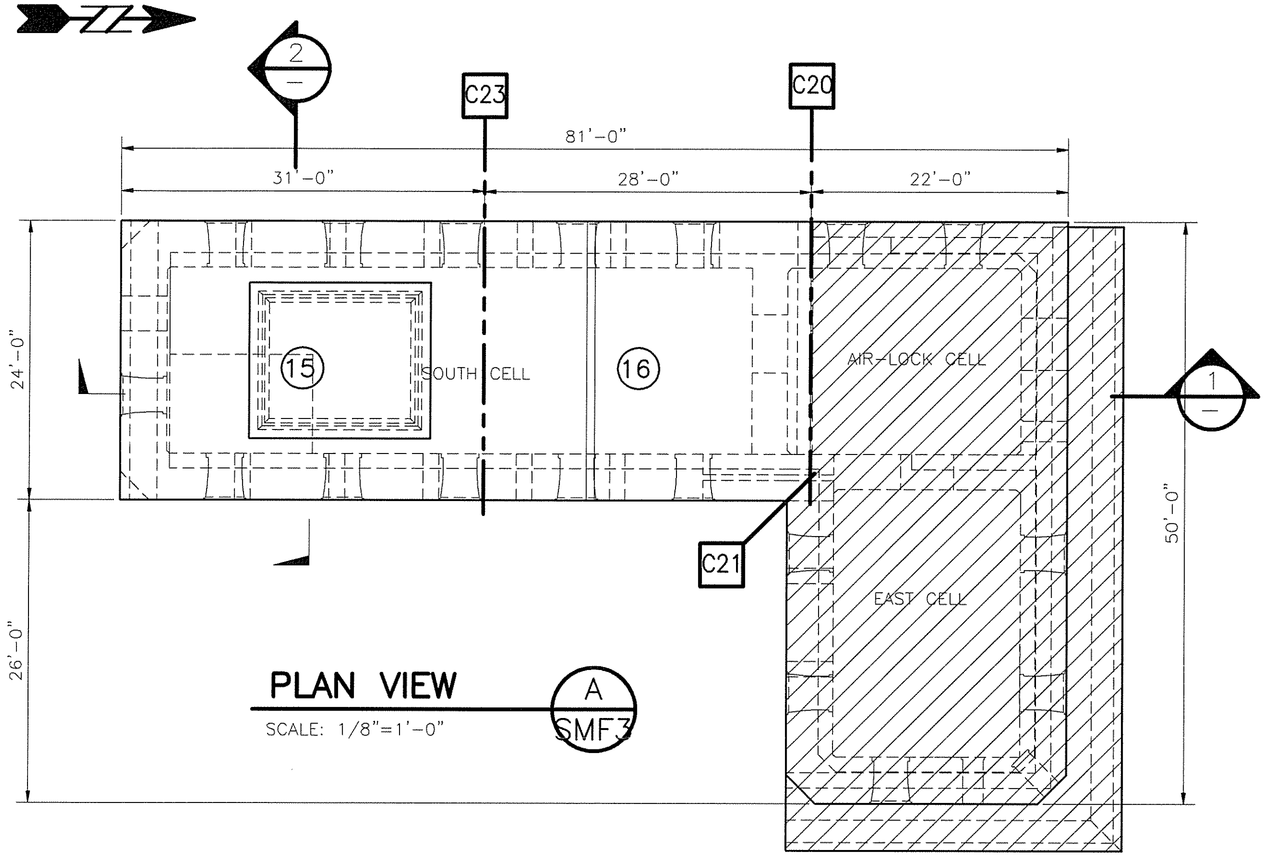
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

TASK	DRAWING NO.	REV. NO.
–	SMF1	A

2234_WCH-SUB.DWG 09/05

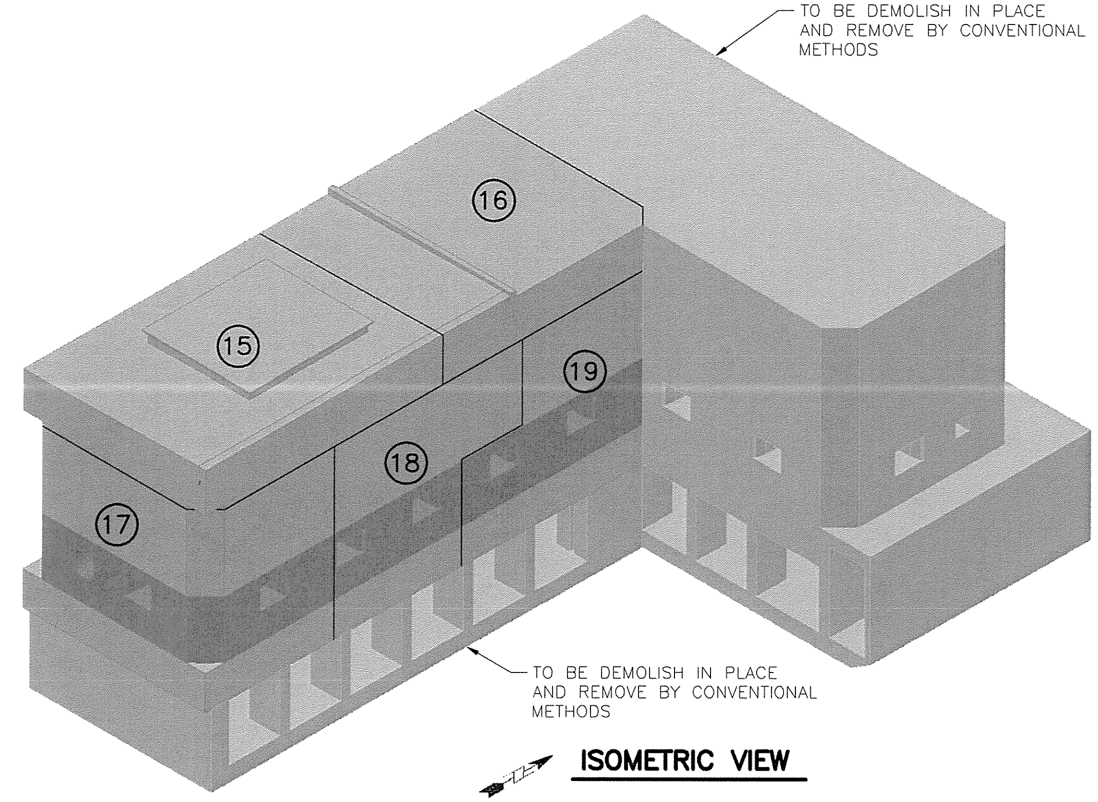
DRAWING NO.	REV. NO.
XX	A



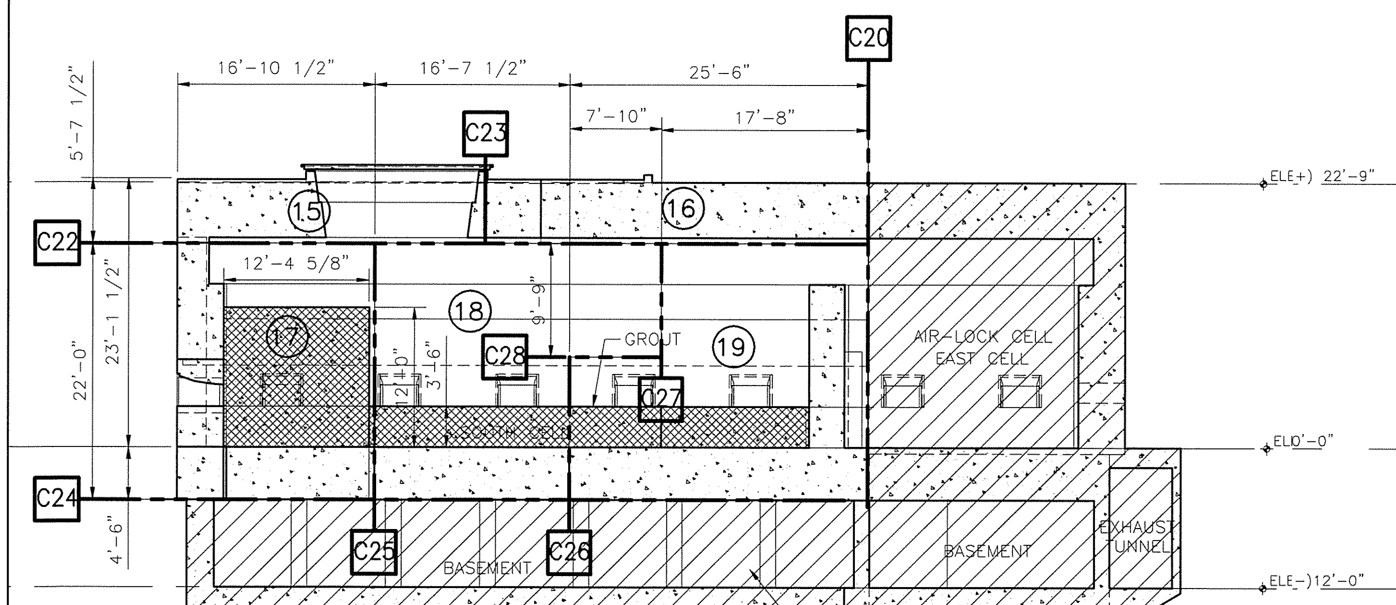
PLAN VIEW

SCALE: 1/8"=1'-0"

A
SMF3



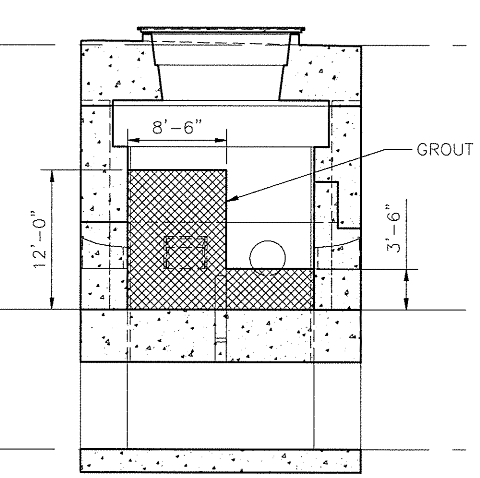
ISOMETRIC VIEW



SECTION

SCALE: 1/8"=1'-0"

1
SMF3



SECTION

SCALE: 1/8"=1'-0"

2
SMF3

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	XX		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF CUTTING PLAN
PLAN VIEW/SECTIONAL ELEVATIONS, ISOMETRIC

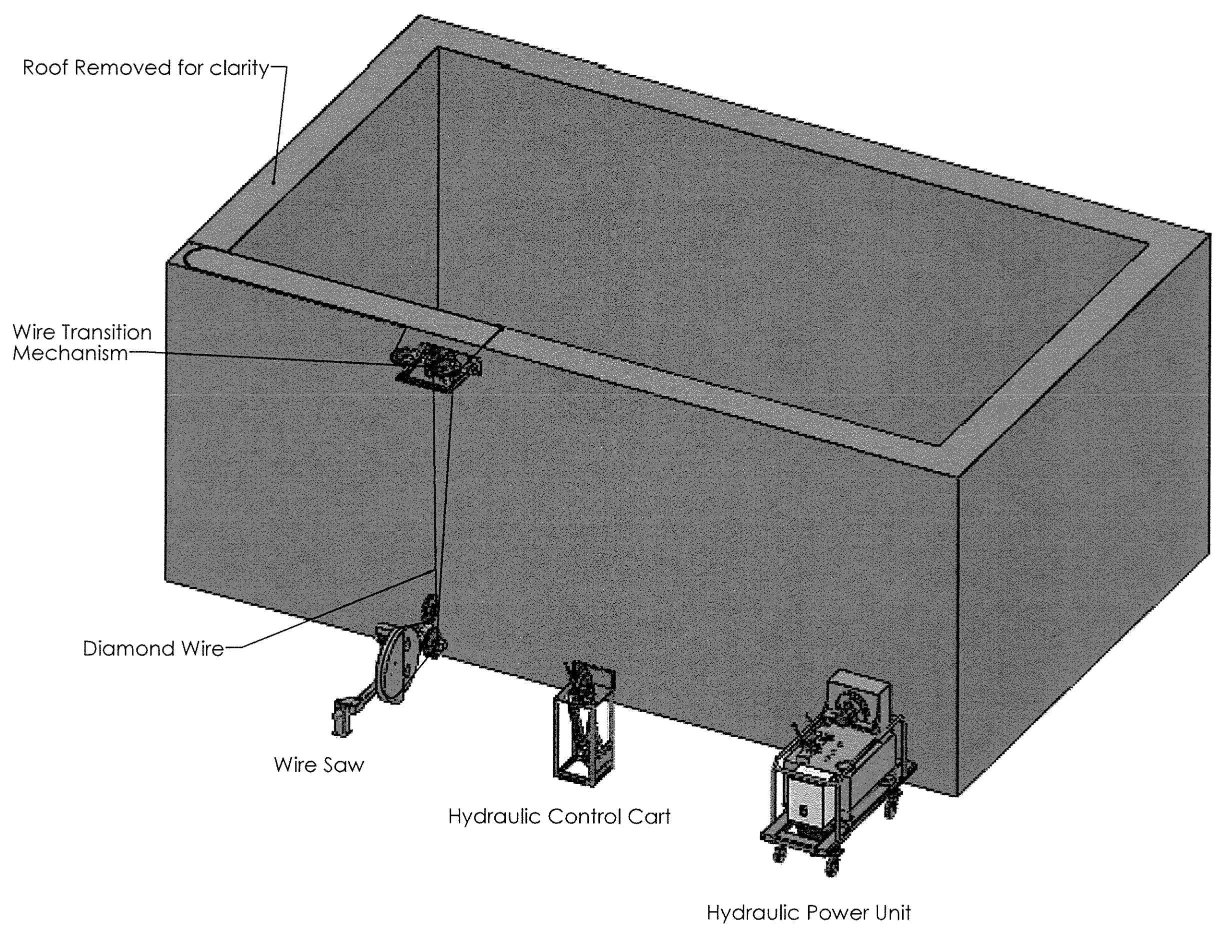
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	SMF3	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

SMF Building Typical Roof Cut



NOTES

1) For Water Containment/ Equipment Protection Refer to BG4 Drawings

REV	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ORIG ENG R	ENG R CHK	QC ENG R	PROJ ENG R
△	XX/XX/XX X	ISSUED FOR PRELIMINARY REVIEW	AD	JAK	CJ	WWY	N/A	X

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIROMENTAL
A JOINT VENTURE
BLUEGRASS
107 Mildred Street
Greenville, Alabama 36037

BLDG. 324 HOT CELLS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	

TASK	DRAWING NO.	REV. NO.
X	SMF5	0

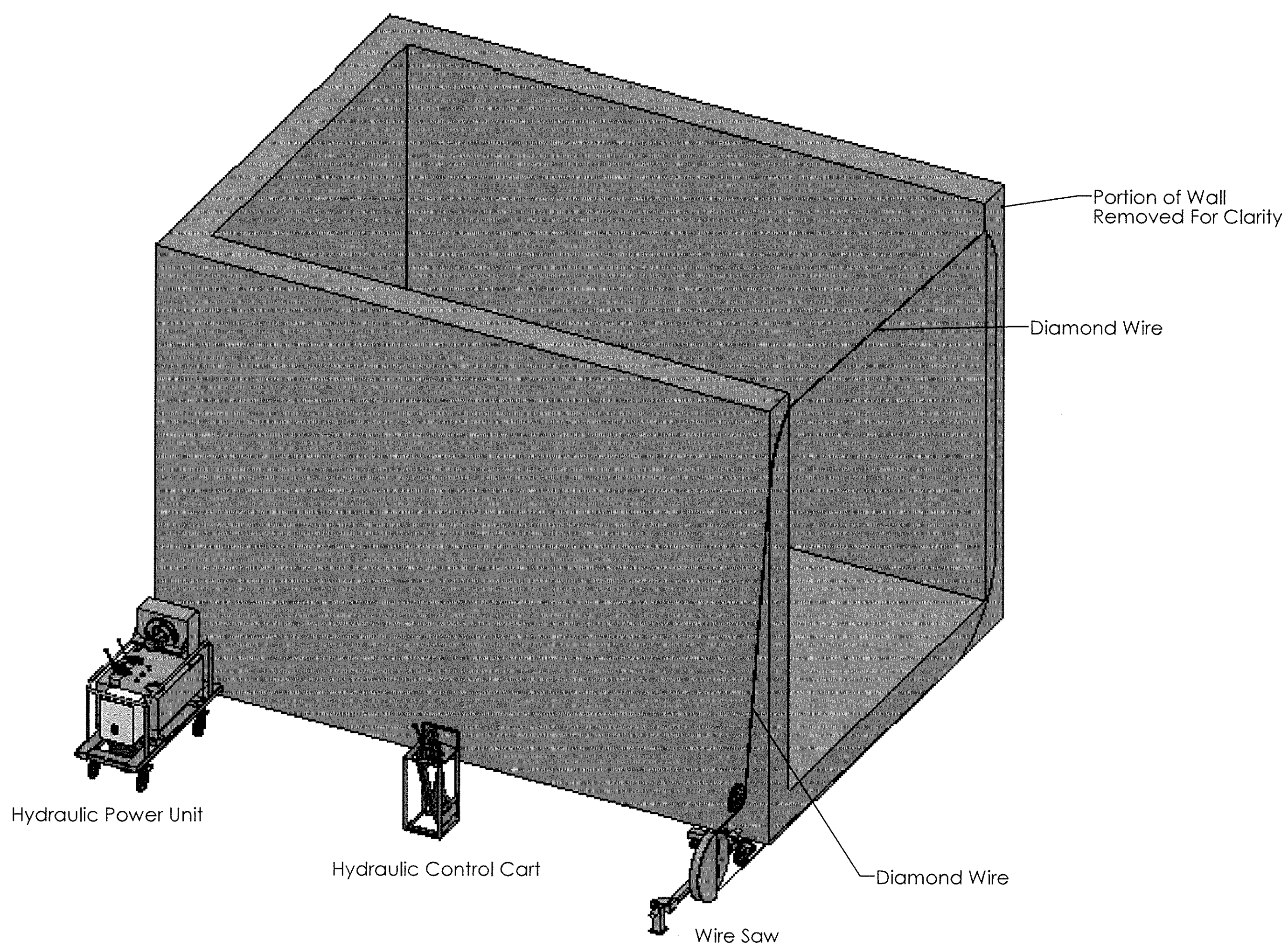
RECORD INFORMATION

RECORD NO.	BLDG. NO.	INDEX NO.
X-X-XXXXXX	324	XXX

WCH
Dedicated to Safety Excellence

DRAWING NO.	REV. NO.
	X

SMF Building Typical Wall Cut



NOTES

1) For Water Containment/ Equipment Protection Refer to BG4 Drawings

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ORIG ENG R	ENG R CHK	C/O ENG R	PROJ ENG P
△	XX/XX/XX X	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIROMENTAL
A JOINT VENTURE

BLUEGRASS
107 Mildred Street
Greenville, Alabama 36037

BLDG. 324 HOT CELLS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	

TASK	DRAWING NO.	REV. NO.
X	SMF6	X

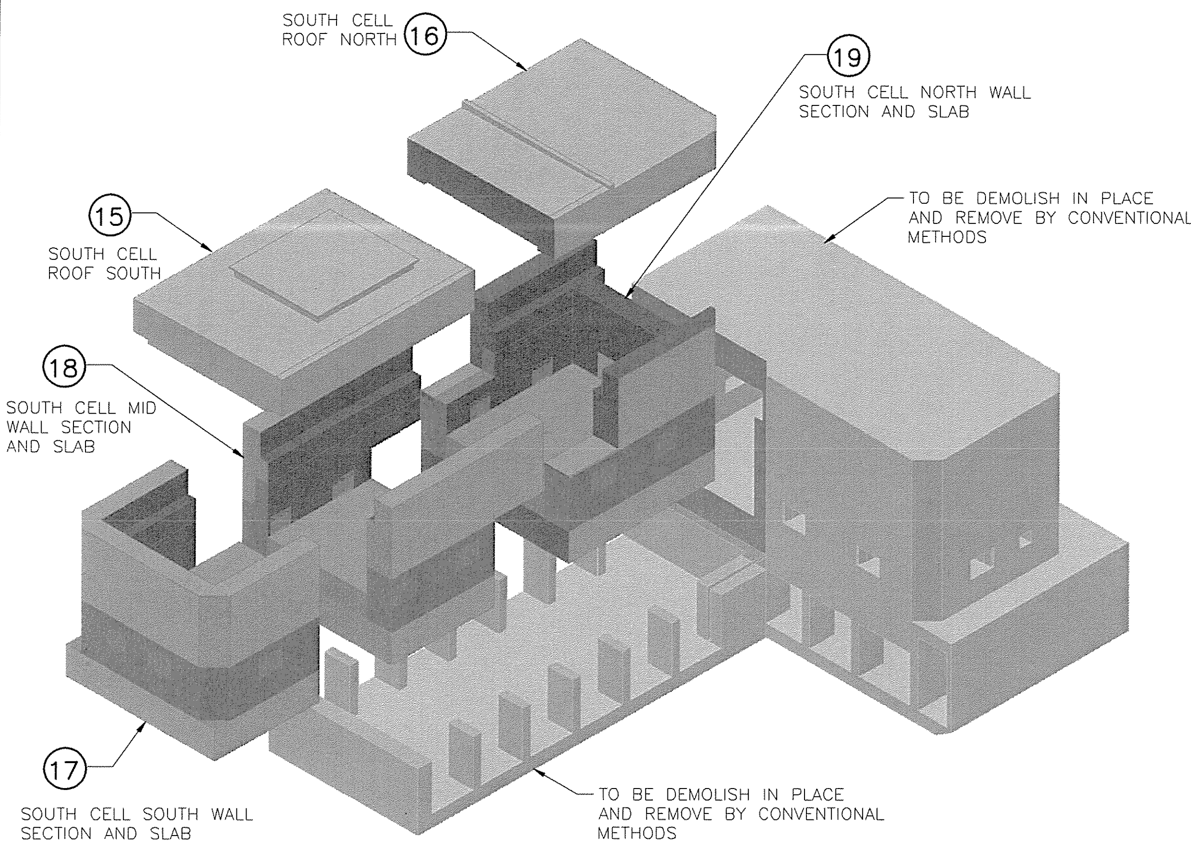
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
X-X-XXXXXX	324	XXX

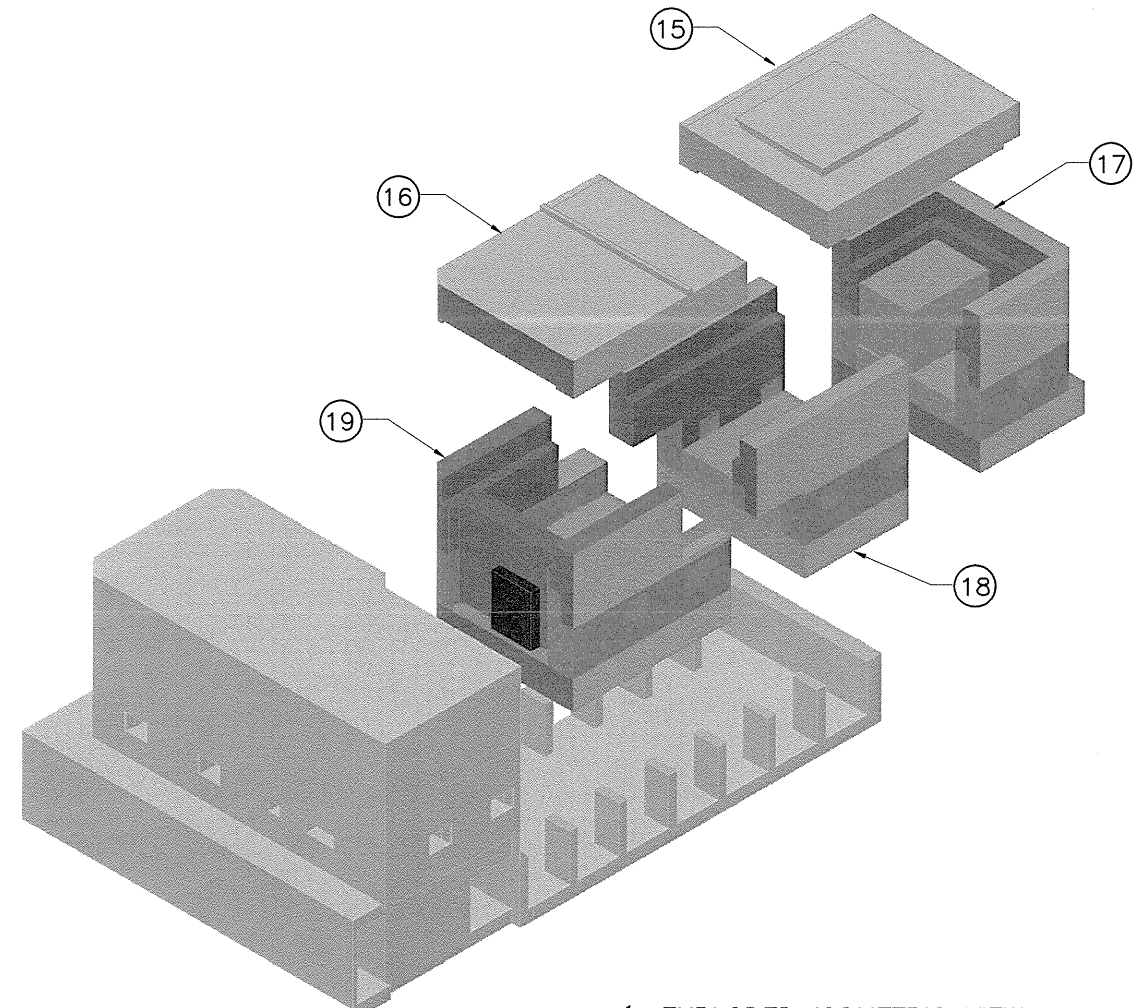
WCH
Dedicated to Safety Excellence

DRAWING NO.	REV. NO.
XX	A

NOTES



EXPLODED ISOMETRIC VIEW



EXPLODED ISOMETRIC VIEW

PICK	MONOLITH	EST. LIFT WEIGHT (TON)
15	SOUTH CELL ROOF SOUTH	235
16	SOUTH CELL ROOF NORTH	231
17	SOUTH CELL SOUTH WALL SECTION AND SLAB	494
18	SOUTH CELL MIDDLE WALL SECTION AND SLAB	489
19	SOUTH CELL NORTH WALL SECTION AND SLAB	440

