6. SUMMARY AND CONCLUSION

The overpressurization tests of the 1:4-scale PCCV model represent a significant advance in understanding the capacity of nuclear power plant containments to withstand loads associated with severe accidents. The data collected during the tests, as well as the response and failure modes exhibited, will be useful to benchmark numerical simulation methods used to predict the response of concrete containment structures. One important observation, which should not be overlooked by focusing on the technical results, is that this program not only demonstrated that international collaboration on large-scale experiments is technically and programmatically feasible, but also desirable. The experience and expertise of the Japanese and U.S. partners, along with those of the Round Robin participants and other international support, contributed to the success of the project and resulted in a much more meaningful and productive effort.

While lessons for actual plants can and should be drawn from this and previous large-scale containment model tests, such insights are beyond the scope of this report and will be addressed in a future effort. (A program has been initiated by the NRC at SNL to apply the results of the test programs to the design and operation of actual plants.) The reader is cautioned *not* to draw direct conclusions regarding the pressure capacity of actual plants from these tests or interpret these results as a demonstration of the prototype capacity. The PCCV model tests demonstrated the importance of the unique details and as-built characteristics of the model on the ultimate capacity. Any efforts to estimate the capacity of an actual containment must address the unique features of the plant under consideration.

Furthermore, no conclusions were drawn in this report regarding the analytical methods used to predict or simulate the response of the model or actual containments. These are addressed separately in the pre- and posttest analysis reports [6, 7, and 8].

The conclusions drawn from the PCCV tests in this report will be limited to a discussion of the model, instrumentation, and test design, and their adequacy in meeting the objectives of the program. Where appropriate, recommendations for further investigation are made.

6.1 Model Design

6.1.1 Scale Artifacts

The results of the test clearly demonstrate the necessity of conducting model tests at a scale large enough to:

- utilize materials that exhibit the characteristics of those in the prototype,
- represent the design details and construction methods used in the prototype, and
- avoid the presence of non-representative details and as-built conditions.

At 1:4-scale, the PCCV model achieved most of these criteria. However, even at this scale, the results of the test were subject to scale-related artifacts, most notably in the response of the liner. A variety of compromises were made in the selection of the liner material (which was similar, but not identical, to the prototype), fabrication methods, and details. The decision to scale the weld acceptance criteria (porosity, inclusion, flaw size) might have, in hindsight, contributed to possible premature liner tearing. Since it was nearly impossible to meet the weld acceptance criteria for the field welds, most were rejected and repaired, resulting in local thinning and strain localization in the vicinity of the welds. When the acceptance criteria were later relaxed, the resulting welds appeared to perform much better than those that were repaired (in that no tears were discovered at unrepaired welds). Other factors, such as using intermittent back-up bars and modified liner anchor and stiffener details, may have further contributed to the localized tearing of the liner.

This observation could lead one to conclude that the initial plan of a mixed-scale model, with a thicker liner, might have been preferable. However, that option is also fraught with difficulties. A thicker liner, which might have delayed liner tearing and leakage, could have resulted in a catastrophic failure (as witnessed during the SFMT), when it is more than likely that an actual liner would have torn before reaching the structural limit of 3.6 P_d.

Suffice it to say that the selection of the model scale is a critical decision which should be guided by a thorough understanding of the prototype design. One must exercise care when introducing any model artifacts that could affect the results of the test.

6.1.2 Material Properties

As a corollary to the previous point, it is worth making a few observations regarding the data from tests used to define the properties of construction materials. Typically, the properties are obtained from standardized tests of small or representative samples of the construction materials. These test methods assure that the construction materials meet a minimum quality standard. Experience has shown that if these minimum standards are met, the structure will meet the design requirements. This is subtly, but significantly, different from characterizing the *in-situ* properties of a structure's constitutive elements.

Nevertheless, these standardized test results are usually all that is available, and most engineers would be happy to have actual material data rather than minimum specified properties. The difficulty arises when the properties of these sample tests are used to develop mathematical material models to predict the response of structures well beyond their design limits, especially when they include inelastic behavior and failure conditions.

The SFMT clearly demonstrated that the tendons failed shortly after the cylinder wall and measured tendon strains were approximately 1%, much less than the 4 to 7% strain obtained from laboratory tests of tendon specimens. Similarly, the measured (and calculated) liner strains at the pressure level where the liner tore were well below the ultimate strain of the liner coupons, even considering local strain concentrations.