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	XX		SH	SH		

SCALE: NOT TO SCALE

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF MONIOLITHS GENERAL
EXPLODED ISOMETRIC VIEW

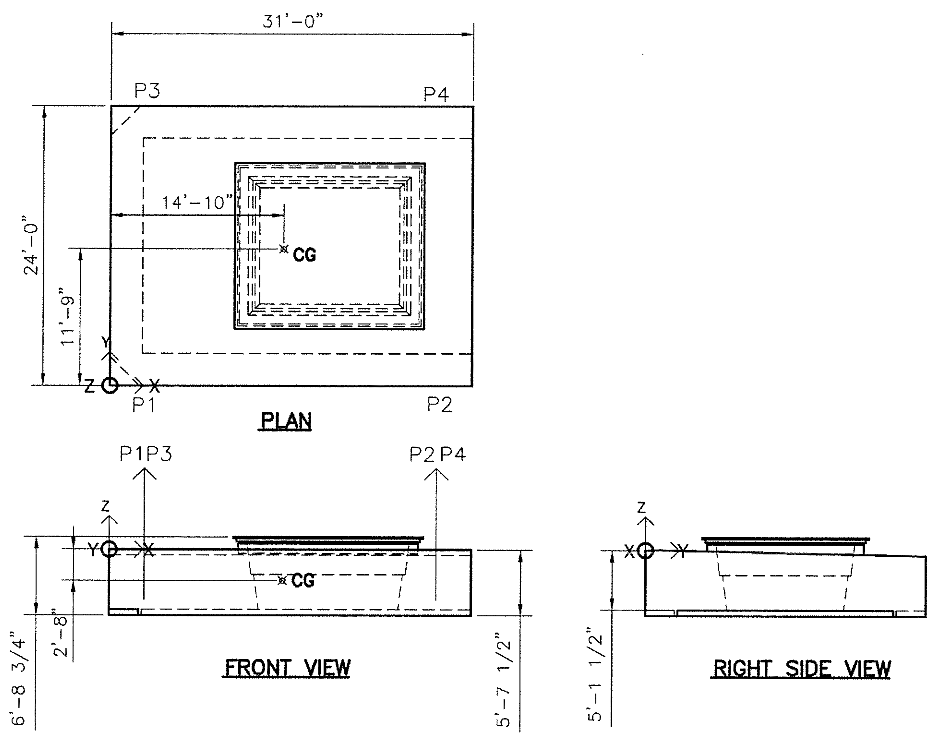
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	SMF7	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XX	A



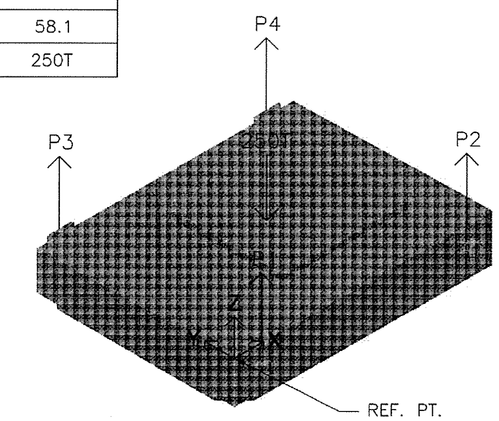
SCALE: 1/8" = 1'-0"

SMF ROOF SOUTH
MONOLITH NO. 15

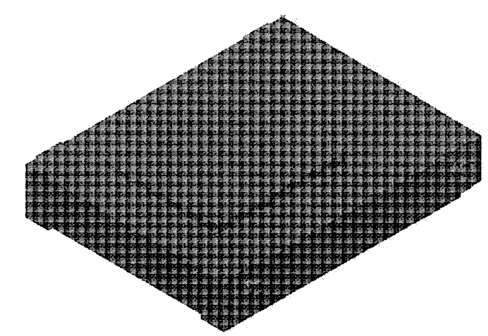
EST. WEIGHT: 250 TON

CENTROID: X: 177.9 IN
Y: 141.5 IN
Z: −31.9 IN

P1	67.0
P2	60.2
P3	64.7
P4	58.1
TOTAL	250T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH DIMENSIONS, WEIGHT, CG, RAD
SMF ROOF SOUTH DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

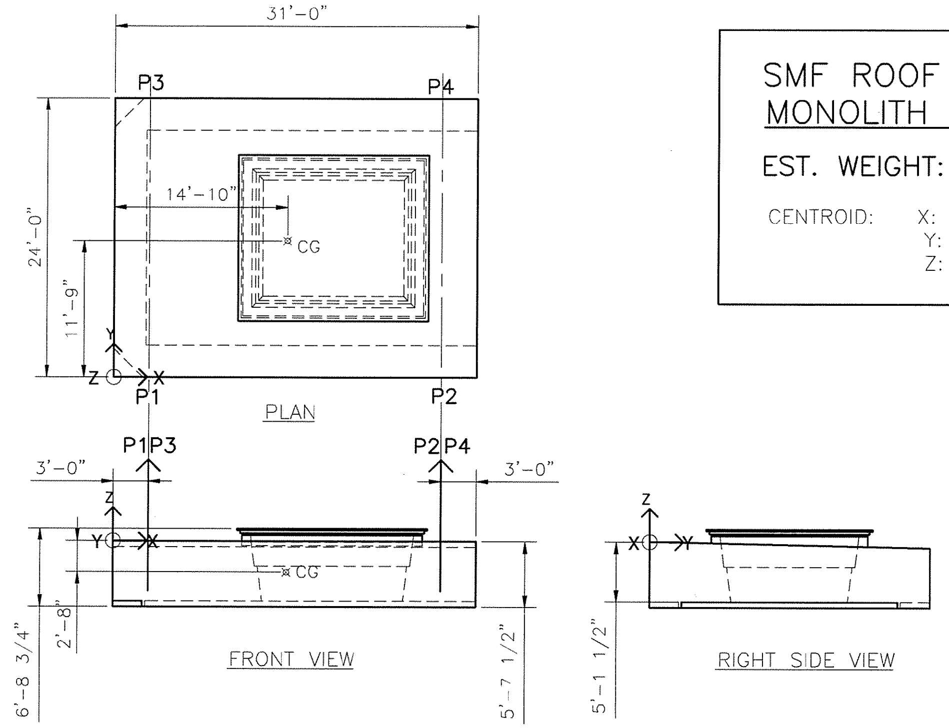
TASK	DRAWING NO.	REV. NO.
—	M15A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract
Dedicated to Excellence

DRAWING NO.	REV. NO.
XX	A



PLAN

FRONT VIEW

RIGHT SIDE VIEW

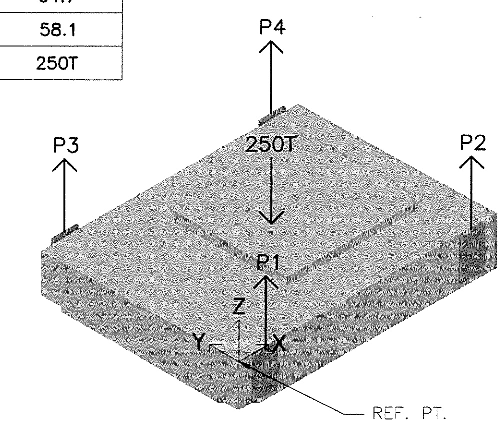
SCALE: 1/8" = 1'-0"

SMF ROOF SOUTH
MONOLITH NO. 15

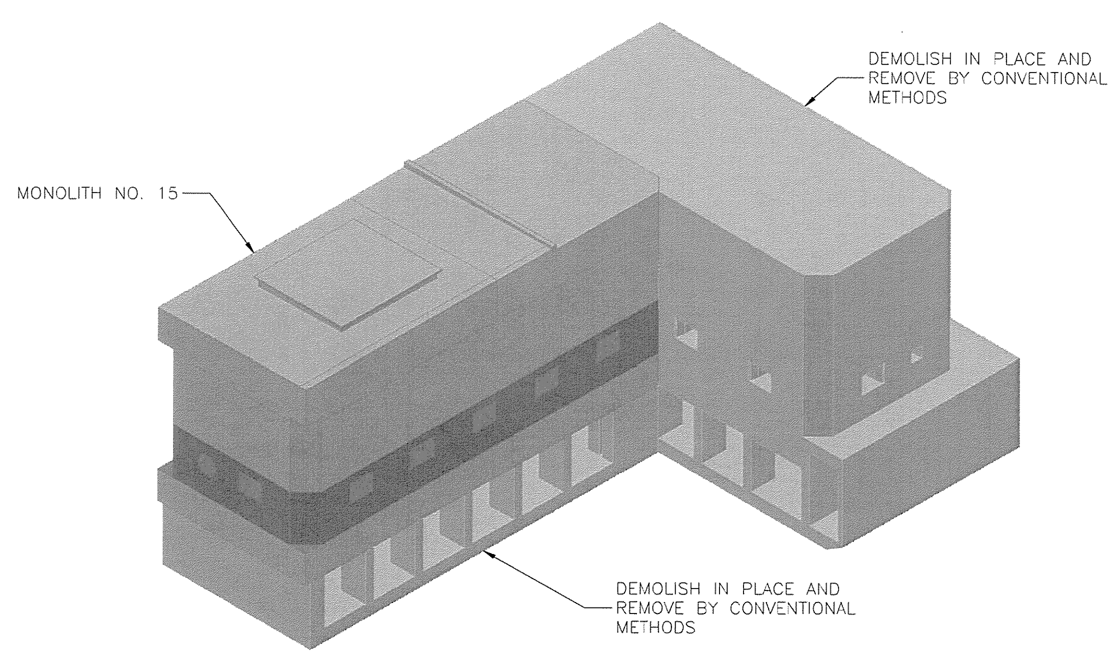
EST. WEIGHT: 250 TON

CENTROID: X: 177.9 IN
Y: 141.5 IN
Z: -31.9 IN

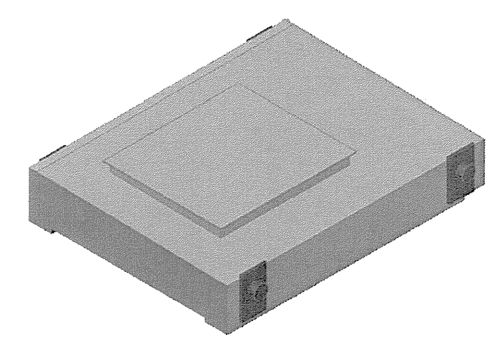
P1	67.0
P2	60.2
P3	64.7
P4	58.1
TOTAL	250T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



SMF ISOMETRIC VIEW
NOT TO SCALE



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ARRAGEMENT
SMF ROOF SOUTH DETAIL PLAN/ISOMETRIC VIEW

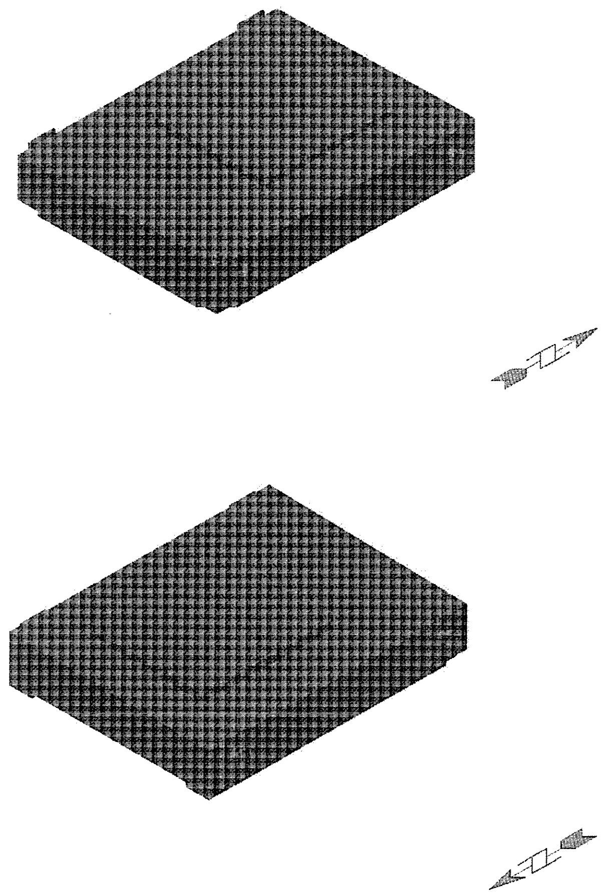
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M15B	A

RECORD INFORMATION

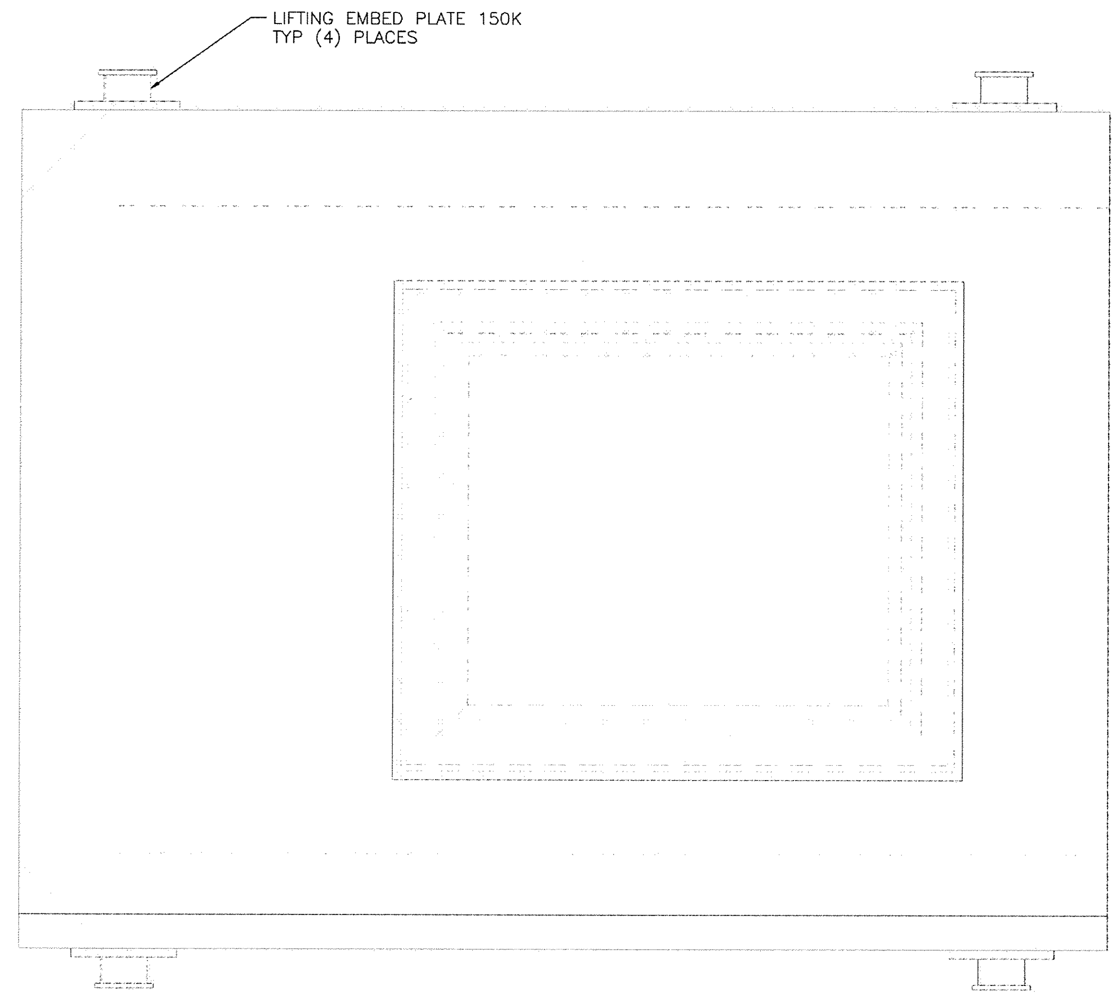
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M15C — ISOMETRIC VIEWS – MONOLITH 15

SCALE: NONE



2 / M15C — PLAN – MONOLITH 15

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF SOUTH ROOF – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

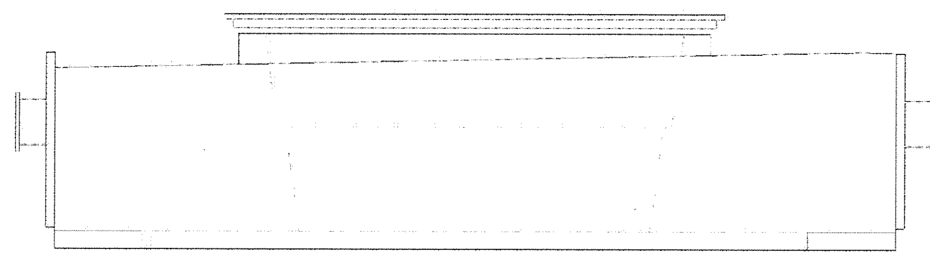
TASK	DRAWING NO.	REV. NO.
–	M15C	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

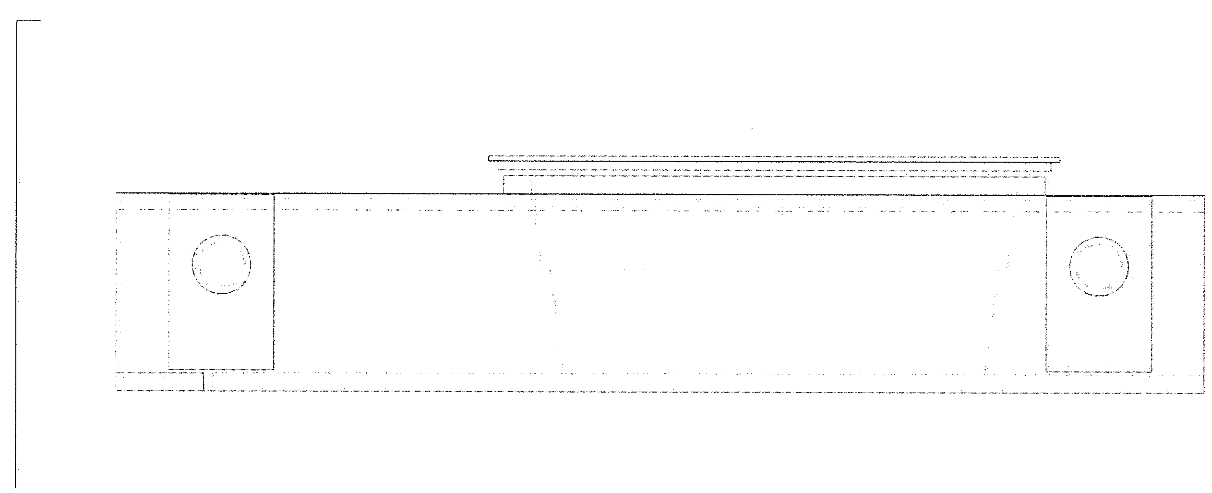
River Corridor Closure Contract — Dedicated to Safety & Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M15C1 SOUTH ELEVATION – MONOLITH 15

SCALE: 3/8"=1'-0"



2 / M15C1 EAST ELEVATION – MONOLITH 15

SCALE: 3/8"=1'-0"

River Corridor Closure Contract
Dedicated to Safety, Performance, Excellence

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF SOUTH ROOF – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

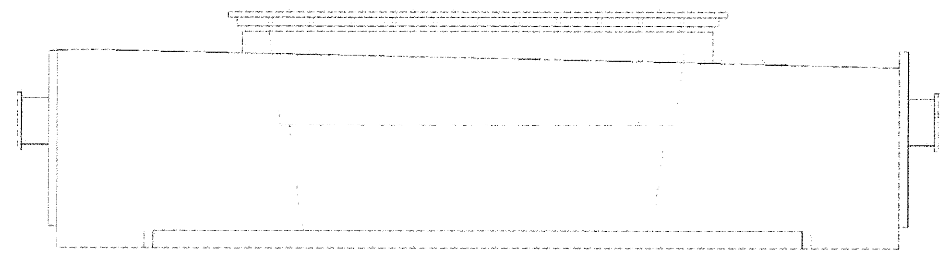
TASK	DRAWING NO.	REV. NO.
–	M15C1	A

RECORD INFORMATION

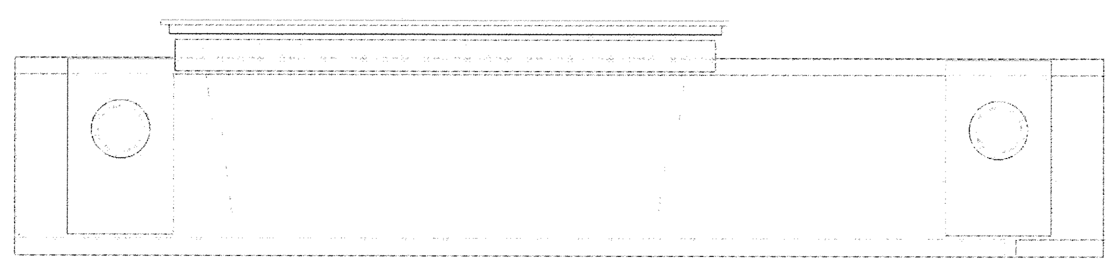
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 NORTH ELEVATION – MONOLITH 15
M15C2 SCALE: 3/8"=1'-0"



2 WEST ELEVATION – MONOLITH 15
M15C2 SCALE: 3/8"=1'-0"

River Corridor Closure Contract
Dedicated WCH Excellence

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

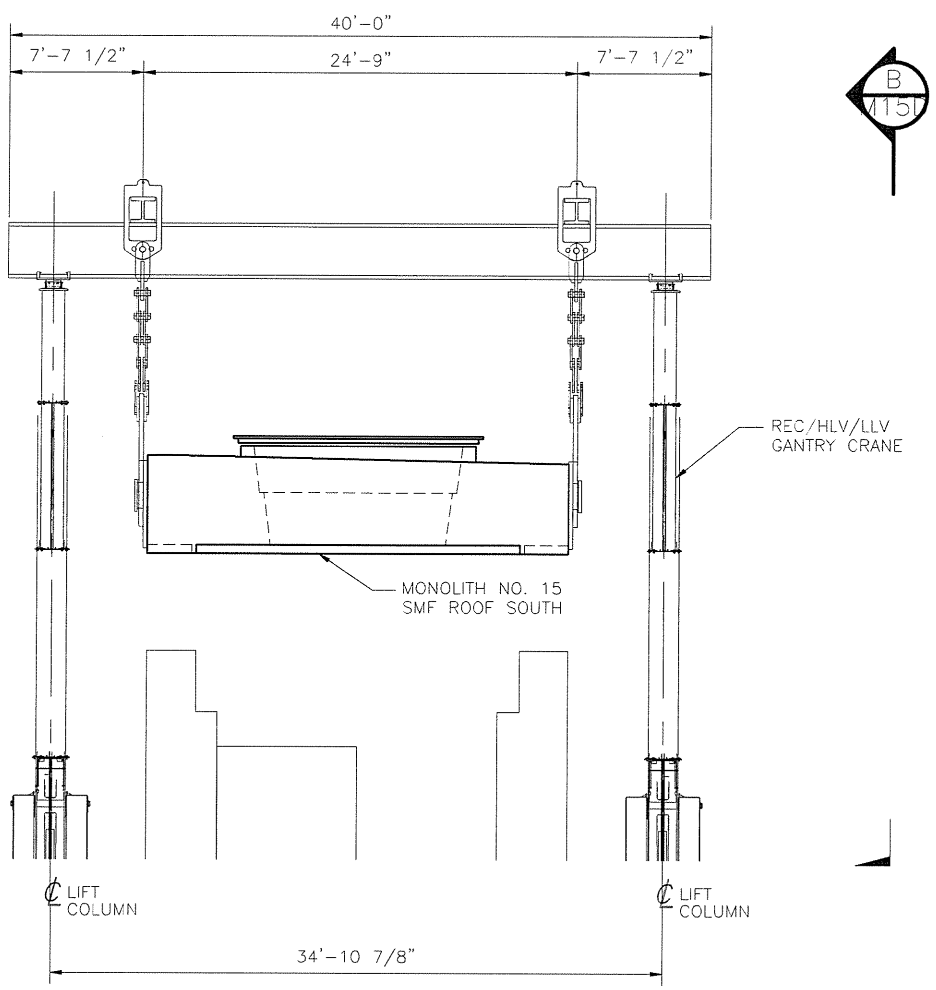
DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF SOUTH ROOF – ELEVATION VIEWS

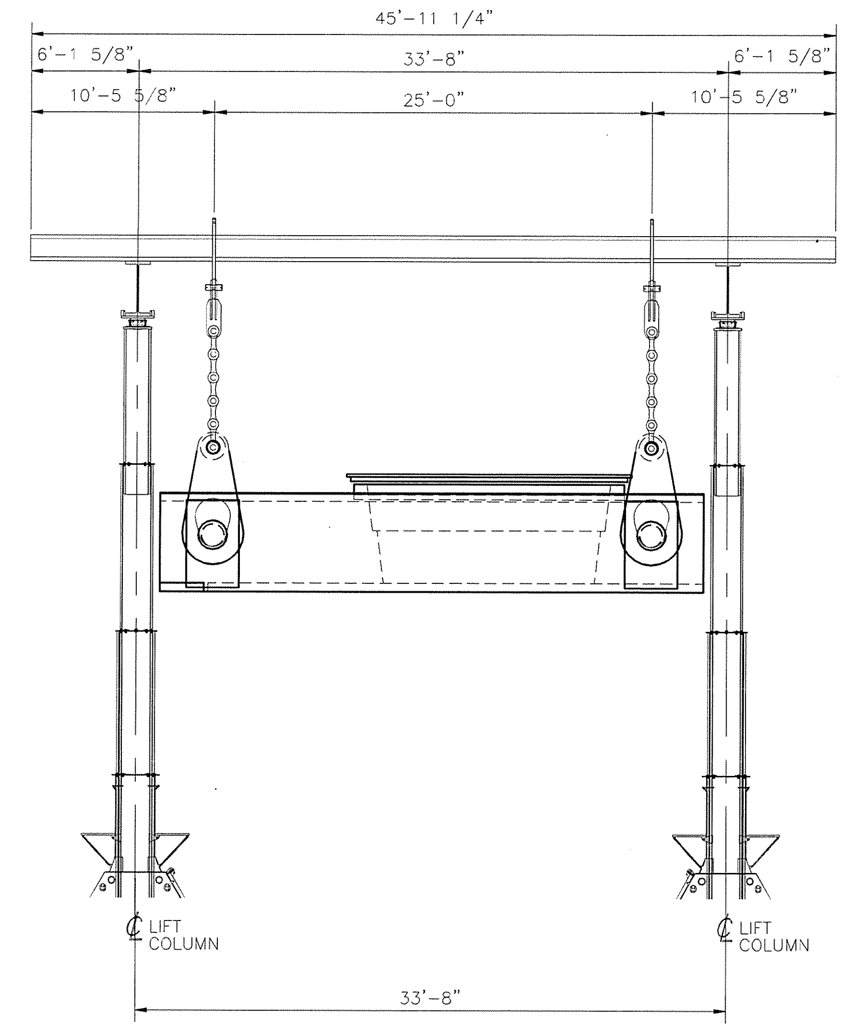
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M15C2	A

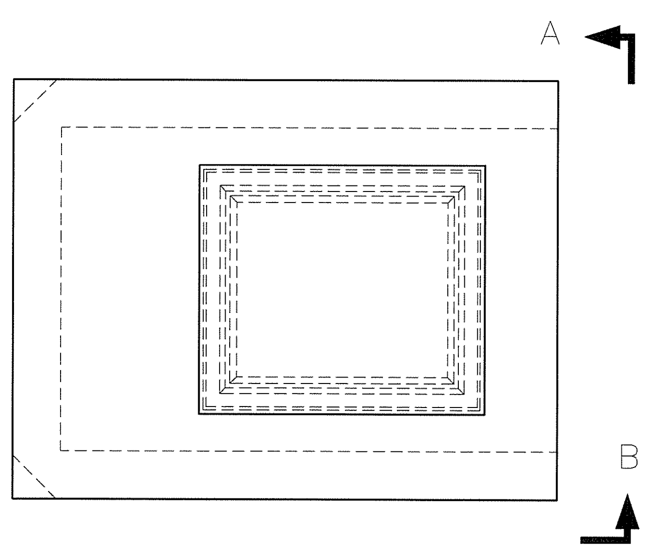
DRAWING NO.	REV. NO.
M15D	A



SECTIONAL ELEVATION (A / M15D)
3/16" = 1'-0"



SECTIONAL ELEVATION (B / M15D)
3/16" = 1'-0"



PLAN
MONOLITH 15
AT SMF ROOF SOUTH

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/16"= 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
MONOLITH 15 RIGGING DETAILS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M15D.DWG

TASK	DRAWING NO.	REV. NO.
	M15D	A

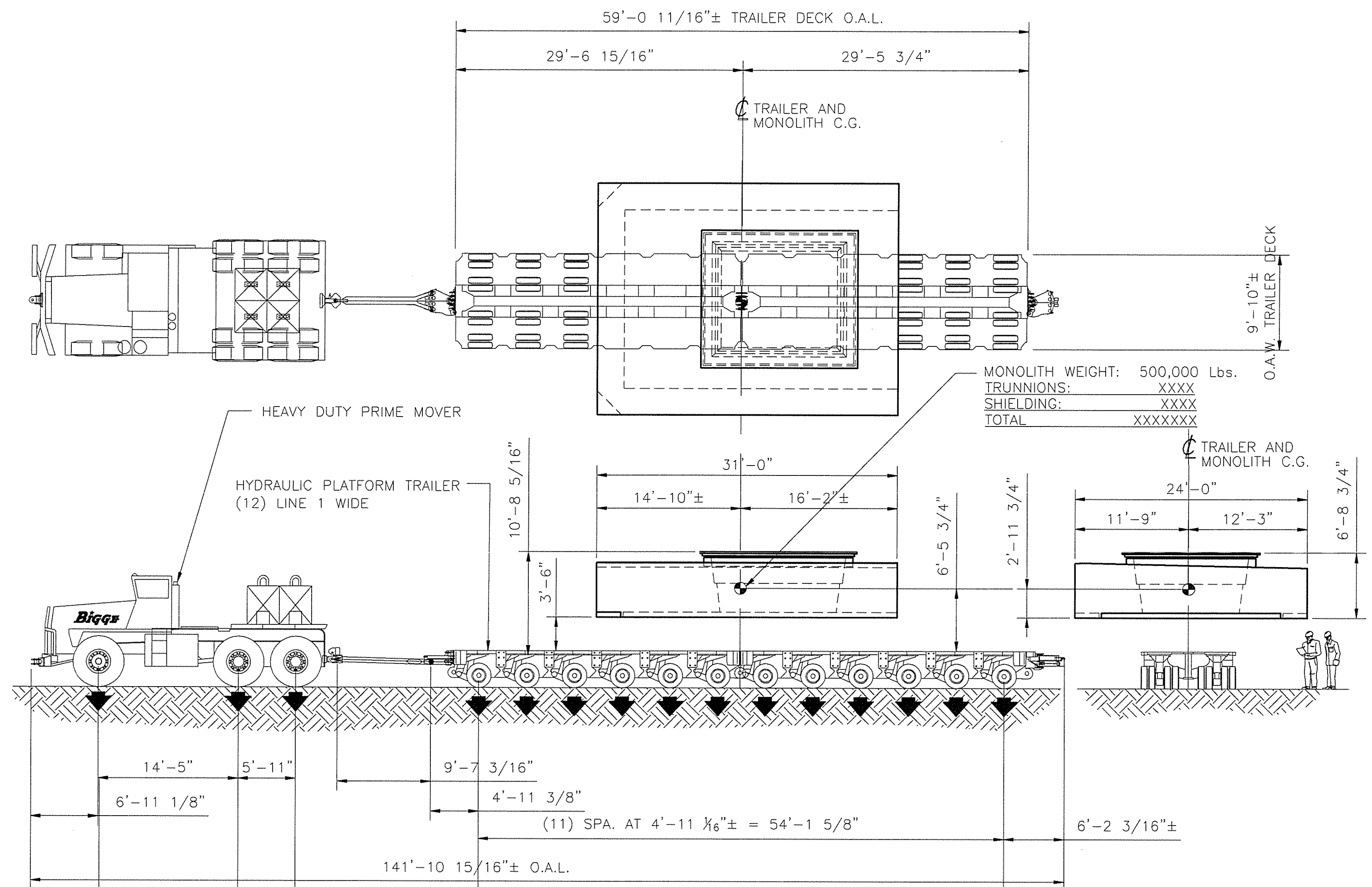
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

G:\Engineer...obs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M15D.dwg

DRAWING NO.	REV. NO.
M15F	A

NOTE: FOR TRAILER SWEEP SEE DWG. M1F



AXLE No.	1	2	3	4 – 15
No. TIRES/AXLE	2	4	4	8
WIDTH	11'-9"	12'-7"	12-7"	9'-10"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 96)

ELEVATION VIEW — M15F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	145,400 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
SMF ROOF SOUTH TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M15F.DWG

TASK	DRAWING NO.	REV. NO.
	M15F	A

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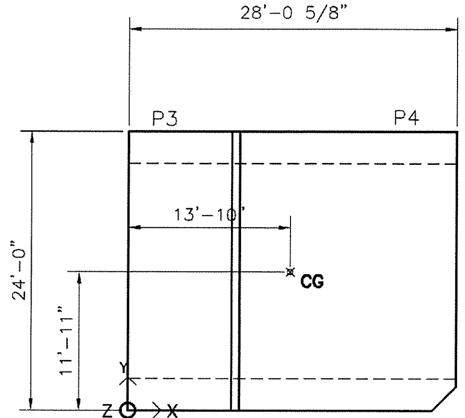
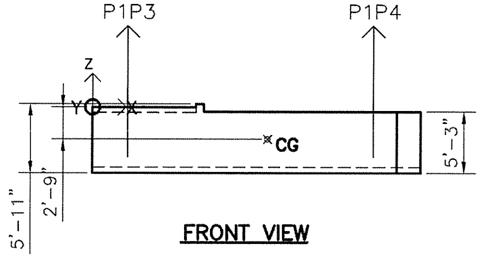
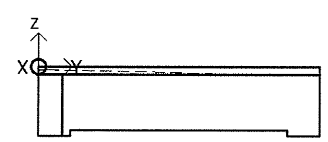
DRAWING NO.	REV. NO.
XX	A



PLAN



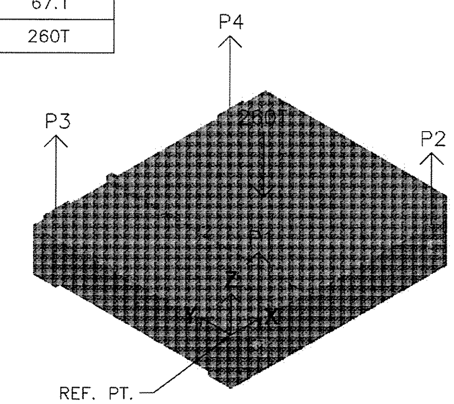
FRONT VIEW



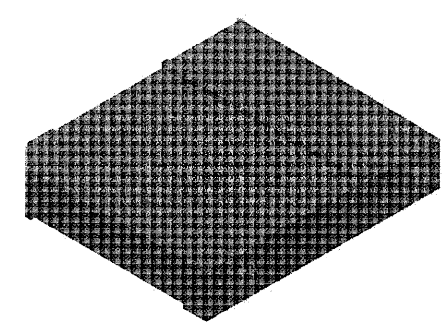
RIGHT SIDE VIEW

SCALE: 1/8" = 1'-0"

P1	62.9
P2	67.4
P3	62.6
P4	67.1
TOTAL	260T



ISOMETRIC VIEW



ISOMETRIC VIEW

SCALE: 1/8" = 1'-0"

SMF ROOF NORTH
MONOLITH NO. 16

EST. WEIGHT: 260 TON

CENTROID: X: 166.4 IN
Y: 143.7 IN
Z: -33.3 IN

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH DIMENSIONS, WEIGHT, CG, RAD
SMF ROOF NORTH DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

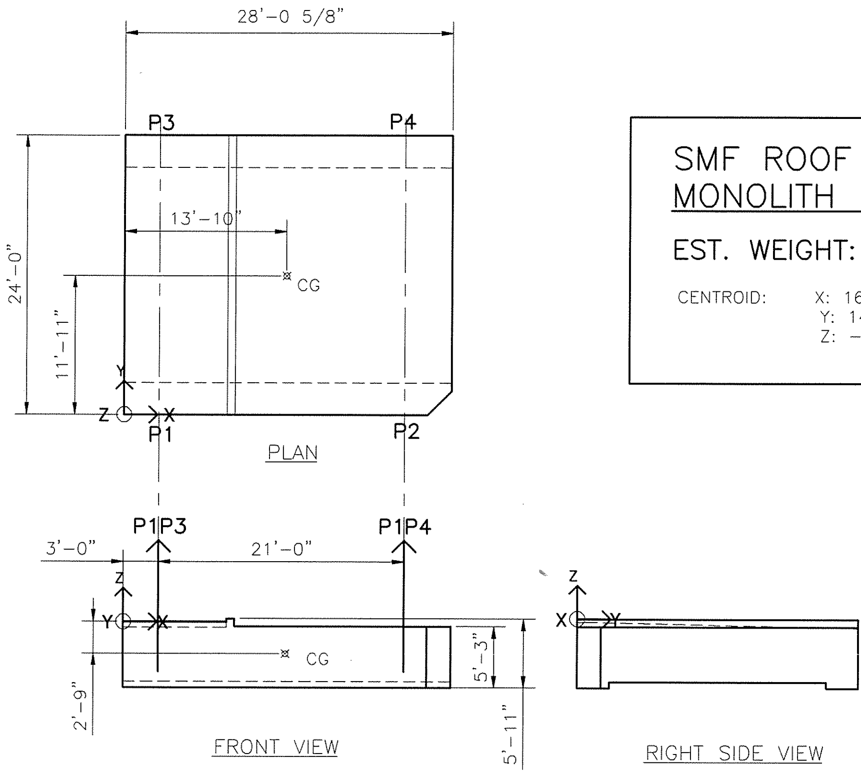
TASK	DRAWING NO.	REV. NO.
–	M16A	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated WCH to Safety & Excellence

DRAWING NO.	REV. NO.
XX	A



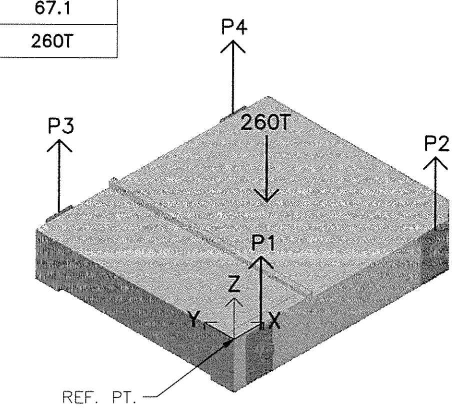
SCALE: 1/8" = 1'-0"

SMF ROOF NORTH
MONOLITH NO. 16

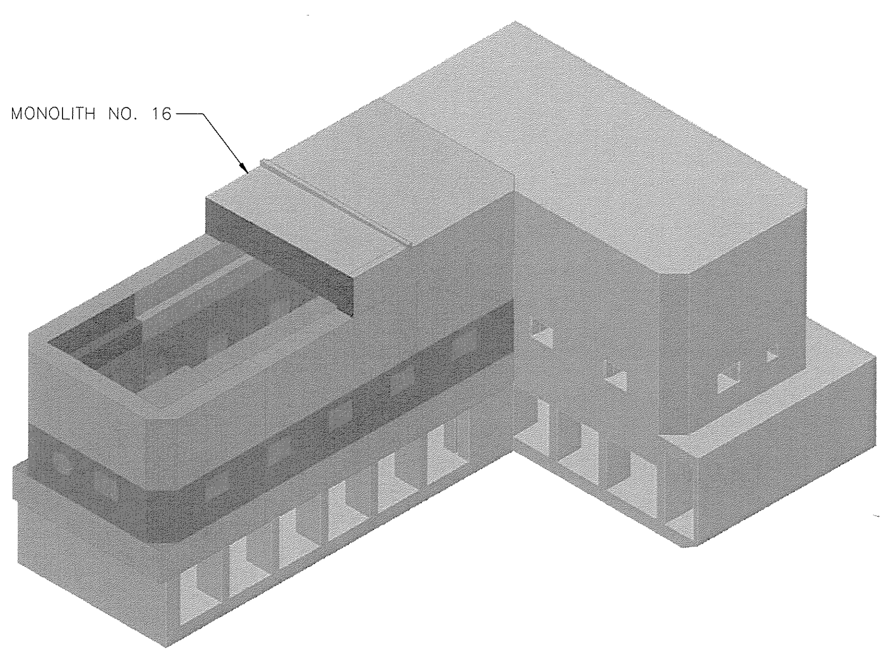
EST. WEIGHT: 260 TON

CENTROID: X: 166.4 IN
Y: 143.7 IN
Z: -33.3 IN

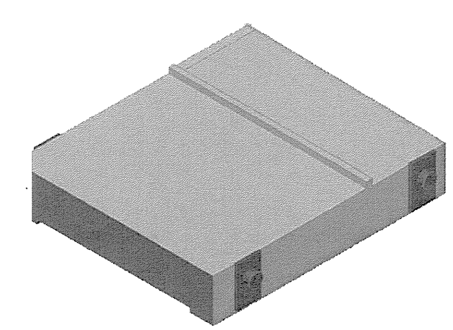
P1	62.9
P2	67.4
P3	62.6
P4	67.1
TOTAL	260T



ISOMETRIC VIEW



SMF ISOMETRIC VIEW
NOT TO SCALE



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ARRAGEMENT
SMF ROOF NORTH DETAIL PLAN/ISOMETRIC VIEW

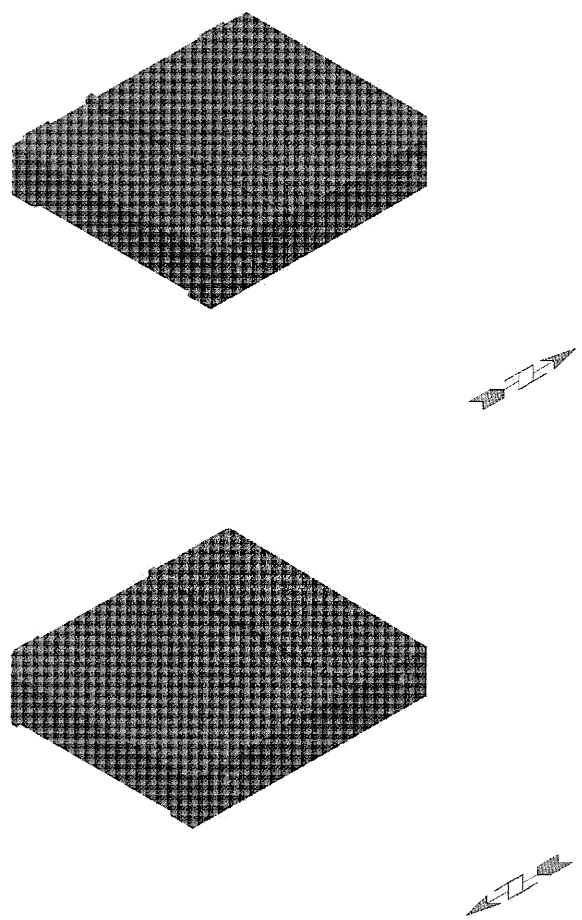
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M16B	A

RECORD INFORMATION

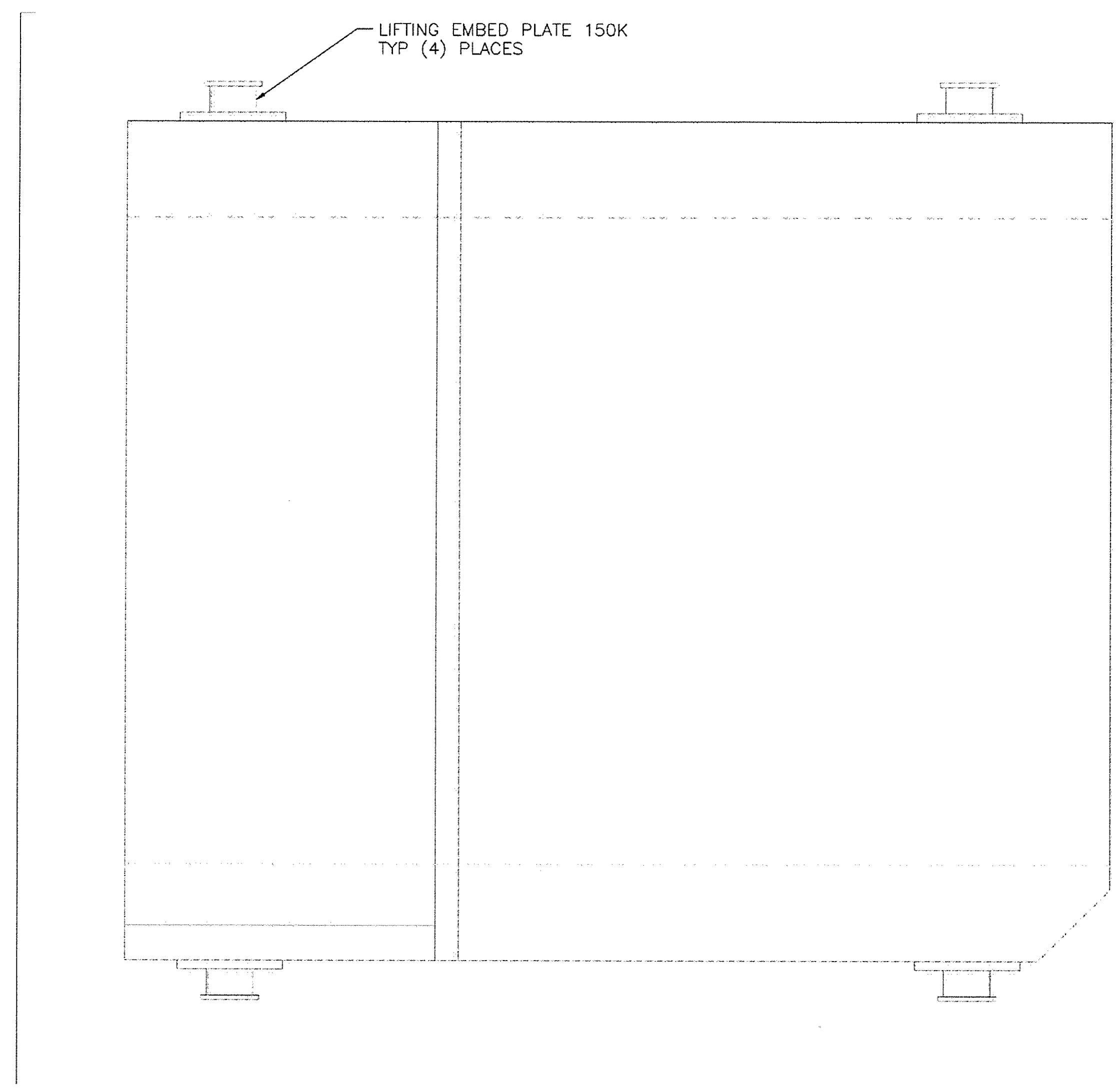
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M16C — ISOMETRIC VIEWS – MONOLITH 16

SCALE: NONE



2 / M16C — PLAN – MONOLITH 16

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF NORTH ROOF – ISOMETRIC/PLAN VIEWS

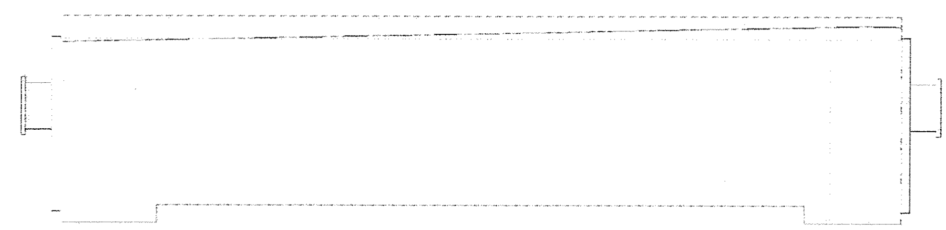
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M16C	A

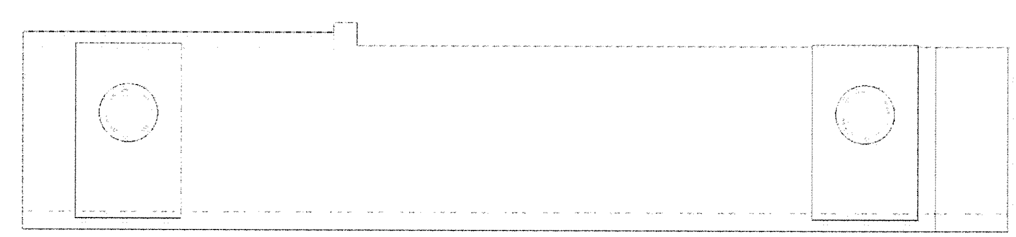
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M16C1 SOUTH ELEVATION – MONOLITH 16
SCALE: 3/8"=1'-0"



2 / M16C1 EAST ELEVATION – MONOLITH 16
SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF NORTH ROOF – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