This raises the question, then, of whether current standard material test methods are being used to perform a function for which they were not originally intended and if they are adequate for the task. If not, can alternate test methods be devised to provide a better basis for constitutive models? There have been significant advances in the computational methods used to simulate structural response, but no comparable advances in the measurement and characterization of material models on which these computational methods depend.

A second question related to the material properties is the type and amount of data considered adequate to calculate the response of actual containments. A fairly extensive suite of material tests were conducted for the PCCV model, and actual properties were used in all cases. It is not clear if this level of information would be available for all containments. If not, the quality of the capacity predictions may be reduced, with a corresponding increase in uncertainty. One way to address this question might be to use the specified properties of the PCCV model and compare the resulting capacity prediction with those based on the measured properties.

These questions pertain to the use of all structural model test data, and it is not possible to answer these questions on the basis of the PCCV test results alone. However, they are worthy of considering when the results of the PCCV model tests are utilized.

6.1.3 Prestressing System

As the critical feature of the PCCV model, the prestressing tendons deserve special attention. Again, because of the scale limitations, several compromises were made in the design of the model prestressing. Although each tendon in the prototype was represented in the model, the individual strands were larger than the prototype tendons. In addition, the tensioning and anchoring hardware could not be scaled, resulting in higher friction losses and a force profile that deviated significantly from the prototype.

It is not obvious from the test results whether the deviations from the prototype had any significant effect on the capacity of the PCCV. However, the test results, while somewhat inconclusive, did indicate that the assumptions used to predict the tendon force distribution and losses might require further investigation. This appears to be particularly true for the vertical tendons, where the losses due to wobble friction appeared to be underestimated and the losses due to angular friction appeared to be overestimated.

The test also indicated that the tendon force distribution becomes more uniform as the pressure is increased, especially beyond the elastic limits of the model. However, the mechanism by which this adjustment occurs was not clearly demonstrated. The question of whether the tendons behaved as if they were unbonded (and achieved the 'load leveling' by slipping relative to the concrete wall) or bonded (resulting in local yielding and increased local deformation) may be an important modeling consideration and should be investigated in more detail, especially if opportunities exist for additional large-scale testing.

It was also noted that, although the vertical tendons were initially tensioned to a higher level than the hoop tendons (nearly 25% higher after anchoring), the challenge to the vertical tendons was minor compared to the hoop tendons. (The level of the vertical prestressing is typically governed by the stress at the apex, where the effective prestressing is calculated to be significantly less than at the base.) This apparent discrepancy between the expected and observed behavior suggests that a review of the design method for the vertical tendons may be in order.

6.2 Instrumentation and Data Acquisition

In spite of a higher-than-expected gage mortality, in most cases from damage during construction, the instrumentation and data acquisition systems performed up to specifications and provided most of the data necessary to understand the response of the model and to compare with analyses. Some observations and lessons learned are warranted.

6.2.1 Displacements

The displacement data provided the most reliable source of information and insight into the model's overall response to the pressure loads. Nevertheless, the tests demonstrated some factors that should have been considered in the design of the instrumentation and might have improved the quality of the data.

Displacement transducers are relatively inexpensive to procure and install. In hindsight, it might have been useful to install more displacement transducers, even at the cost of eliminating some other gages.

The primary difficulty in measuring displacements is finding a stable global reference point. For small structures, this may be relatively simple; but for large, exposed structures, this can be a significant challenge. In the case of the PCCV, most of the model displacements were measured relative to the stiff instrumentation frame, which was mounted on the fairly rigid basemat. This proved to be a good choice and internal measurements of the frame motion confirm that it did not move significantly as a result of basemat uplift or thermal expansion. (One minor problem discovered after prestressing was that the displacement transducers were attached to the liner, assuming it was 'bonded' to the concrete wall, which turned out not to be the case. This was recognized fairly quickly, but could have been avoided if the locations of the displacement measurements corresponded with liner anchor locations, or if small anchors had been attached to the liner at the displacement measurement locations before placing concrete.)