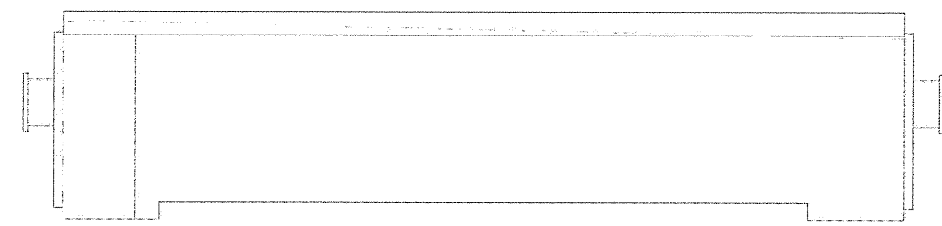
TASK	DRAWING NO.	REV. NO.
–	M16C1	A

RECORD INFORMATION

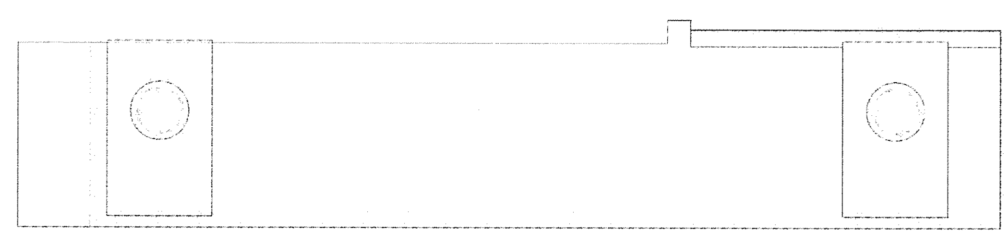
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Contract — Dedicated to Safety for Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M16C2 NORTH ELEVATION – MONOLITH 16
SCALE: 3/8"=1'-0"



2 / M16C2 WEST ELEVATION – MONOLITH 16
SCALE: 3/8"=1'-0"

River Corridor Closure Contract — Dedicated WCH Excellence

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF NORTH ROOF X- ELEVATION VIEWS

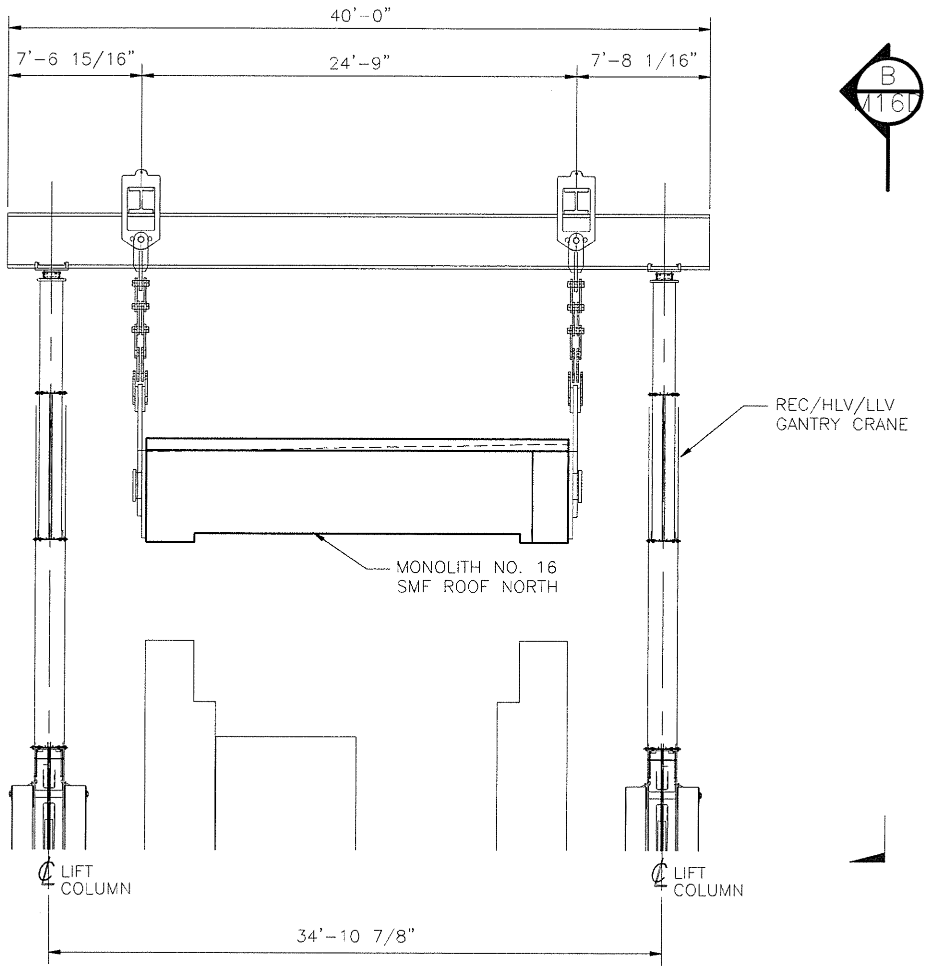
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M16C2	A

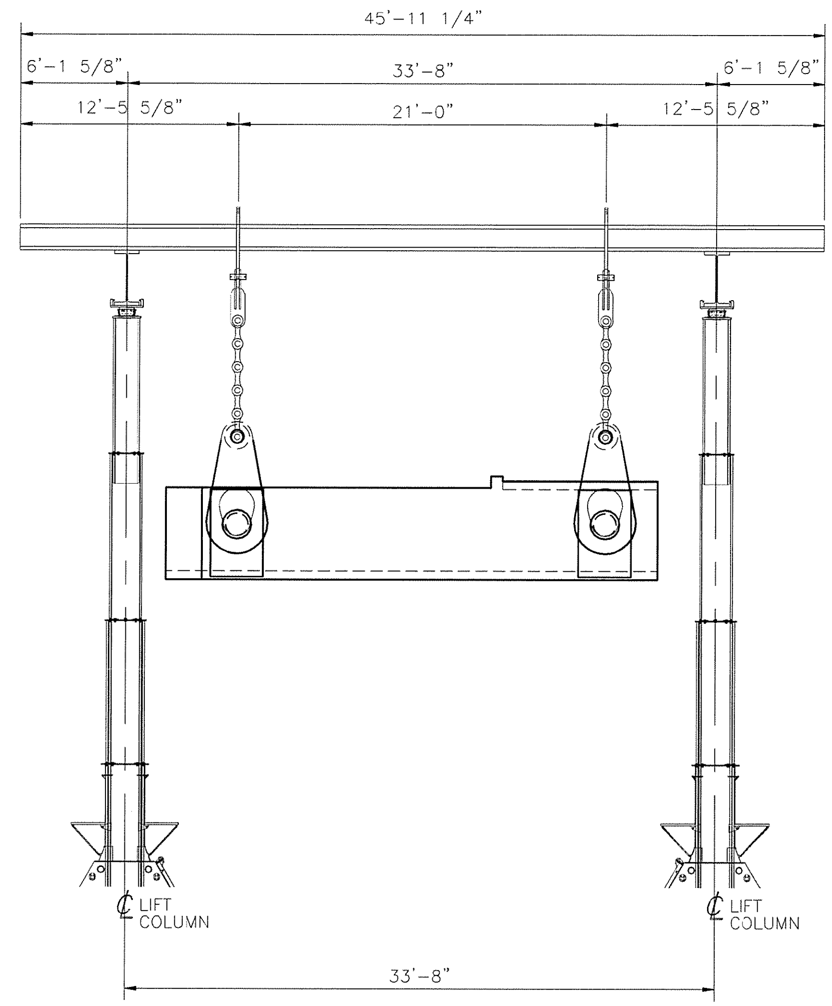
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

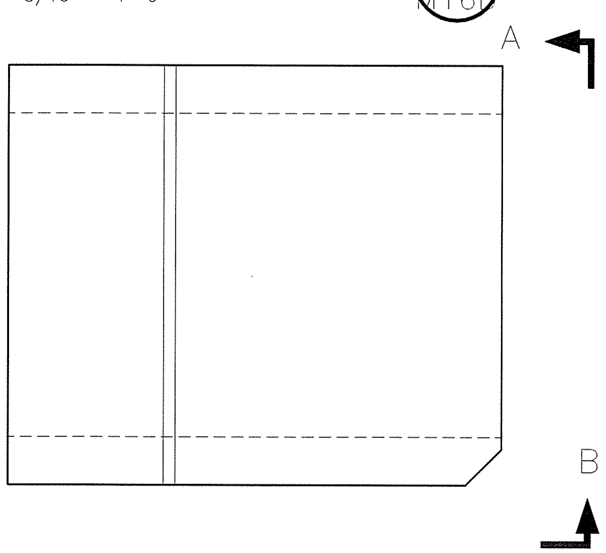
DRAWING NO.	REV. NO.
M16D	A



SECTIONAL ELEVATION (A / M16D)
3/16" = 1'-0"



SECTIONAL ELEVATION (B / M16D)
3/16" = 1'-0"



PLAN
MONOLITH 16
AT SMF ROOF NORTH

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/16"= 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
MONOLITH 16 RIGGING DETAILS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M16D.DWG

TASK	DRAWING NO.	REV. NO.
	M16D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

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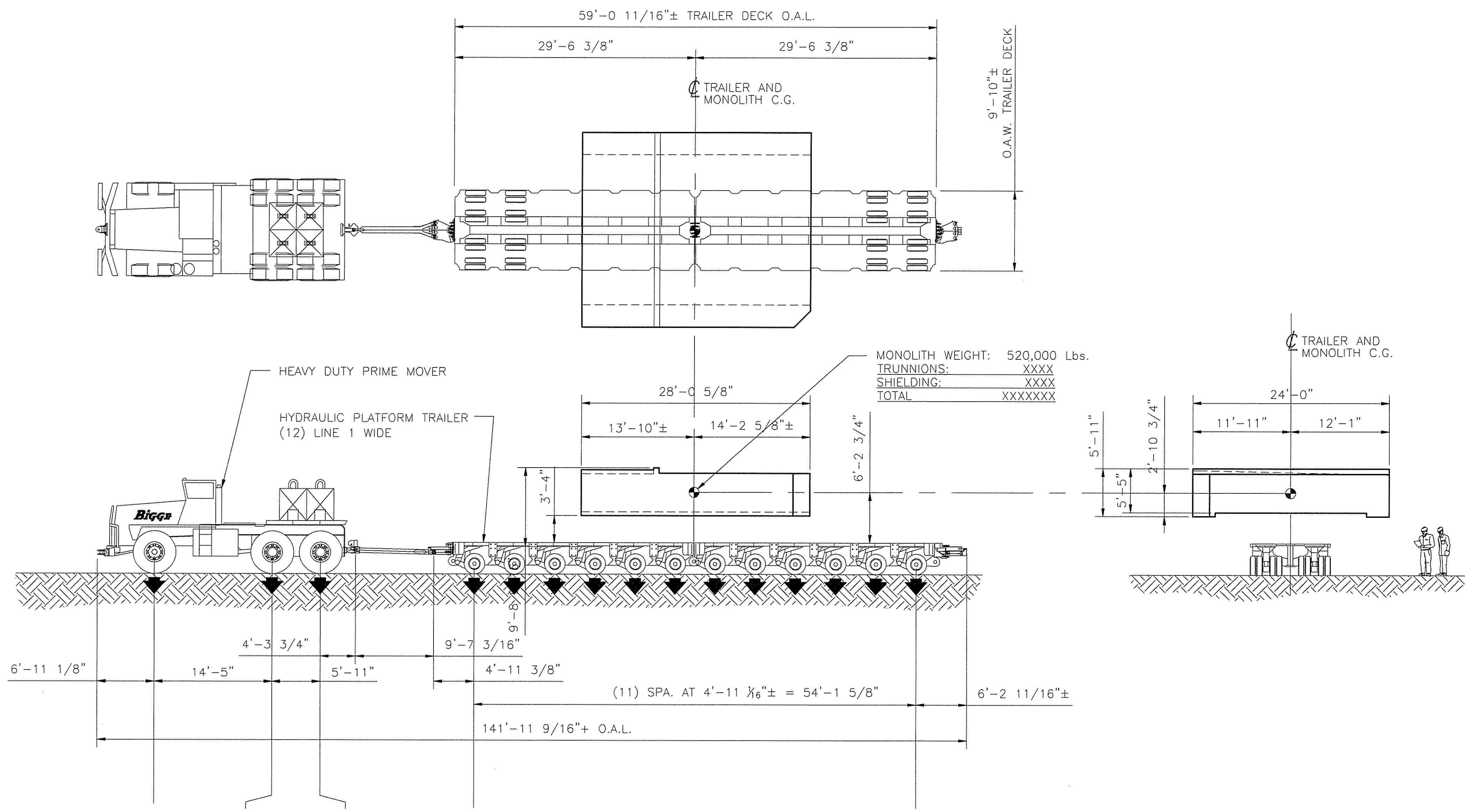
DRAWING NO.	REV. NO.
M16F	A

NOTE: FOR TRAILER SWEEP SEE DWG. M1F



AXLE No.	1	2	3	4 – 15
No. TIRES/AXLE	2	4	4	8
WIDTH	11'-9"	12'-7"	12'-7"	9'-10"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 96)

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	145,400 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

SMF ROOF NORTH
MONOLITH 16
ELEVATION VIEW — / M16F

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

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RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
SMF ROOF NORTH TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M16F.DWG

TASK	DRAWING NO.	REV. NO.
	M16F	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

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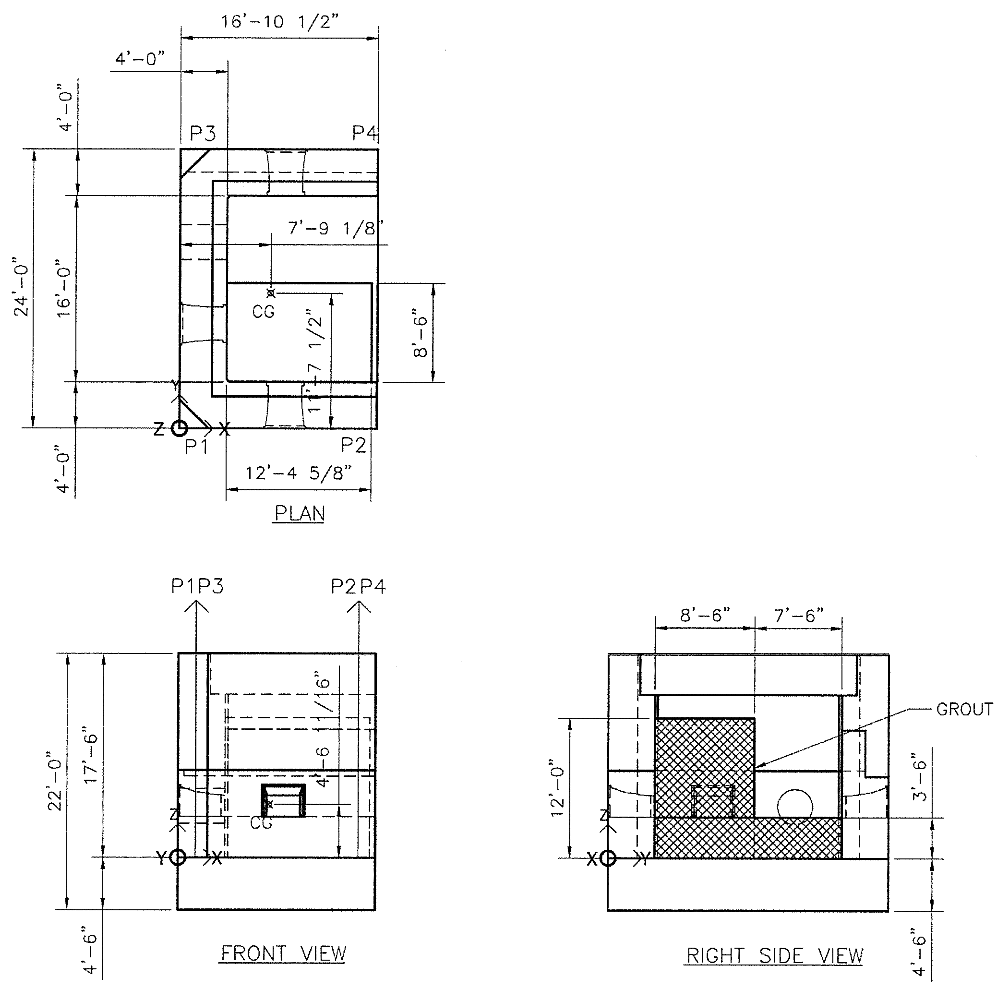
DRAWING NO.	REV. NO.
XX	A



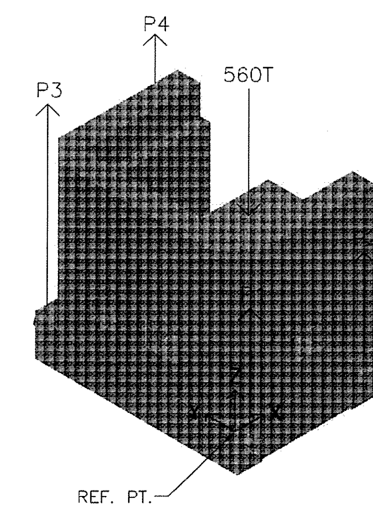
SCALE: 1/8" = 1'-0"

SMF SOUTH WALL AND SLAB
MONOLITH NO. 17

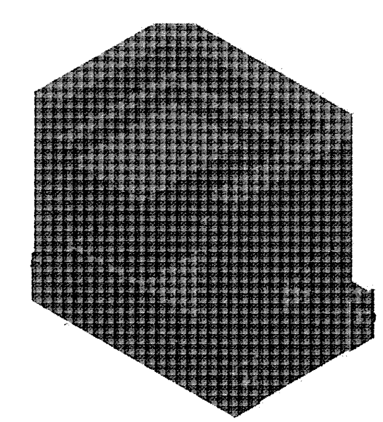
EST. WEIGHT: 560 TON

CENTROID: X: 93.1 IN
Y: 139.5 IN
Z: 54.7 IN

P1	158.5
P2	130.3
P3	148.8
P4	122.4
TOTAL	560T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH DIMENSIONS, WEIGHT, CG, RAD
SOUTH WALL AND SLAB DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

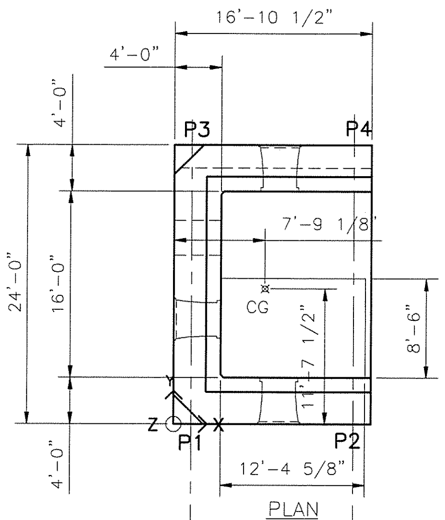
TASK	DRAWING NO.	REV. NO.
–	M17A	A

RECORD INFORMATION

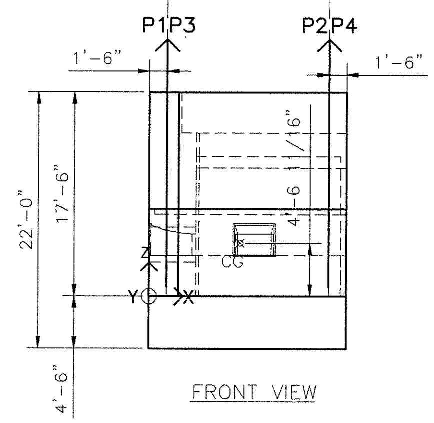
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated WCH Excellence

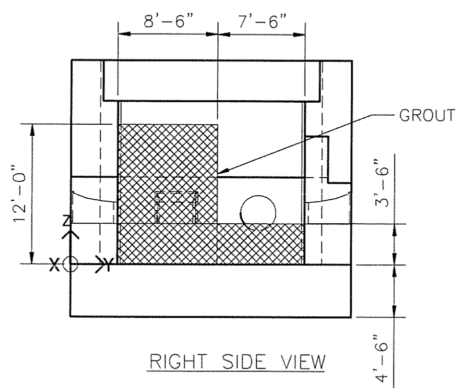
DRAWING NO.	REV. NO.
XX	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

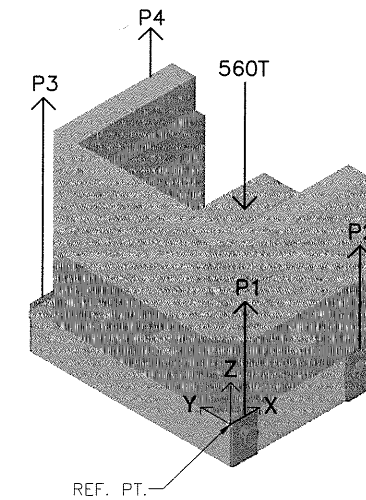
SCALE: 1/8" = 1'-0"

SMF SOUTH WALL AND SLAB
MONOLITH NO. 17

EST. WEIGHT: 560 TON

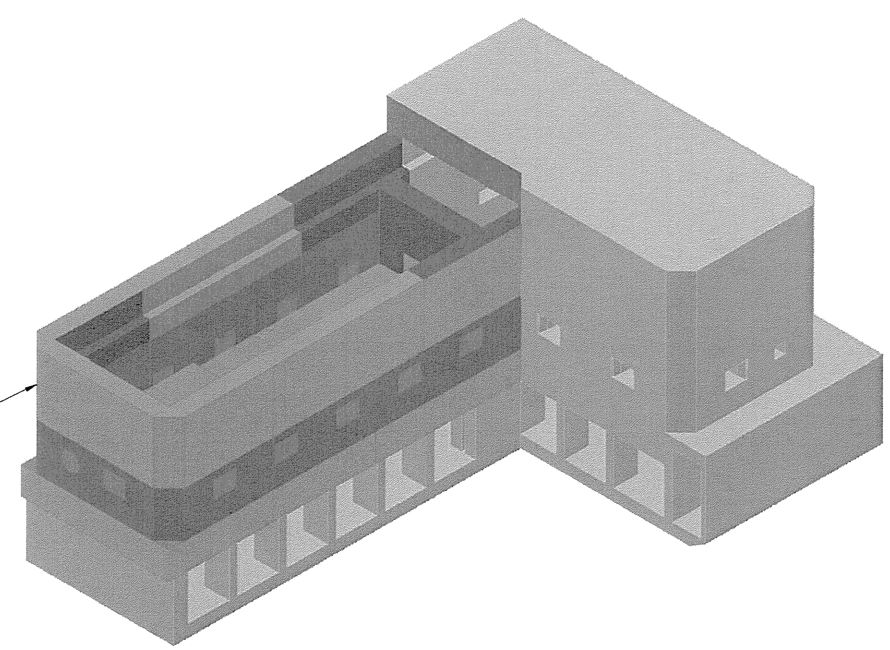
CENTROID: X: 93.1 IN
Y: 139.5 IN
Z: 54.7 IN

P1	158.5
P2	130.3
P3	148.8
P4	122.4
TOTAL	560T

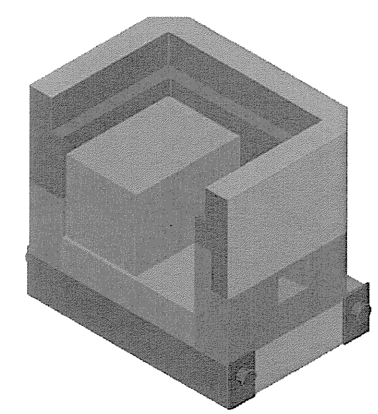


ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

MONOLITH NO. 17



SMF ISOMETRIC VIEW
NOT TO SCALE



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ARRAGEMENT
SOUTH WALL AND SLAB DETAIL PLAN/ISOMETRIC VIEW

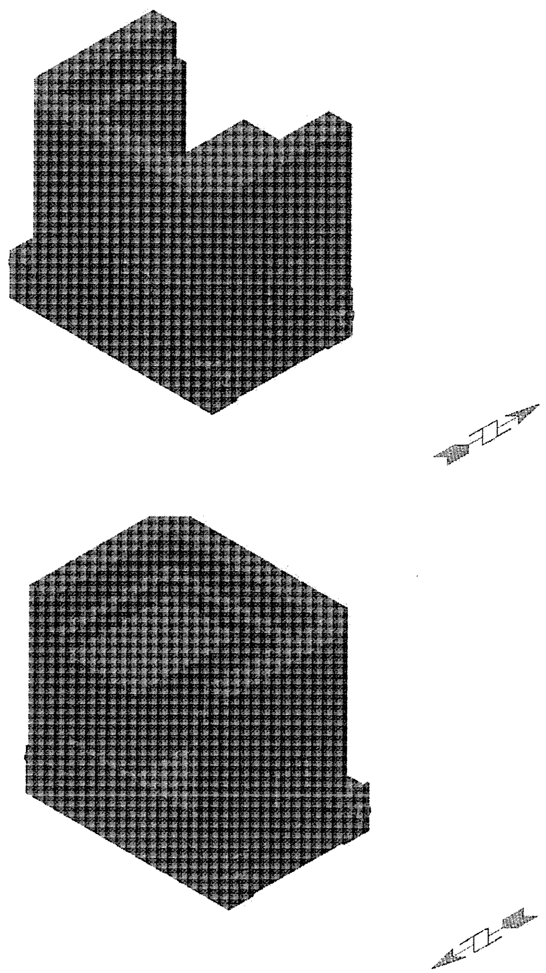
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M17B	A

RECORD INFORMATION

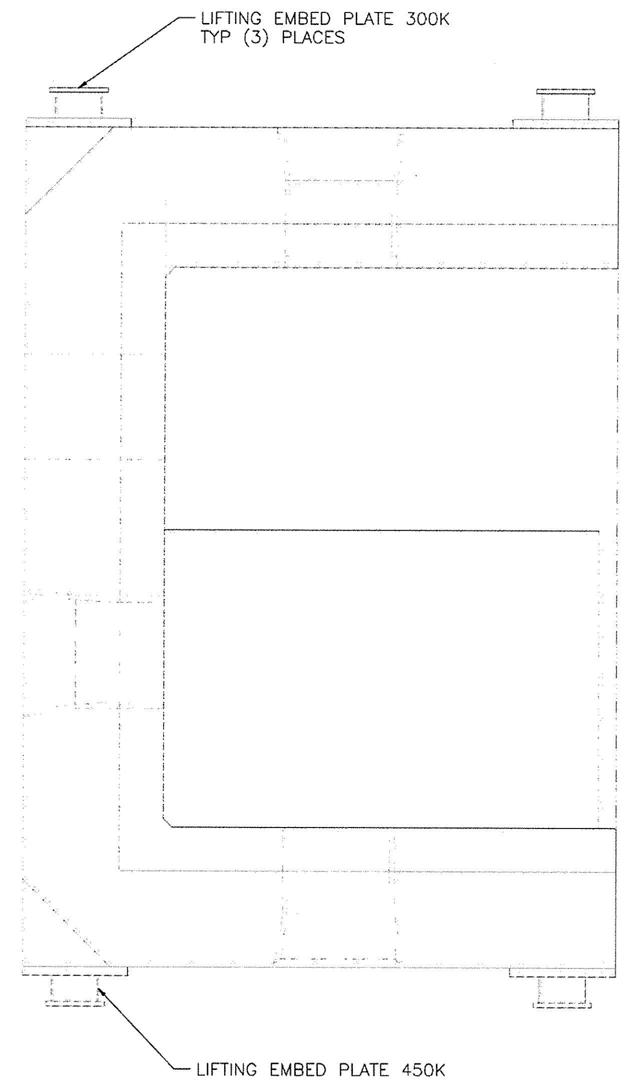
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 M17C ISOMETRIC VIEWS – MONOLITH 17

SCALE: NONE



2 M17C PLAN – MONOLITH 17

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF SOUTH – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M17C	A

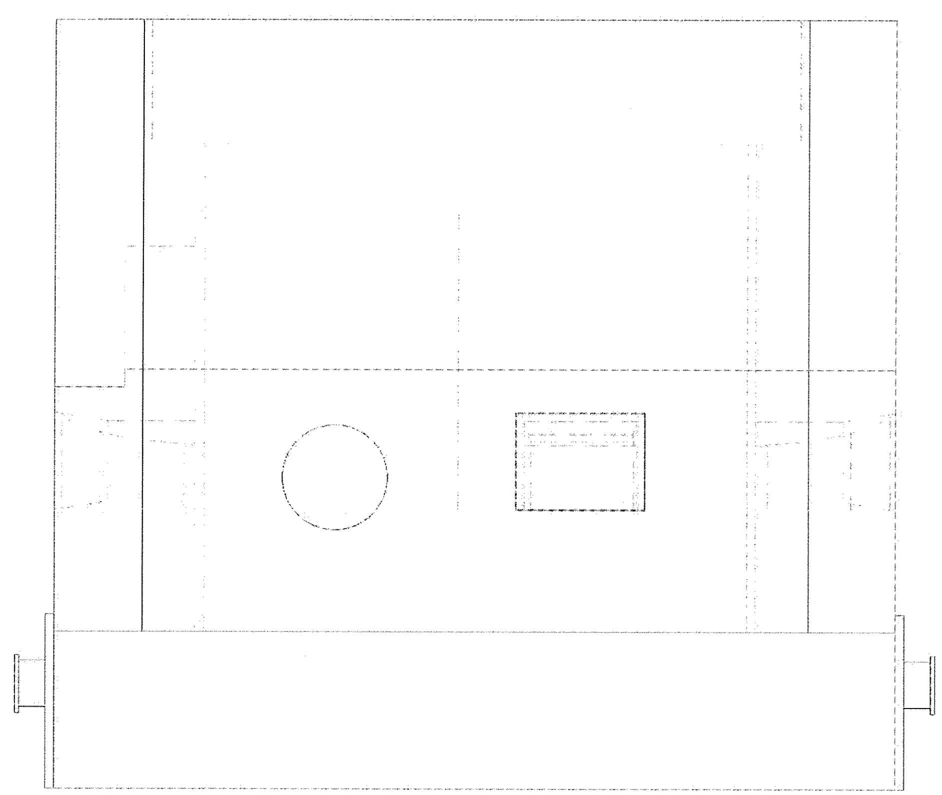
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

River Corridor Closure Contract
Dedicated to Safety & Excellence

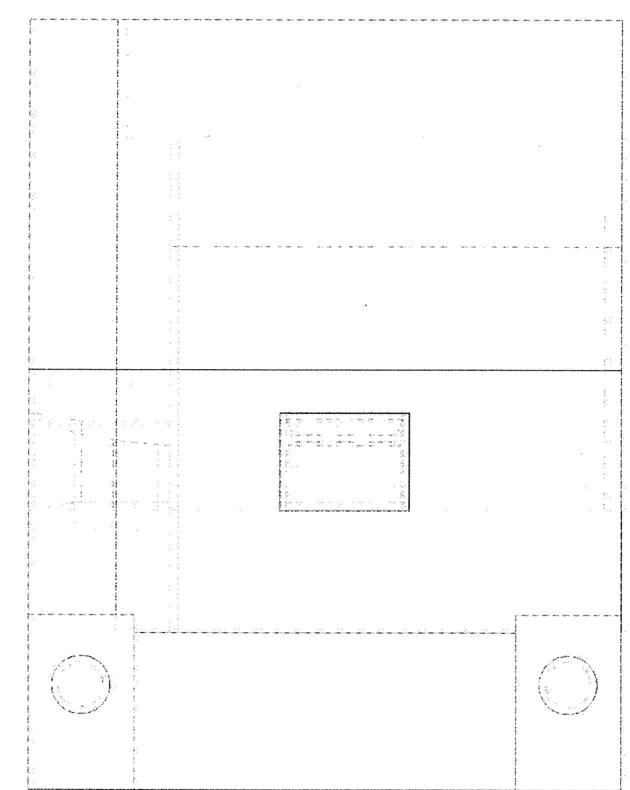
DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 / M17C1 SOUTH ELEVATION – MONOLITH 17

SCALE: 3/8"=1'-0"



2 / M17C1 EAST ELEVATION – MONOLITH 17

SCALE: 3/8"=1'-0"

River Corridor Closure Contract — Dedicated WCH Excellence

RECORD INFORMATION		
RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC. RICHLAND, WASHINGTON	DCI ENGINEERS 400 SW 6TH AVE PORTLAND, OREGON 9704

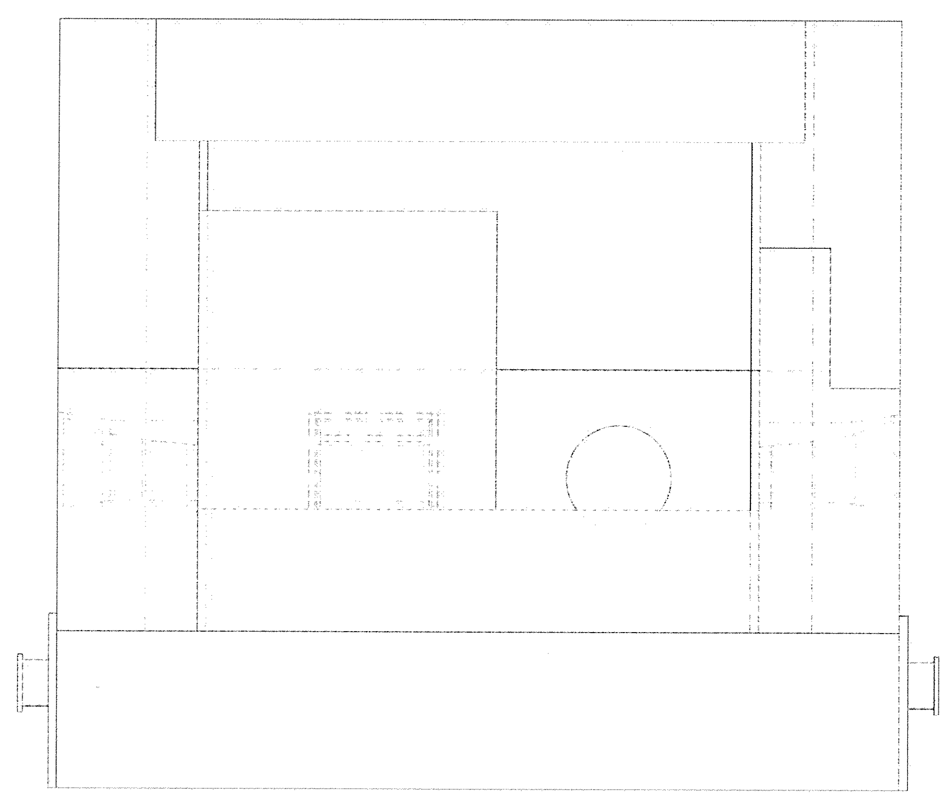
BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF SOUTH – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

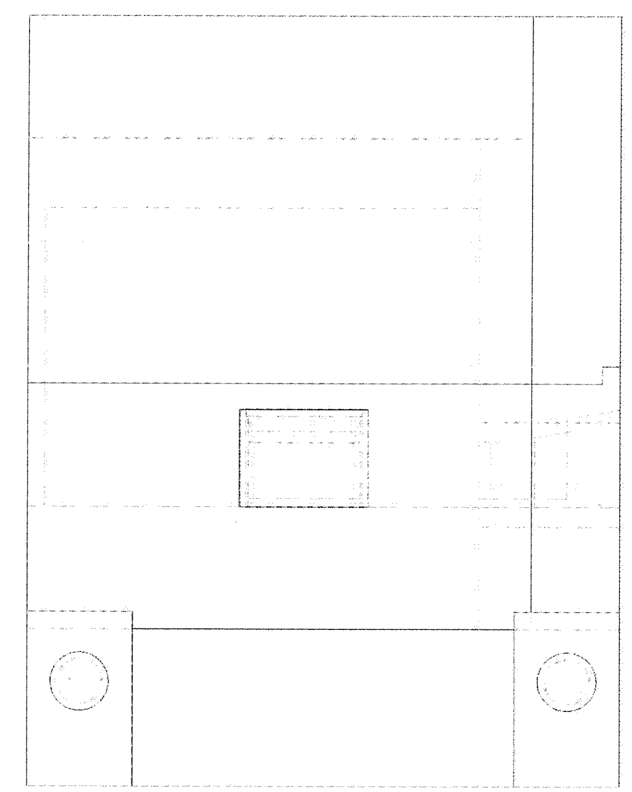
TASK	DRAWING NO.	REV. NO.
–	M17C1	A

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1
M17C2
NORTH ELEVATION – MONOLITH 17
SCALE: 3/8"=1'-0"



2
M17C2
WEST ELEVATION – MONOLITH 17
SCALE: 3/8"=1'-0"

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF SOUTH – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M17C2	A

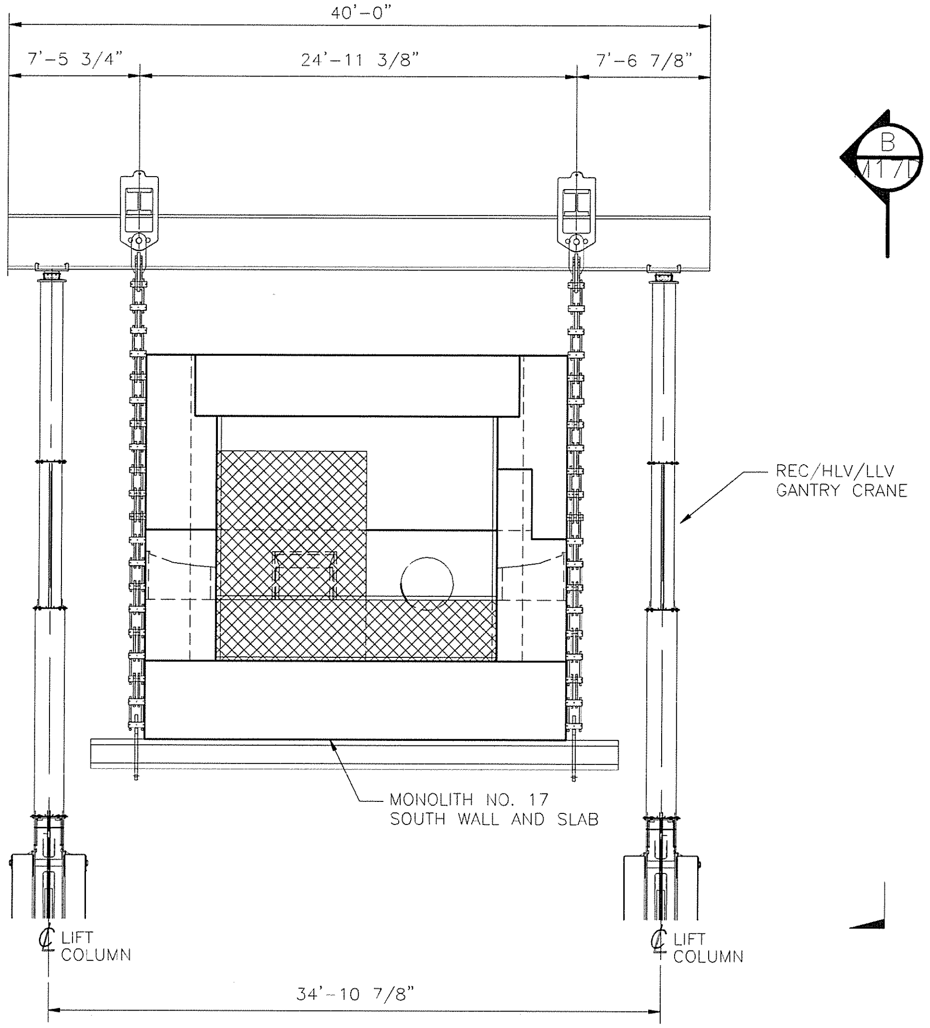
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

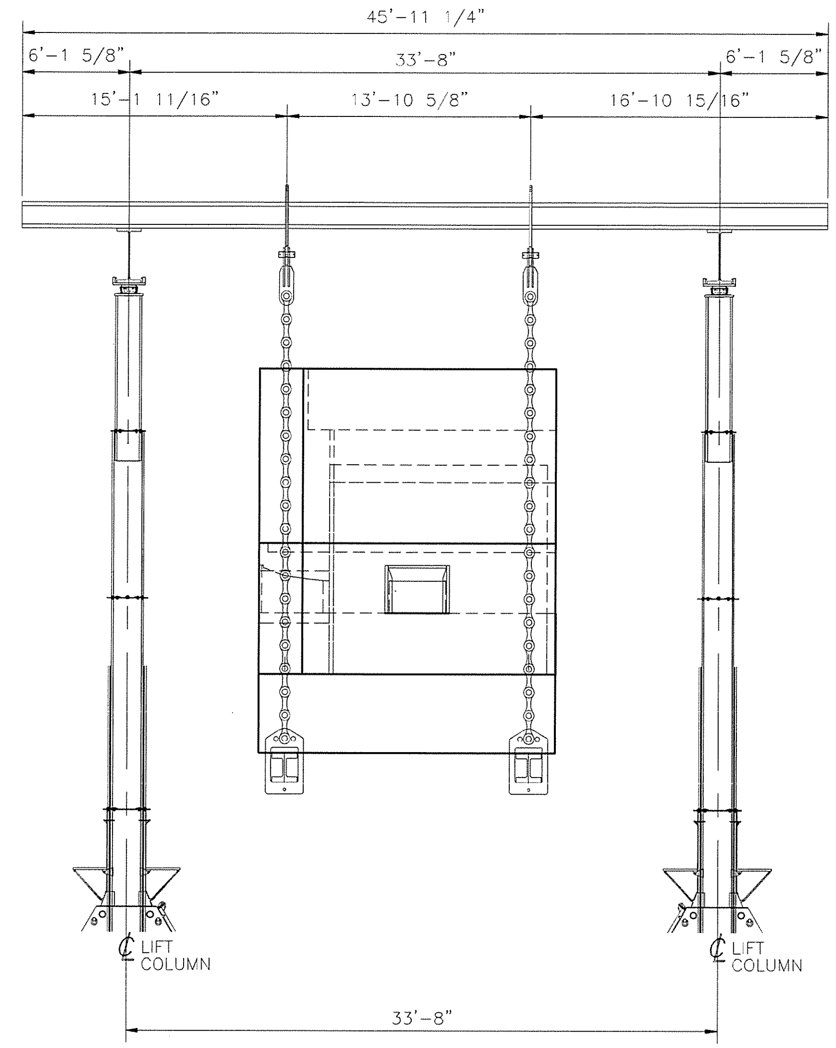
River Corridor Closure Contract
Dedicated WCH to Excellence

DRAWING NO.	REV. NO.
M17D	A

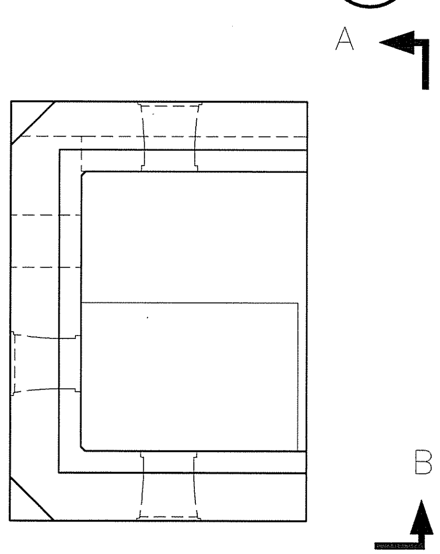
NOTES



SECTIONAL ELEVATION (A / M17D)
3/16" = 1'-0"



SECTIONAL ELEVATION (B / M17D)
3/16" = 1'-0"



PLAN
MONOLITH 17
SOUTH WALL AND SLAB

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
△								
△								
△								
△								
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/16"= 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
MONOLITH 17 RIGGING DETAILS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M17D.DWG

TASK	DRAWING NO.	REV. NO.
	M17D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

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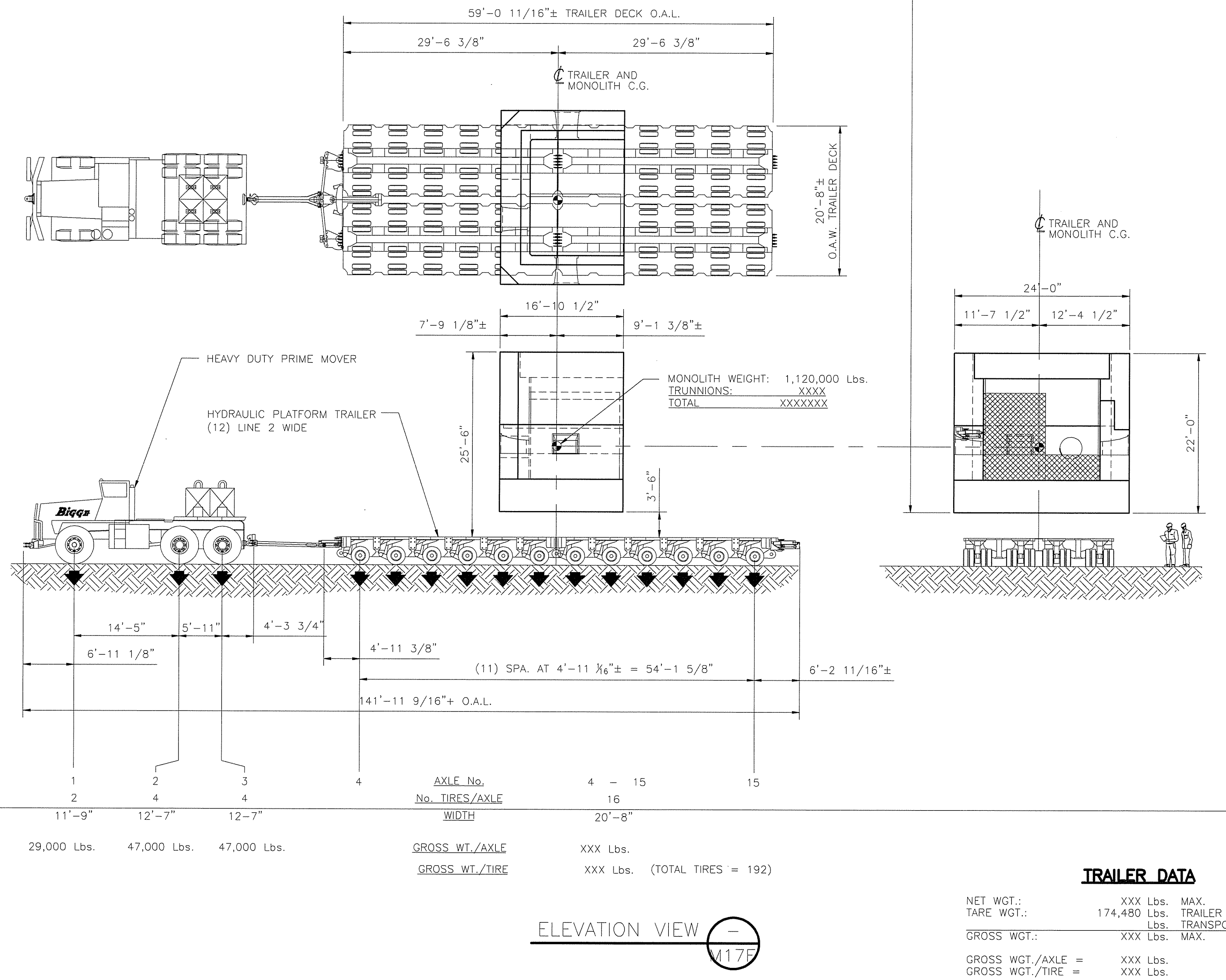
DRAWING NO.	REV. NO.
M17F	A

NOTE: FOR TRAILER SWEEP SEE DWG. M11F



AXLE No.	1	2	3	4 – 15
No. TIRES/AXLE	2	4	4	16
WIDTH	11'-9"	12'-7"	12-7"	20'-8"
GROSS WT./AXLE	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 192)

ELEVATION VIEW — M17F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	174,480 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
SOUTH WALL AND SLAB TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M17F.DWG

TASK	DRAWING NO.	REV. NO.
	M17F	A

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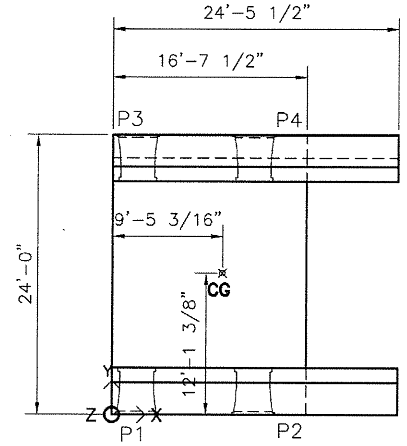
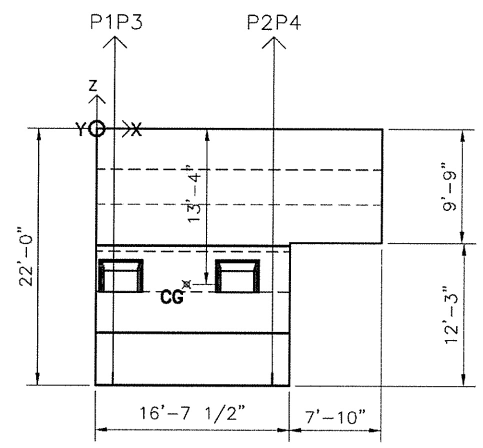
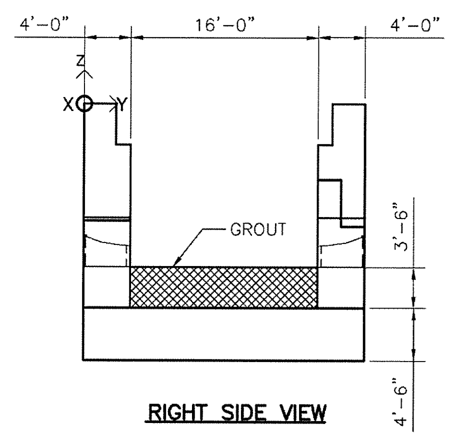
DRAWING NO.	REV. NO.
XX	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

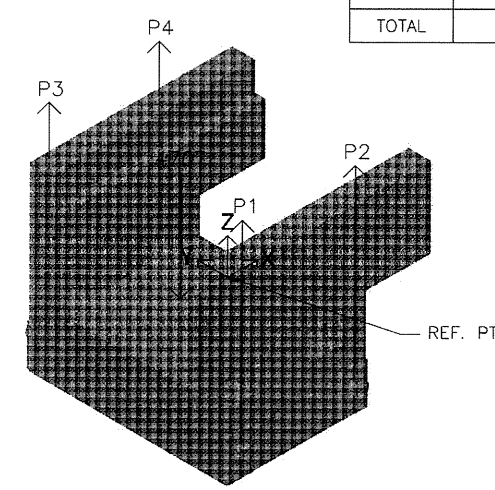
SCALE: 1/8" = 1'-0"

SMF MID WALL AND SLAB
MONOLITH NO. 18

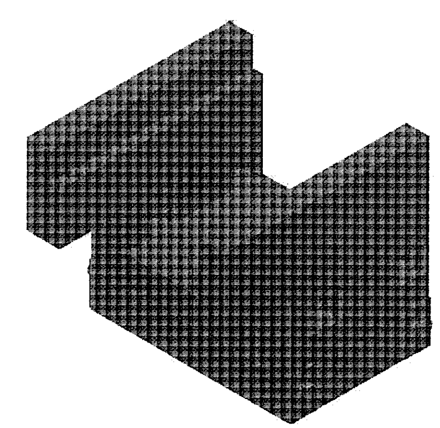
EST. WEIGHT: 470 TON

CENTROID: X: 113.2 IN
Y: 145.4 IN
Z: 160.0 IN

P1	97.3
P2	135.5
P3	99.2
P4	138.1
TOTAL	470T



ISOMETRIC VIEW



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH DIMENSIONS, WEIGHT, CG, RAD
MID WALL AND SLAB DETAIL PLAN/ISOMETRIC VIEW

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

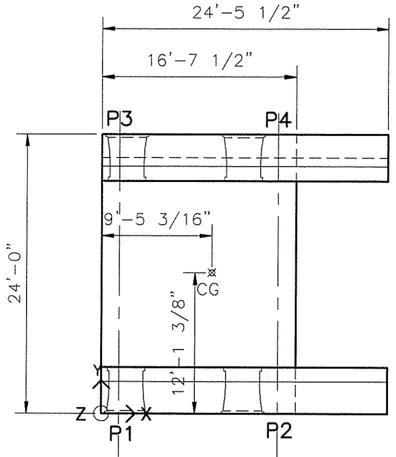
TASK	DRAWING NO.	REV. NO.
–	M18A	A

RECORD INFORMATION

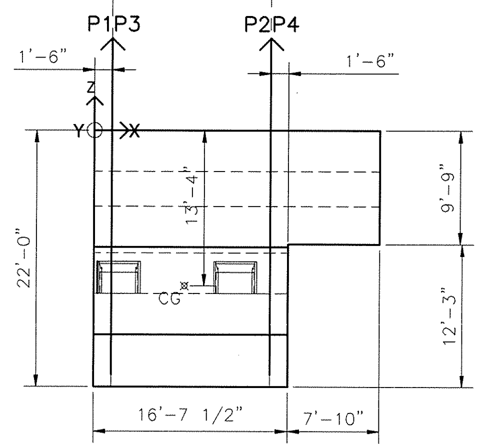
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated to Safety & Excellence

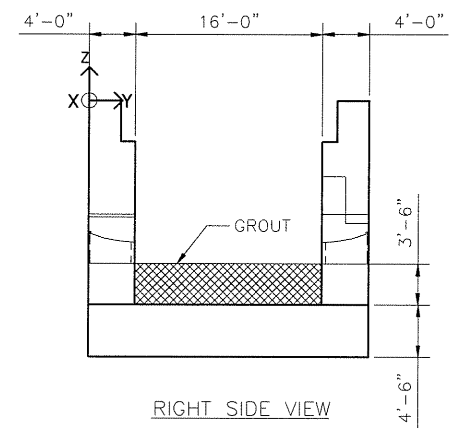
DRAWING NO.	REV. NO.
XX	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

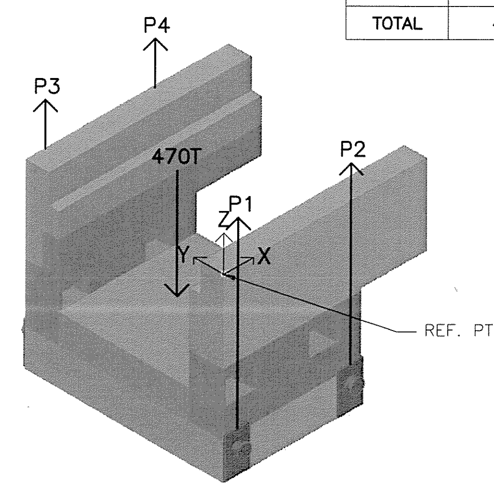
SCALE: 1/8" = 1'-0"

SMF MID WALL AND SLAB
MONOLITH NO. 18

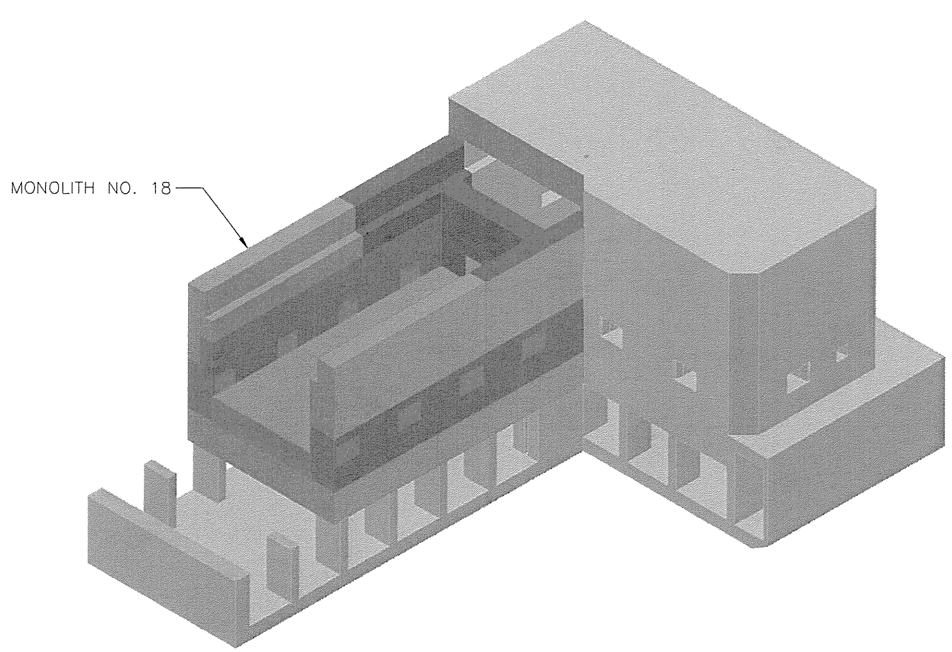
EST. WEIGHT: 470 TON

CENTROID: X: 113.2 IN
Y: 145.4 IN
Z: 160.0 IN

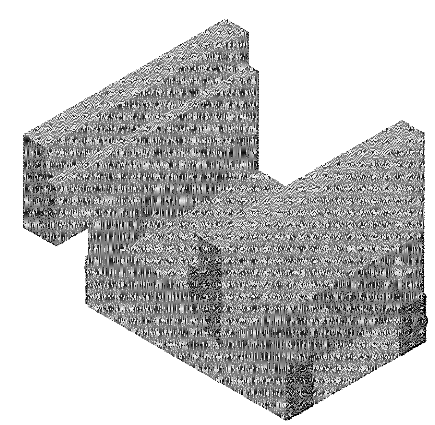
P1	97.3
P2	135.5
P3	99.2
P4	138.1
TOTAL	470T



ISOMETRIC VIEW



SMF ISOMETRIC VIEW
NOT TO SCALE



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ARRAGEMENT
MID WALL AND SLAB DETAIL PLAN/ISOMETRIC VIEW

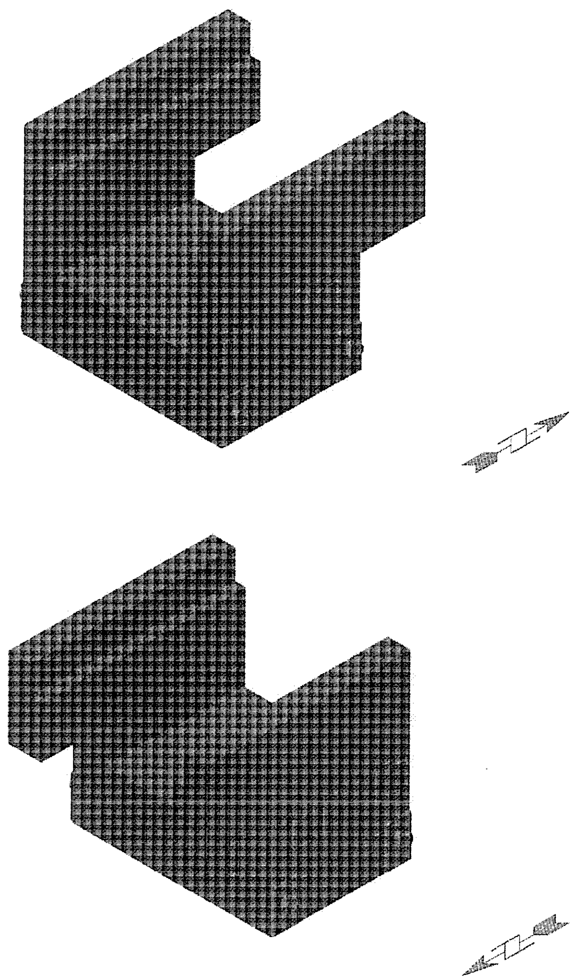
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M18B	A

RECORD INFORMATION

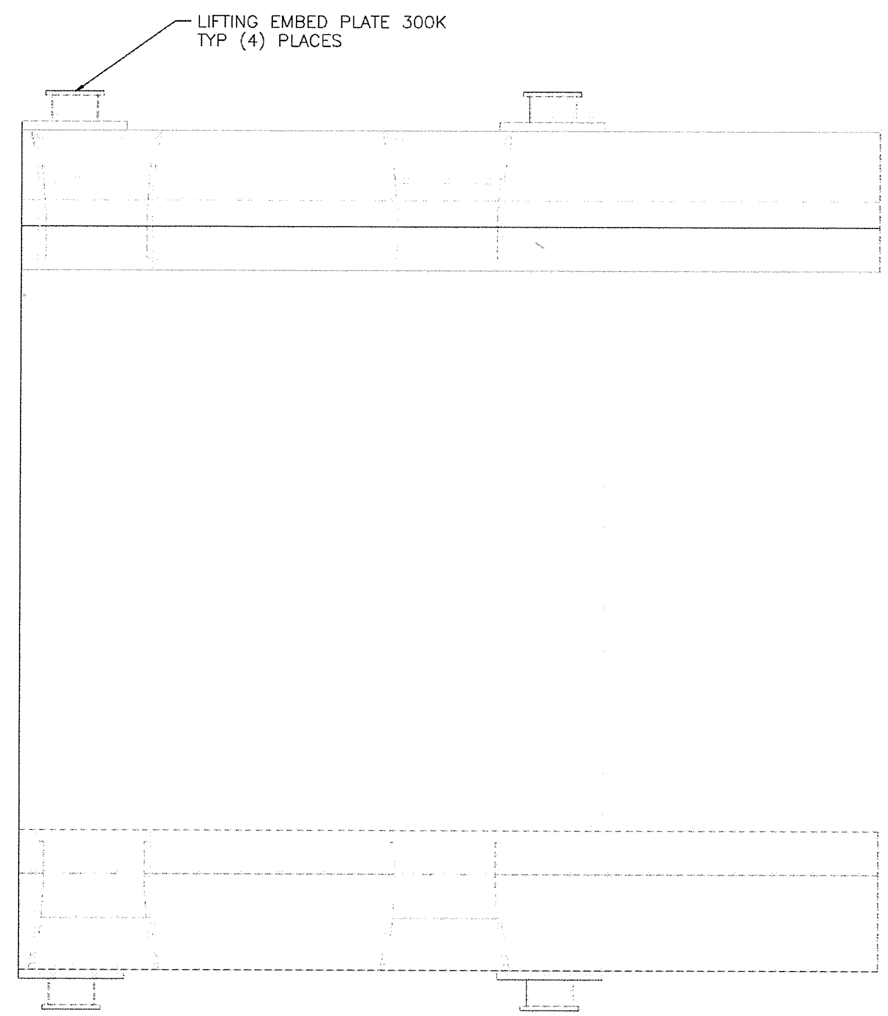
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M18C ISOMETRIC VIEWS – MONOLITH 18

SCALE: NONE



2 / M18C PLAN – MONOLITH 18

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF MID – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

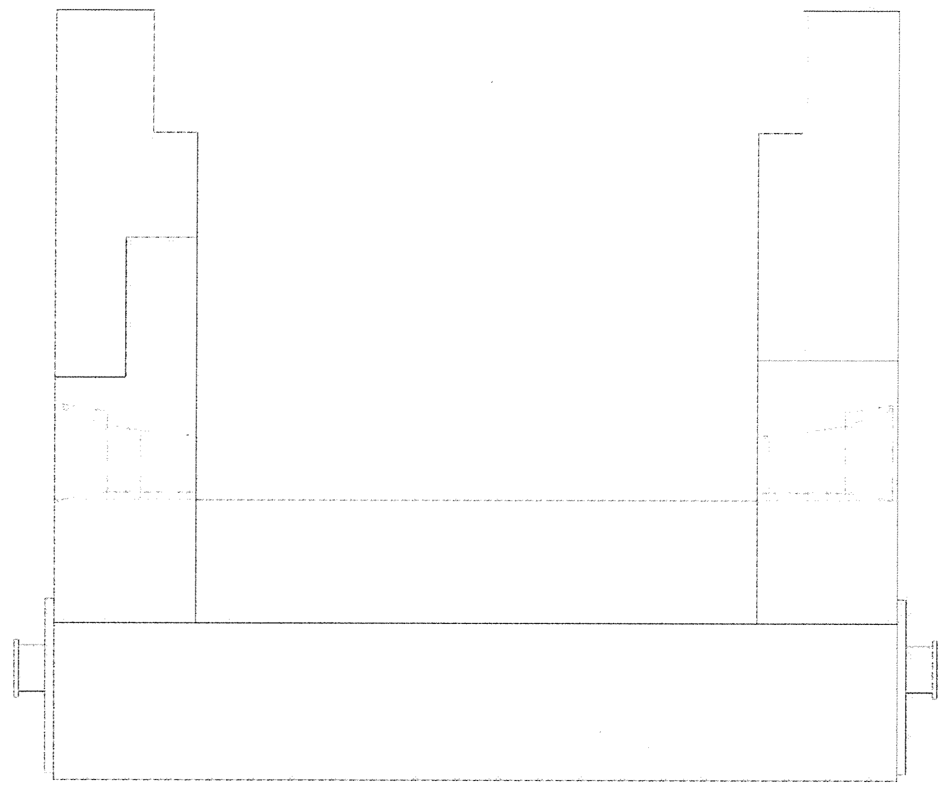
TASK	DRAWING NO.	REV. NO.
–	M18C	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

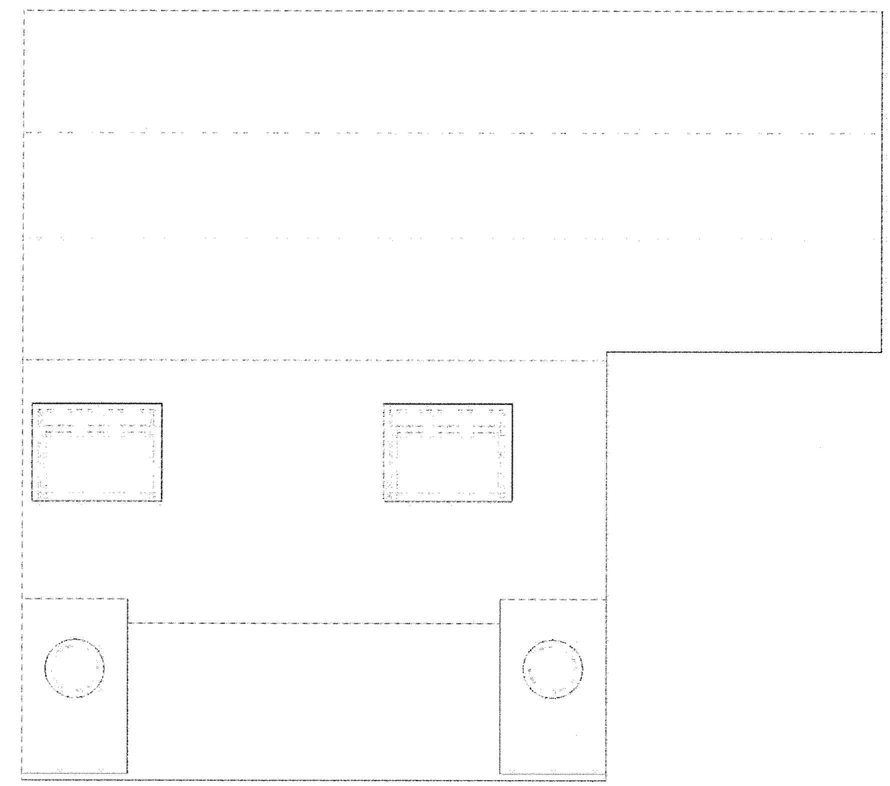
River Corridor Closure Contract — Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M18C1 SOUTH ELEVATION – MONOLITH 18

SCALE: 3/8"=1'-0"



2 / M18C1 EAST ELEVATION – MONOLITH 18

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF MID – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

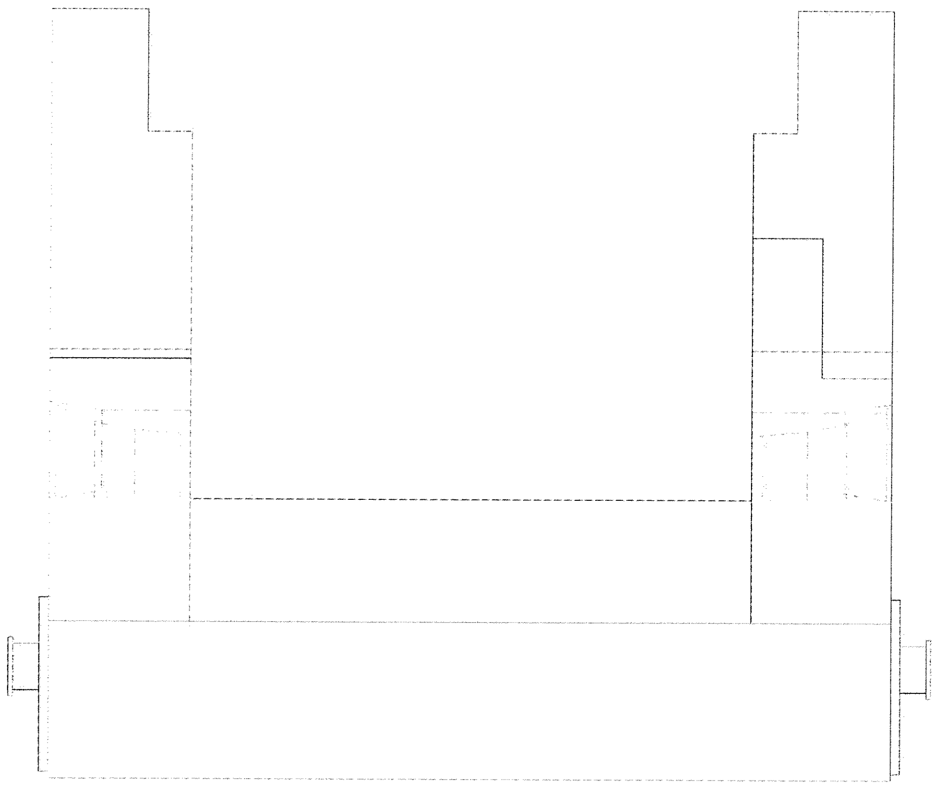
TASK	DRAWING NO.	REV. NO.
–	M18C1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

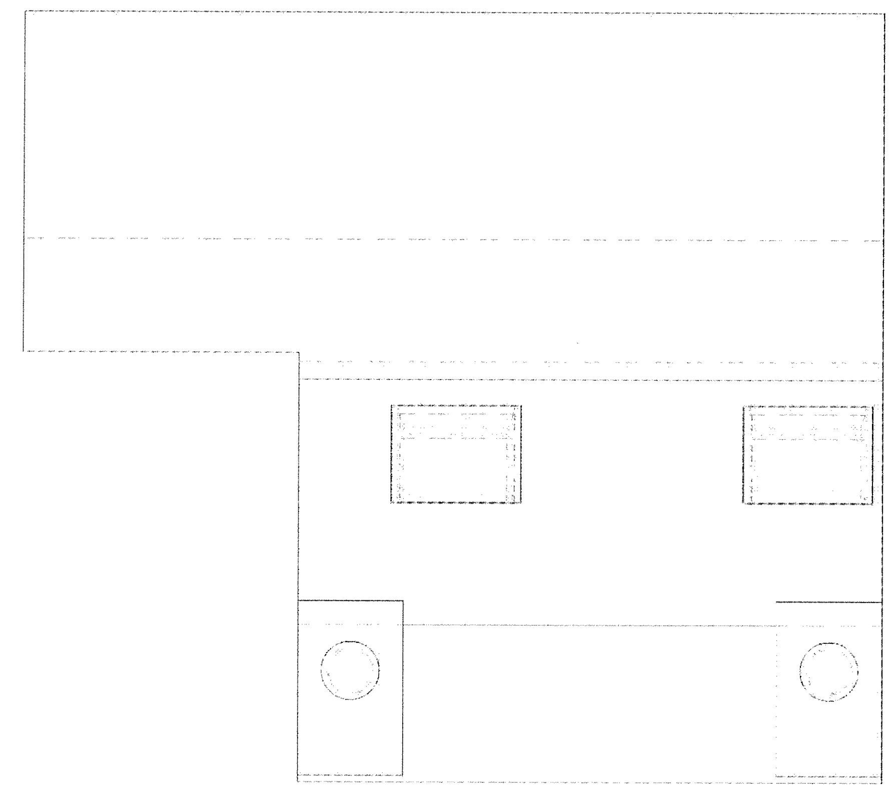
River Corridor Closure Contract – Dedicated to Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 M18C2 NORTH ELEVATION – MONOLITH 18

SCALE: 3/8"=1'-0"



2 M18C2 WEST ELEVATION – MONOLITH 18

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF MID – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M18C2	A

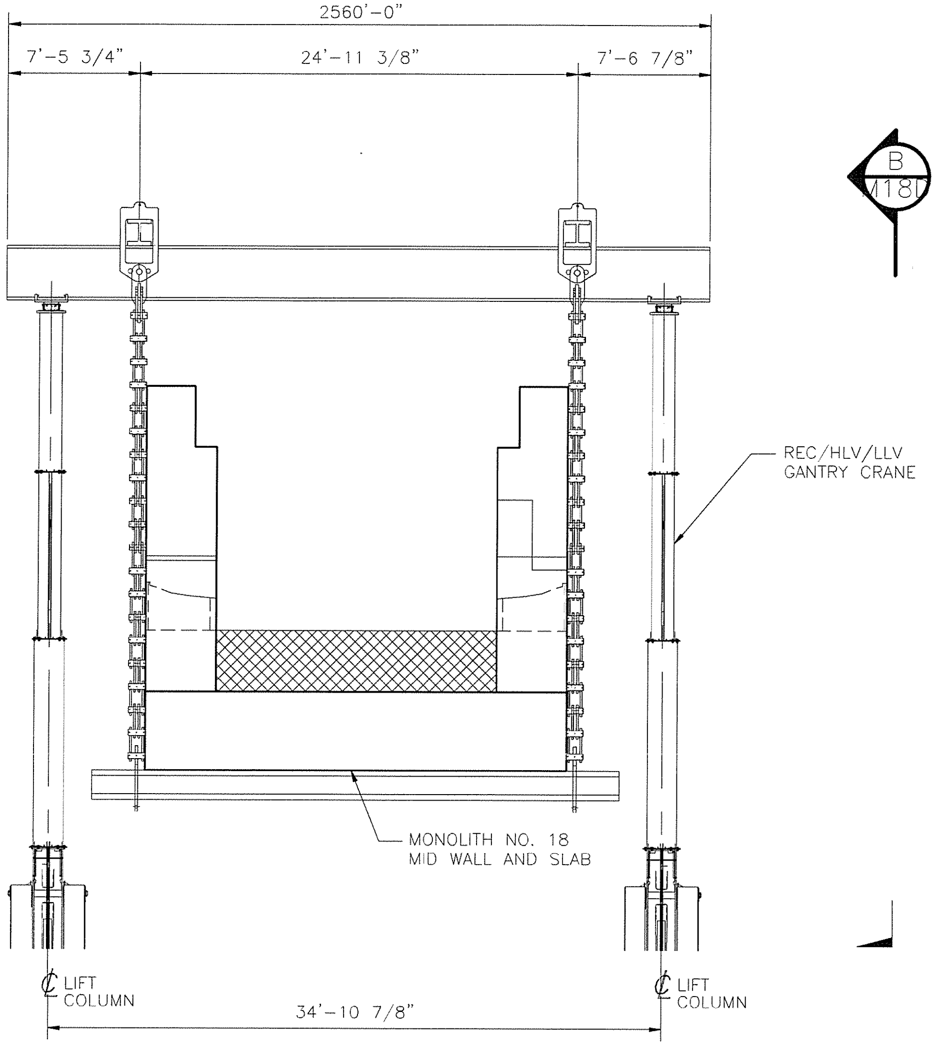
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

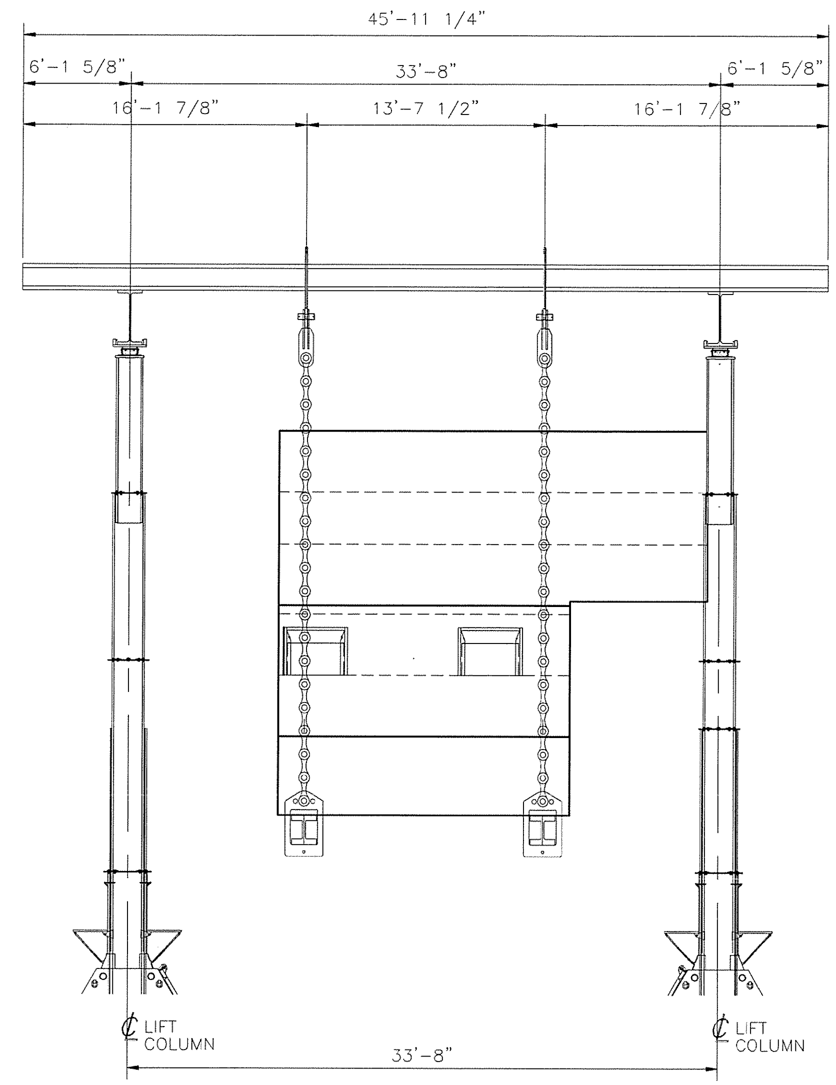
River Corridor Closure Contract
Dedicated to Safety and Excellence

2234_WCH-SUB.DWG 09/05

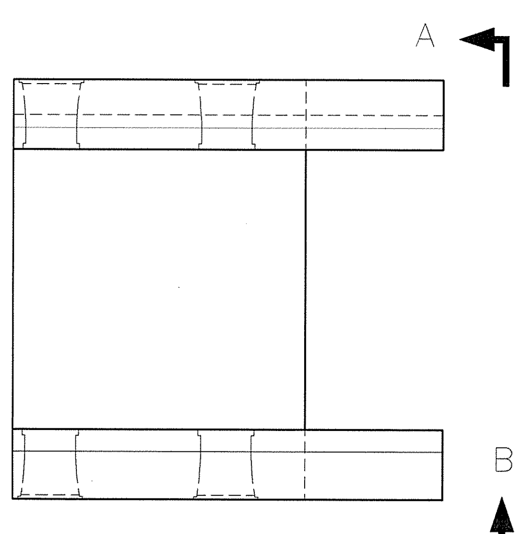
M18D | A



SECTIONAL ELEVATION A / M18D
3/16" = 1'-0"



SECTIONAL ELEVATION B / M18D
3/16" = 1'-0"



PLAN
MONOLITH 18
MID WALL AND SLAB

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/16"= 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
MONOLITH 18 RIGGING DETAILS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M18D.DWG

TASK	DRAWING NO.	REV. NO.
	M18D	A

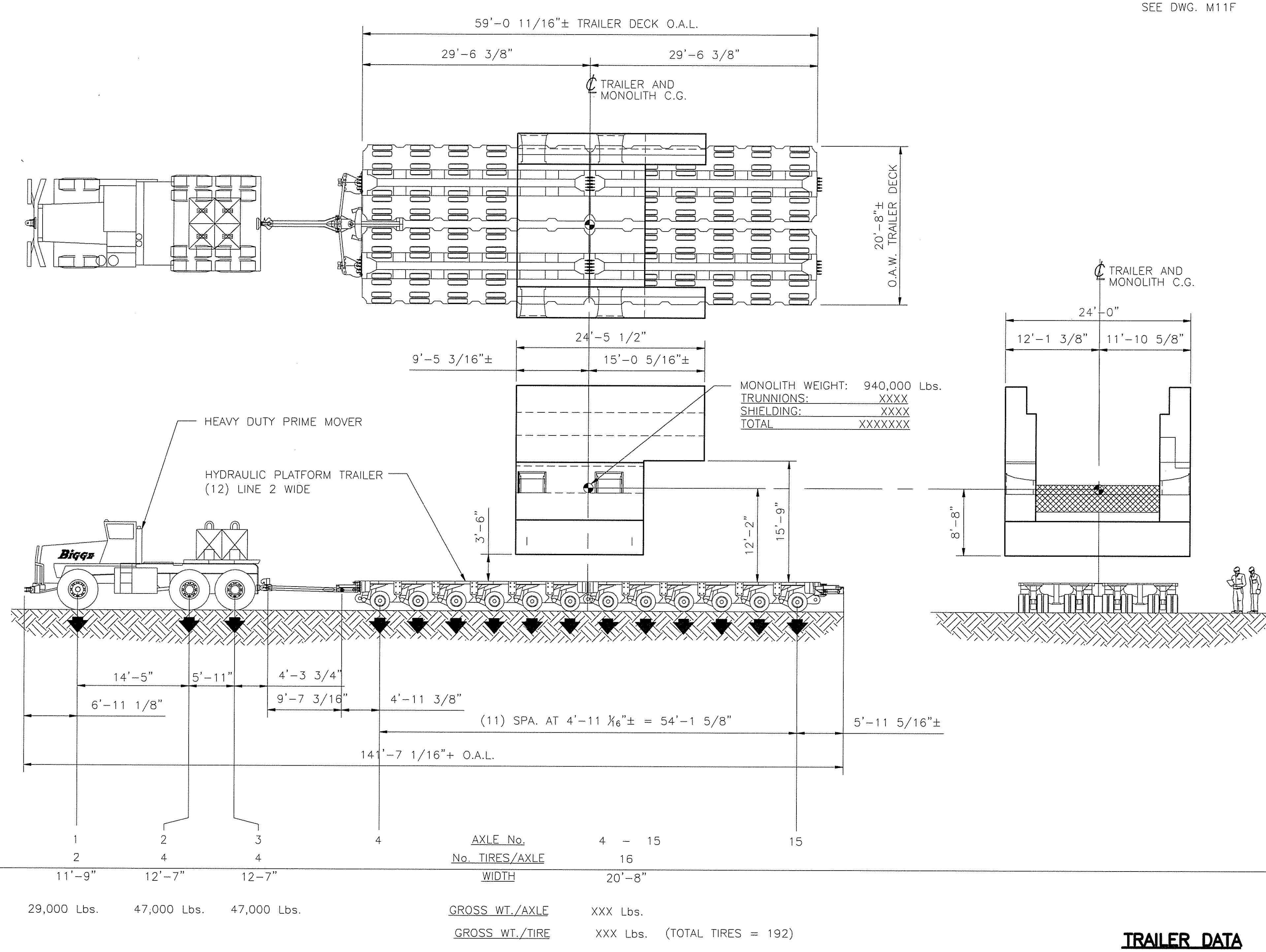
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

G:\Engineering\Jobs\2009\09E37 - 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M15D\...dwg

DRAWING NO.	REV. NO.
M18F	A

NOTE: FOR TRAILER SWEEP SEE DWG. M11F



MID WALL AND SLAB MONOLITH 18

ELEVATION VIEW (– / M18F)

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	174,480 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

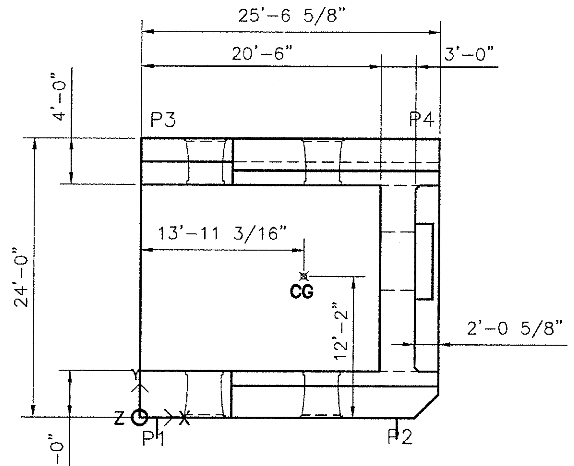
BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
MID WALL AND SLAB TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M18F.DWG

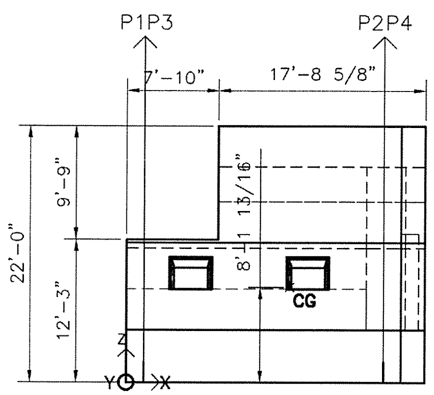
TASK	DRAWING NO.	REV. NO.
	M18F	A

G:\Engineering\Jobs\2009\09E37 – 02299 WCH Hanford Bldg 324 Hot Cell Demo\Drawings\Bigge\M1F-30% Submit.dwg

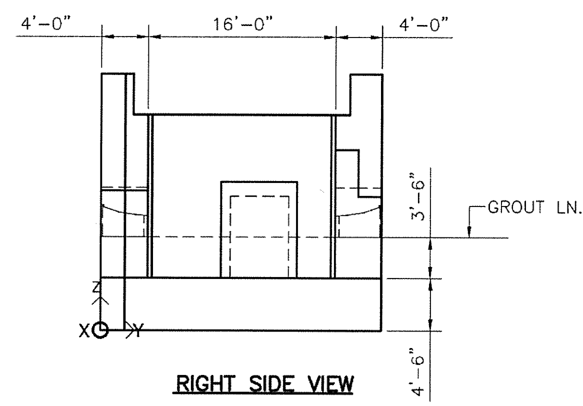
DRAWING NO.	REV. NO.
XX	A



PLAN



FRONT VIEW



RIGHT SIDE VIEW

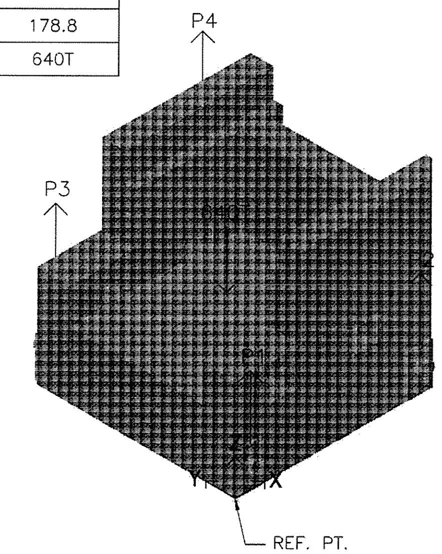
SCALE: 1/8" = 1'-0"

SMF NORTH WALL AND SLAB
MONOLITH NO. 19

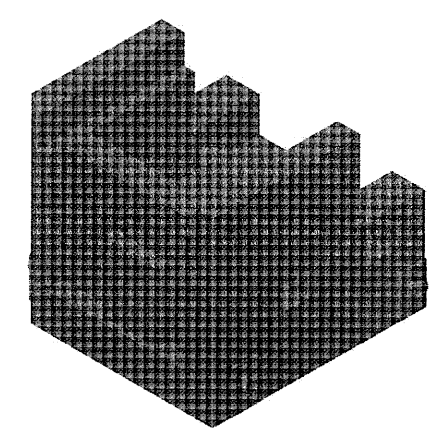
EST. WEIGHT: 640 TON

CENTROID: X: 167.2 IN
Y: 146.0 IN
Z: 97.8 IN

P1	141.6
P2	174.0
P3	145.5
P4	178.8
TOTAL	640T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

River Corridor Closure Contract
Dedicated WCH Excellence

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ORIG/ ENG'R	ENG'R CHK	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

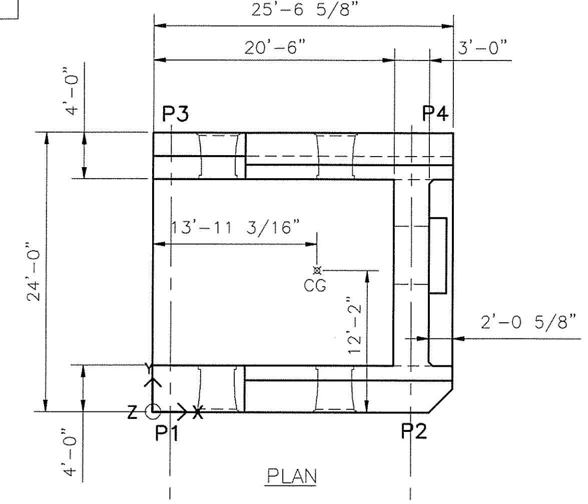
DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH DIMENSIONS, WEIGHT, CG, RAD
SMF ROOF SOUTH DETAIL PLAN/ISOMETRIC VIEW

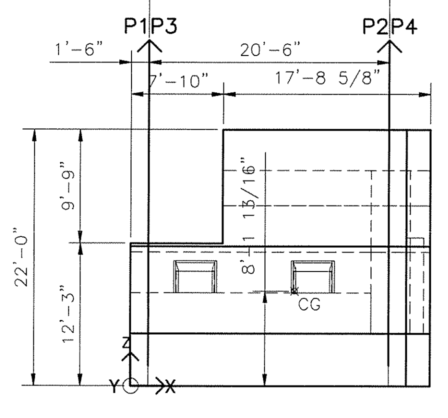
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
_	M19A	A

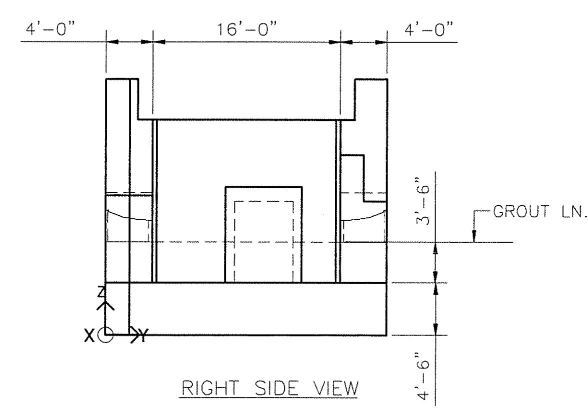
XX	A



PLAN



FRONT VIEW



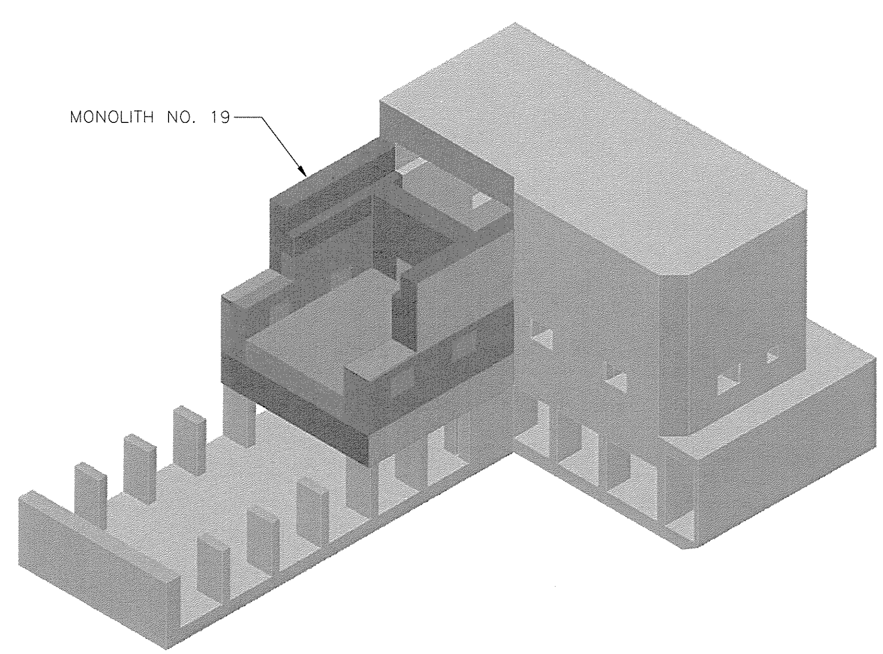
RIGHT SIDE VIEW

SCALE: 1/8" = 1'-0"

SMF NORTH WALL AND SLAB
MONOLITH NO. 19

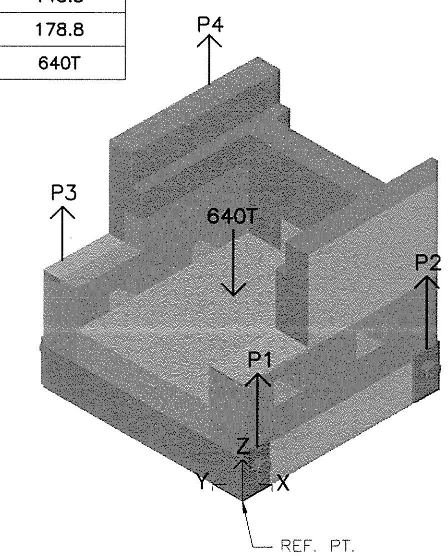
EST. WEIGHT: 640 TON

CENTROID: X: 167.2 IN
Y: 146.0 IN
Z: 97.8 IN

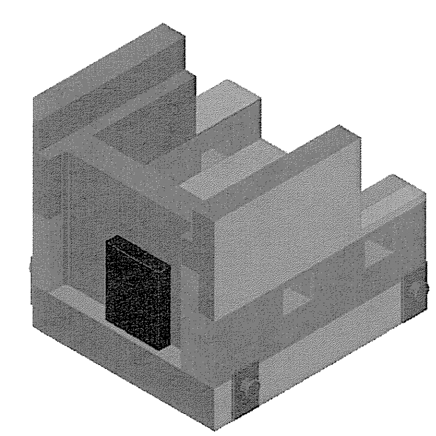


SMF ISOMETRIC VIEW
NOT TO SCALE

P1	141.6
P2	174.0
P3	145.5
P4	178.8
TOTAL	640T



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"



ISOMETRIC VIEW
SCALE: 1/8" = 1'-0"

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	MF		SH	SH		

SCALE: AS SHOWN

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ARAGEMENT
NORTH WALL AND SLAB DETAIL PLAN/ISOMETRIC VIEW

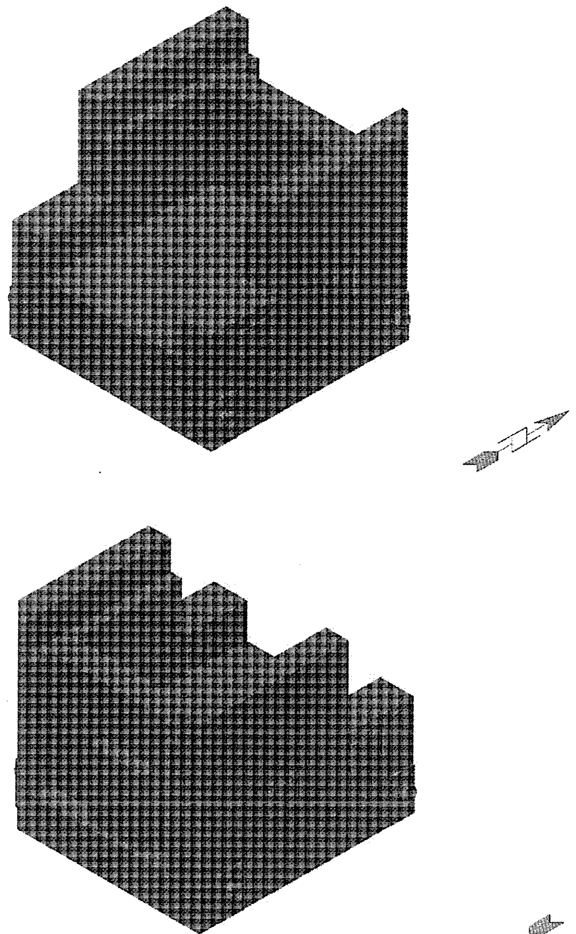
WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XX.DWG

TASK	DRAWING NO.	REV. NO.
	M19B	A

RECORD INFORMATION

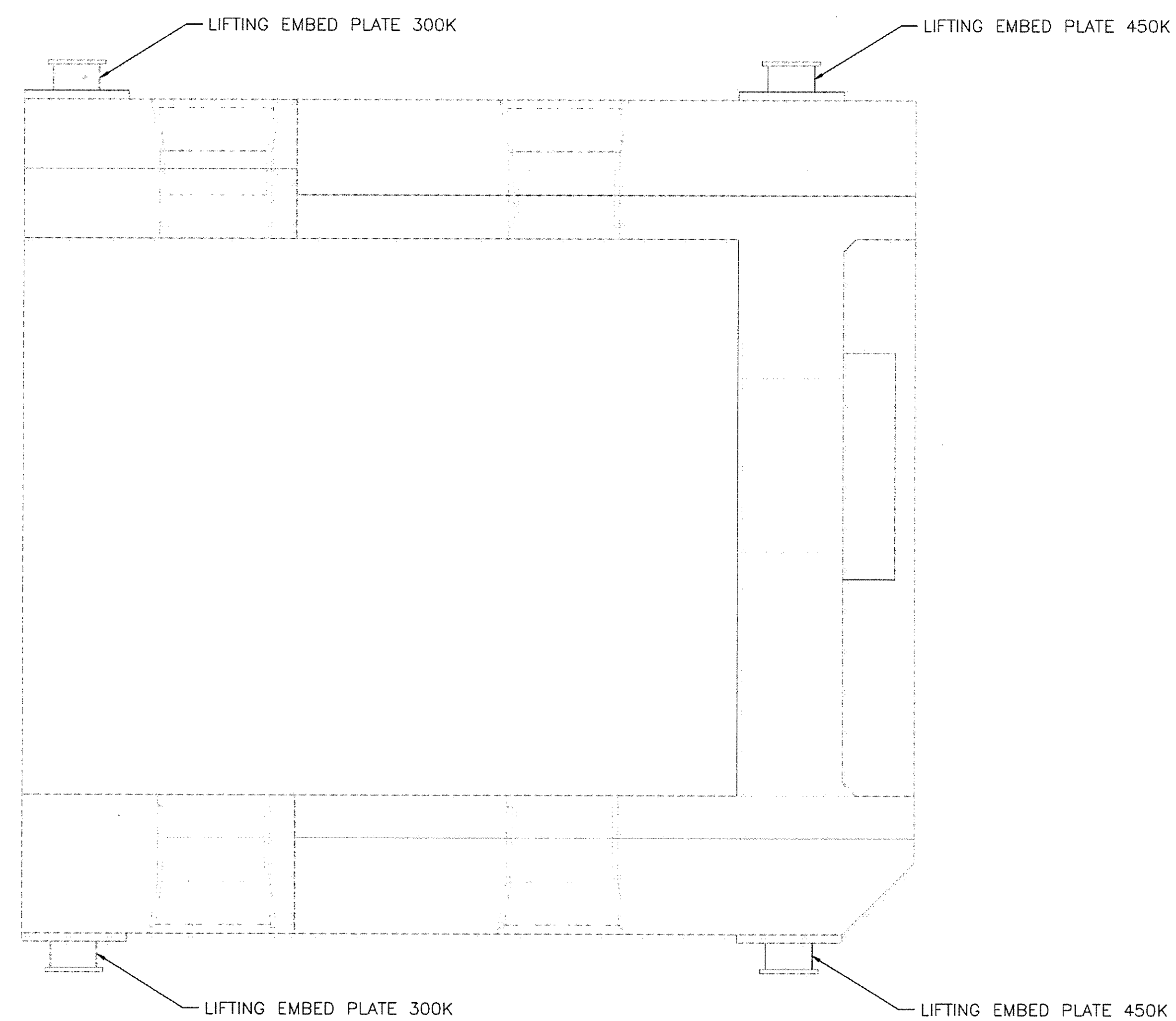
RECORD NO.	BLDG NO.	INDEX NO.

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M19C — ISOMETRIC VIEWS – MONOLITH 19

SCALE: NONE



2 / M19C — PLAN – MONOLITH 19

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF NORTH – ISOMETRIC/PLAN VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

TASK	DRAWING NO.	REV. NO.
–	M19C	A

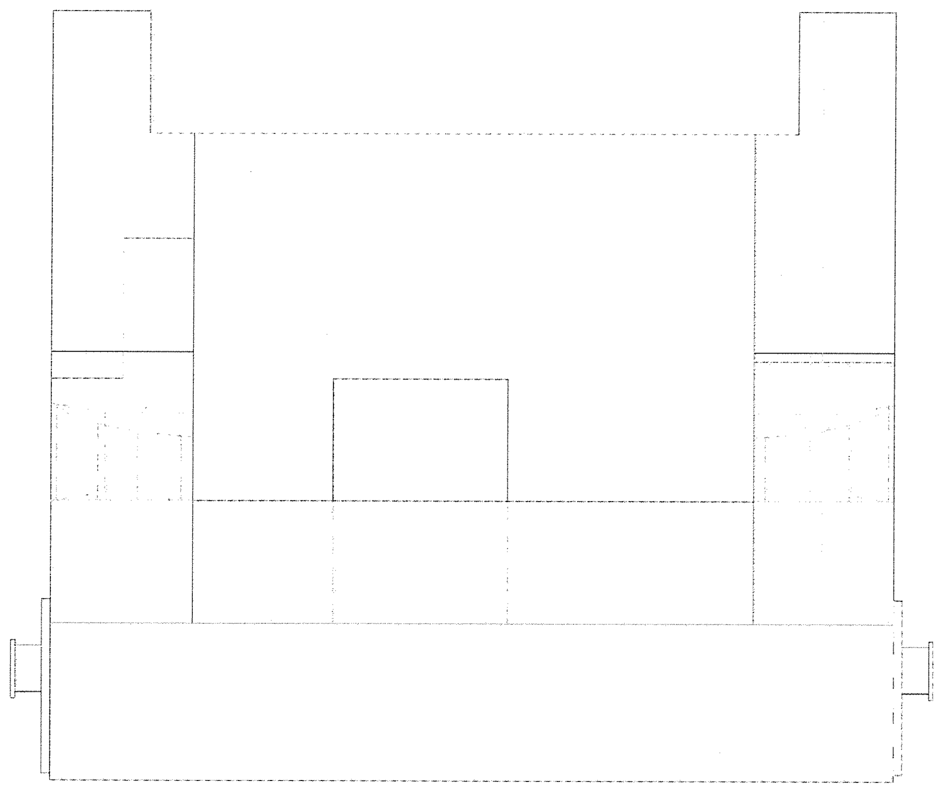
RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract — Dedicated to Excellence

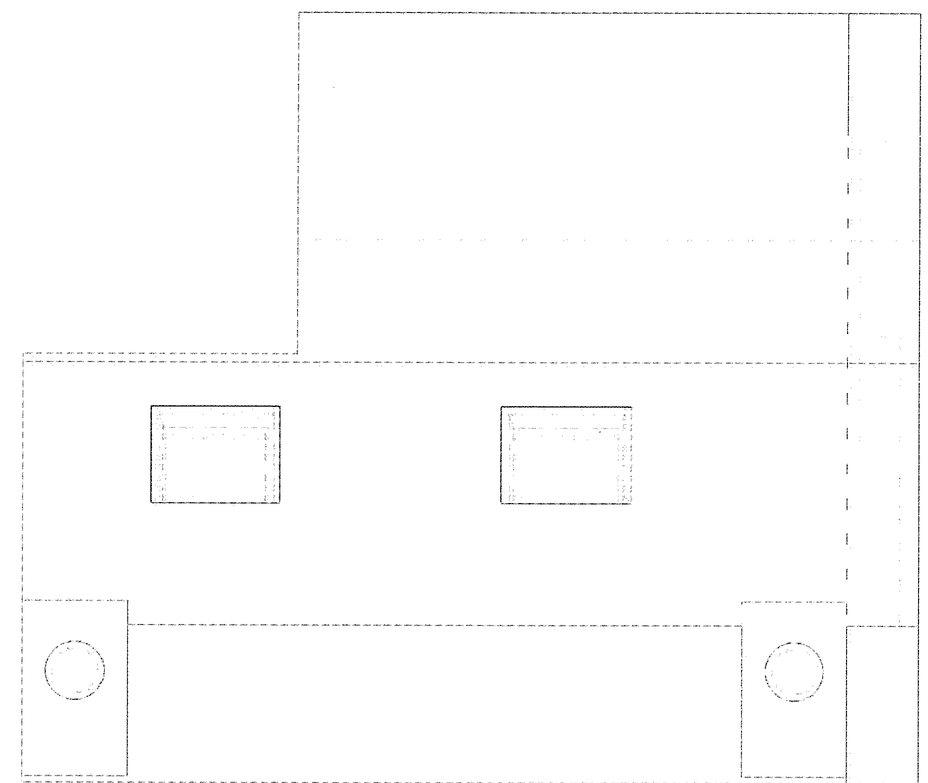
DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A

NOTES



1 / M19C1 SOUTH ELEVATION – MONOLITH 19

SCALE: 3/8"=1'-0"



2 / M19C1 EAST ELEVATION – MONOLITH 19

SCALE: 3/8"=1'-0"

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF NORTH – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

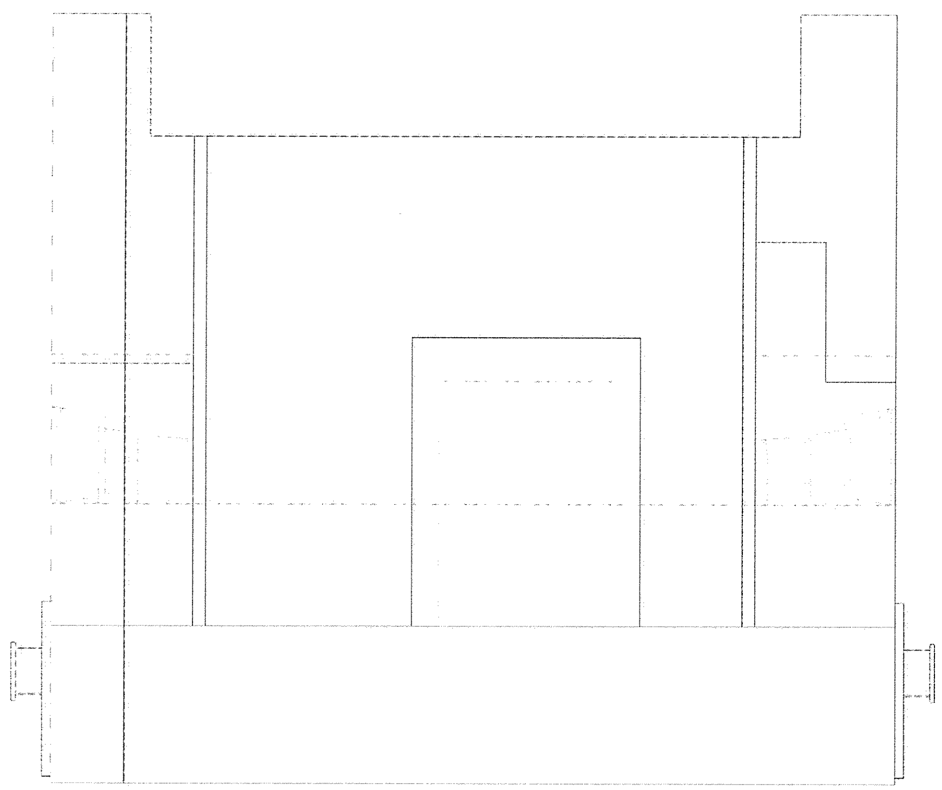
TASK	DRAWING NO.	REV. NO.
_	M19C1	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.
_-_-_____	324	___

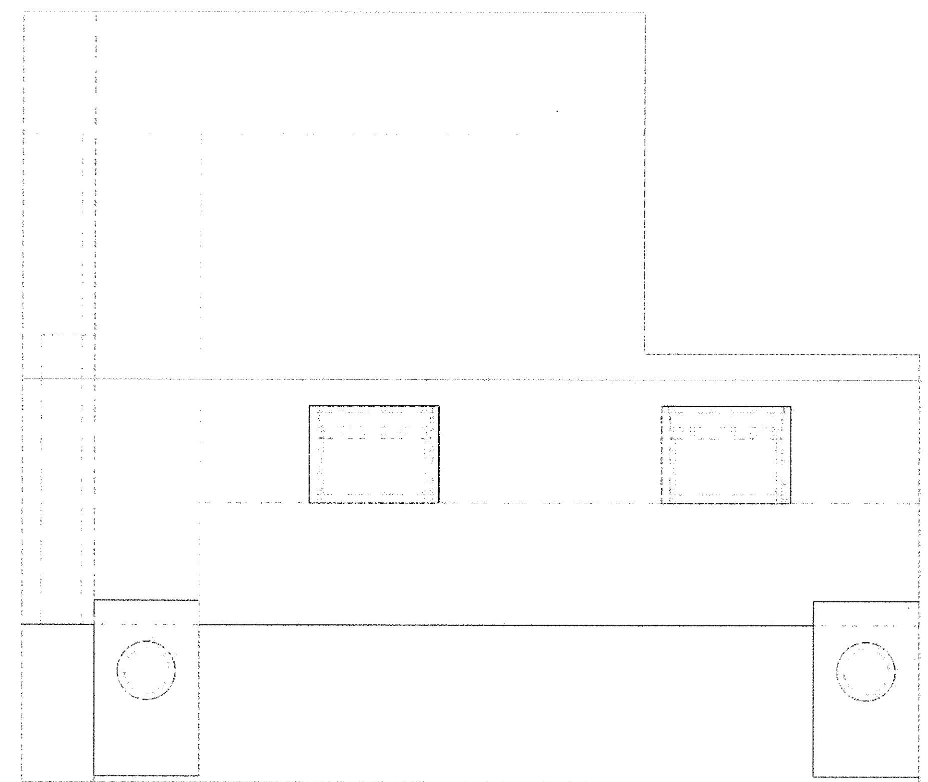
River Corridor Closure Contract
Dedicated to Safety and Excellence

DRAWING NO.	REV. NO.
XXXXX-XX-XXXXX	A



1 / M19C2 NORTH ELEVATION – MONOLITH 19

SCALE: 3/8"=1'-0"



2 / M19C2 WEST ELEVATION – MONOLITH 19

SCALE: 3/8"=1'-0"

NOTES

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
X	XX/XX/XX	ISSUED FOR PRELIMINARY REVIEW	AD	IAK	CJ	WWY	N/A	X

SCALE:

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

DCI ENGINEERS
400 SW 6TH AVE
PORTLAND, OREGON 9704

BLDG. 324 HOT CELLS
SMF MONOLITH LIFTING ATTACHMENTS
SMF NORTH – ELEVATION VIEWS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	XXXXXXXX.DWG

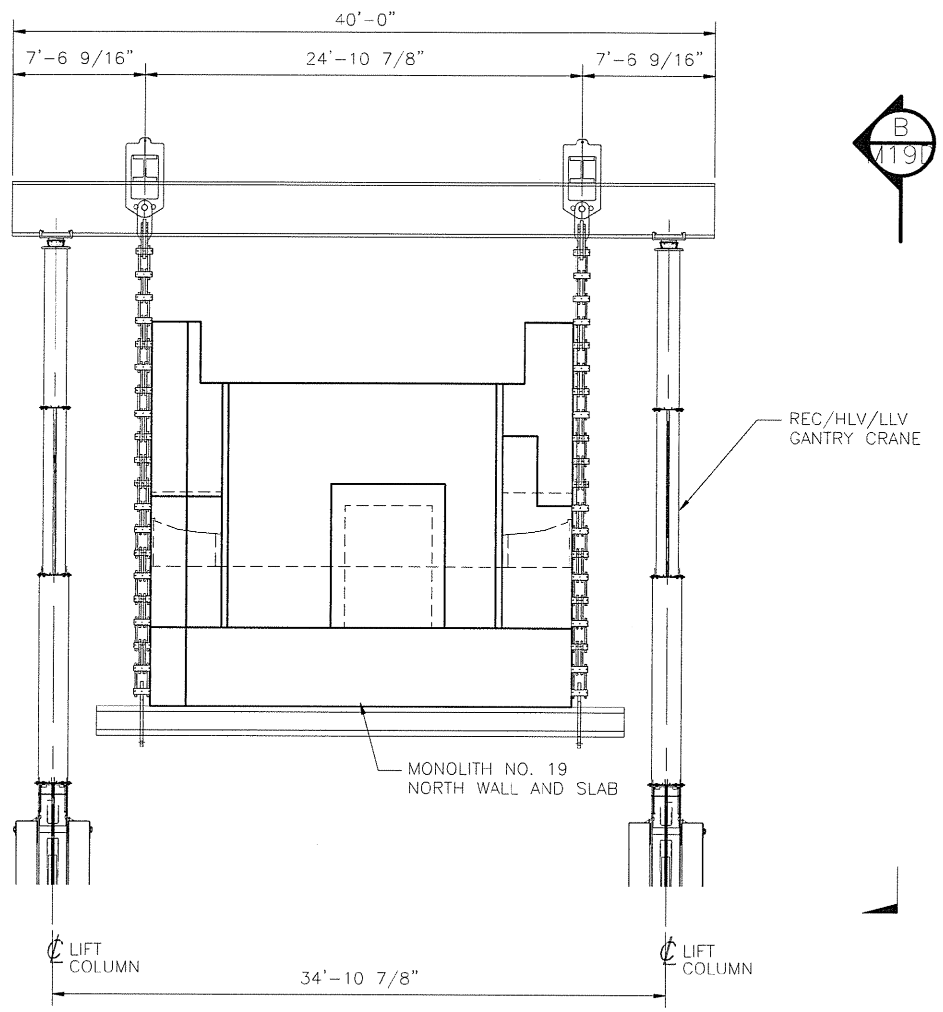
TASK	DRAWING NO.	REV. NO.
–	M19C2	A

RECORD INFORMATION

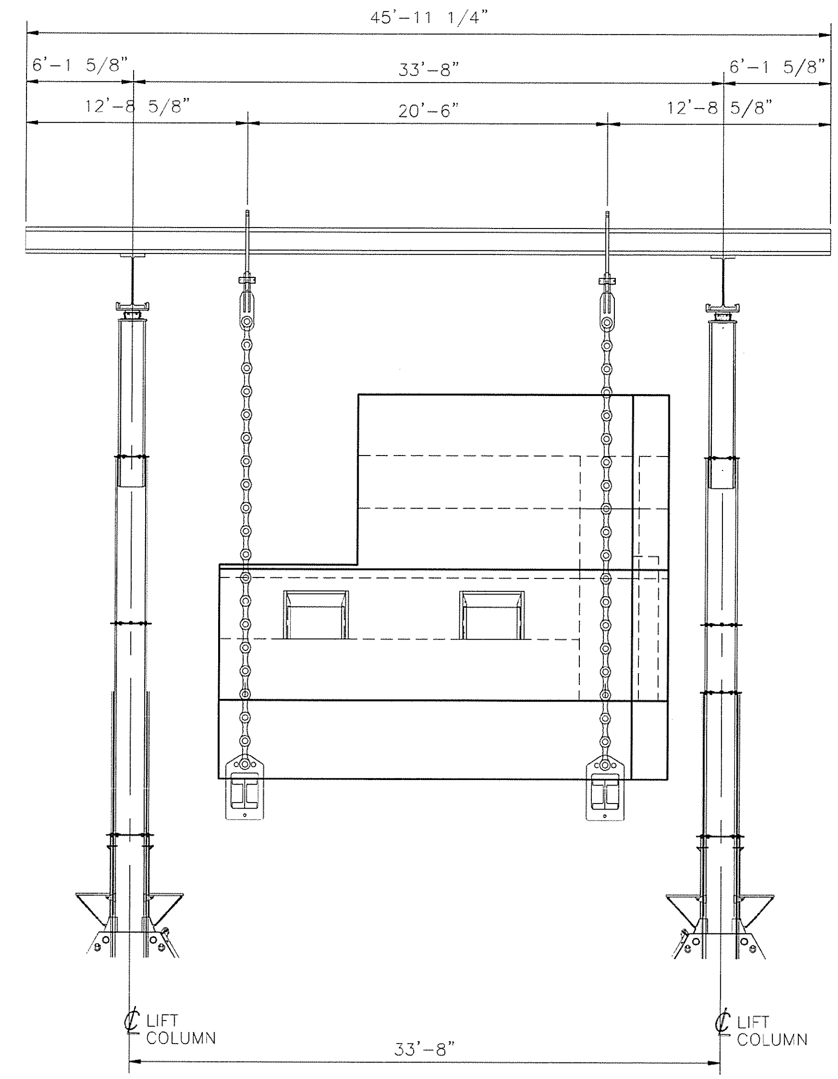
RECORD NO.	BLDG NO.	INDEX NO.
_-_-______	324	___

River Corridor Closure Contract
Dedicated WCH Excellence

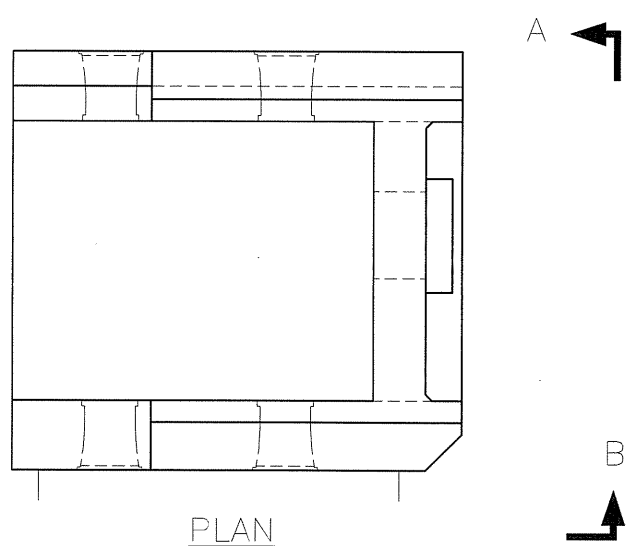
DRAWING NO.	REV. NO.
M19D	A



SECTIONAL ELEVATION (A / M19D)
3/16" = 1'-0"



SECTIONAL ELEVATION (B / M19D)
3/16" = 1'-0"



PLAN
MONOLITH 19
NORTH WALL AND SLAB

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 3/16"= 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
MONOLITH 19 RIGGING DETAILS

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M19D.DWG

TASK	DRAWING NO.	REV. NO.
	M19D	A

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

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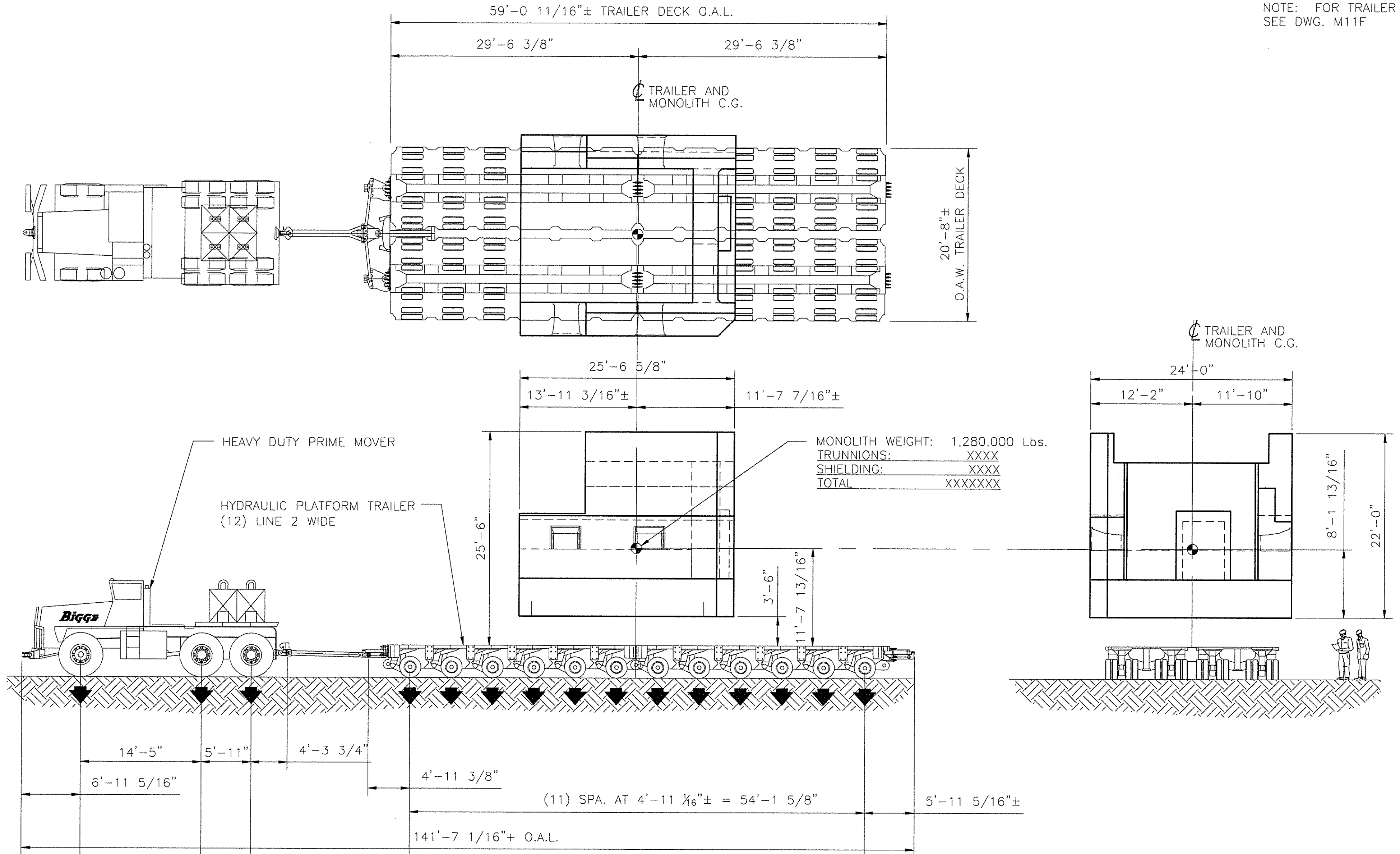
DRAWING NO.	REV. NO.
M19F	A

NOTE: FOR TRAILER SWEEP SEE DWG. M11F



AXLE No.	1	2	3	4 – 15
No. TIRES/AXLE	2	4	4	16
WIDTH	11'-9"	12'-7"	12-7"	20'-8"
	29,000 Lbs.	47,000 Lbs.	47,000 Lbs.	
GROSS WT./AXLE				XXX Lbs.
GROSS WT./TIRE				XXX Lbs. (TOTAL TIRES = 192)

NORTH WALL AND SLAB
MONOLITH 19

ELEVATION VIEW — / M19F

TRAILER DATA

NET WGT.:	XXX Lbs.	MAX.
TARE WGT.:	174,480 Lbs.	TRAILER
	Lbs.	TRANSPORT EQUIPMENT
GROSS WGT.:	XXX Lbs.	MAX.
GROSS WGT./AXLE =	XXX Lbs.	
GROSS WGT./TIRE =	XXX Lbs.	

RECORD INFORMATION

RECORD NO.	BLDG NO.	INDEX NO.

NOTES

30% SUBMITTAL SET

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CH'K	ORIG/ ENG'R	ENG'R CH'K	SYS ENG'R	PROJ ENG'R
A	6/24/10	PRELIMINARY	JRD		SH	SH		

SCALE: 1/8" = 1'-0"

U.S. DEPARTMENT OF ENERGY
DOE RICHLAND OPERATIONS OFFICE
RIVER CORRIDOR CLOSURE CONTRACT

WASHINGTON CLOSURE HANFORD LLC.
RICHLAND, WASHINGTON

NW DEMOLITION AND ENVIRONMENTAL
A JOINT VENTURE
BIGGE POWER CONSTRUCTORS
10700 BIGGE AVE. SAN LEANDRO, CA. 94577

BLDG. 324 HOT CELLS
REC/SMF/HHV/LLV DEMOLITION
NORTH WALL AND SLAB TRANSPORT ARRANGEMENT

WCH JOB NO.	DOE CONTRACT NO.	CADD FILENAME
14655	DE-AC06-05RL-14655	M19F.DWG

TASK	DRAWING NO.	REV. NO.
	M19F	A

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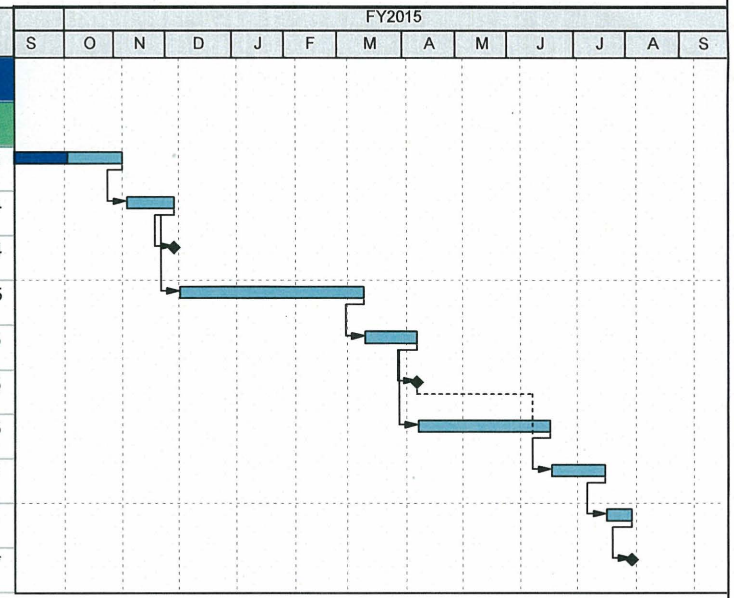
Attachment 4

Activity ID	Activity Name	Start	Finish
324			
Soil Remediation Under B Cell			
XPH-02000	Develop 60% Design	11-Jun-14 A	31-Oct-14
XPH-02700	WCH 60% Design Review/Approval	03-Nov-14	28-Nov-14
XS-05	Phase II 60% Engineering & Design Approved Status 1		28-Nov-14
XPH-03000	Develop 90% Design	01-Dec-14	09-Mar-15
XPH-03700	WCH 90% Design Review/Approval	10-Mar-15	06-Apr-15
XS-08	Phase II 90% Engineering & Design Approved Status 1		06-Apr-15
XPH-04200	Prepare IFC/IFF Design Package	07-Apr-15	16-Jun-15
XPH-04300	WCH IFC Design Review	17-Jun-15	15-Jul-15
XPH-04310	Incorporate Comments & Issue IFC	16-Jul-15	29-Jul-15
XS-11	Phase II 100% Engineering and Design Approved (IFF/IFC) Approved Status 1		29-Jul-15*



Level of effort
Critical Remaining Work
Remaining Work
Milestone

300-296 Soil Remediation Project
Engineering Design