Some transducers were not or could not be mounted on the reference frame, and an incomplete understanding of the interaction between the reference and measurement locations resulted in misleading data. The most notable example of this was the measurement of uplift at the edge of the basemat. In this case, the vertical motion of the basemat's outside bottom edge was measured relative to the top of the mudmat. This arrangement failed to recognize that the mudmat's stiffness was insignificant compared to the basemat and that any deformation of the basemat was reflected by the mudmat. As a result, no differential displacement was measured and the initial conclusion was that no basemat uplift had occurred. While comparing this response with the analyses, which did predict some uplift would occur, the flaw in the transducers' placement was recognized. Unfortunately, no data was obtained to confirm the analytical results. If this phenomenon had been recognized in advance, a more stable reference location could have been identified or constructed.

Other examples of such difficulty include the measurement of the radial and vertical displacement at the wall-base junction, where again some minor modifications could have eliminated all or most of the problem and ensured the desired data was obtained. The point of this discussion is not to fault the design of the instrumentation system, but to point out the importance of carefully considering the stability of the physical reference frame and interpreting the data with a thorough understanding of its practical limitations.

In designing the instrumentation for the PCCV model, efforts were made to obtain independent displacement measurements with a stable fixed reference frame. A number of optical and laser tracking systems were considered, but none of them provided a cost-effective solution with the required accuracy in harsh environmental conditions. Advances in these or other systems may, however, yield viable options for future large scale tests.

6.2.2 Liner Strains

With 559 installed on the PCCV model, the liner strain gages accounted for over one-third the total number of transducers on the model. While strain gages are relatively inexpensive to purchase, the installation, monitoring, and processing of the data represented a significant portion of the project's cost. This naturally leads to the question of whether the data obtained justified the expense.

The liner strain gages were intended to measure:

- the global or free-field hoop and meridional strains,
- the local strains near liner discontinuities, and
- the local strains in the liner anchors and stiffeners.

The free-field strain gages yielded larger maximum strains than those derived from the displacement data. For example, at the maximum LST pressure (3.3P_d), the liner hoop strain at Z6 was 0.90%, compared to approximately 0.5% computed from the displacement data. The difficulty of measuring global or even near-field strains from liner strain data is in the sensitivity of small gage length strain gages to local discontinuities or variations in the liner, even when these discontinuities are not readily apparent. It does not appear that these free-field liner strains reliably indicate the free-field strains in the wall. This problem might have been reduced by installing larger gage-length strain gages for the free-field measurements, thus minimizing the effect of local variations, but these are more difficult to install and even at larger gage lengths (e.g. 50 mm or 2 in) the problem is not completely eliminated.

The strain gages located near the liner discontinuities (e.g. near anchors and stiffeners, fold lines, and inserts) registered higher strains than the surrounding material and provided some valuable information for comparison with local liner analysis. Direct comparison was difficult, however, since the problem of local variations and discontinuities was exacerbated by the high local strain gradients and as-built conditions which may not be modeled. In this case, the gage length of the strain gages may have been too large to measure the peak liner strains. Individual strain gage data can be misleading, and multiple gages are required to construct a map of the strain fields in the vicinity of the discontinuity.

One other problem with local liner strain measurements is well known, but difficult to avoid. Strain gages placed near a tear typically measure smaller strains than strain gages placed in a similar location without a tear, because the tear acts as a strain relief mechanism. This phenomenon was demonstrated by the strain gages located near the E/H and M/S penetrations.

The liner anchor strain gages were generally consistent with the free-field meridional gages and the average vertical strain in the cylinder wall calculated from the displacements. In fact, the peak liner anchor strain of 0.1% is identical to the average strain derived from the displacements. This makes sense when considering that the anchors are bonded better to the concrete than the liner, suggesting that the free-field strains can be measured more accurately by mounting strain gages on the anchors and hoop stiffeners if they can be isolated from other discontinuities.

6.2.3 Rebar/Concrete Strains

The strain gages were mounted on the main reinforcing steel and on specially fabricated gage bars, expecting that these rebar strains would be an accurate measure of the local strains in the wall due to membrane and bending forces. A few fiber-optic strain gages were installed to independently measure the concrete wall strains at a few selected locations to corroborate this assumption. The test data indicates that the rebar strains are a reliable measure of the wall strains up to the onset of local yielding. At this point, the method to mount the strain gages on the rebar, which removes a small portion of the bar to provide a smooth surface on which the gage is bonded, forms a 'structural fuse.' This structural fuse

yields before the rest of the bar yields and experiences artificially higher strains, up to 0.5%, beyond yield. For the PCCV test, the post-yield behavior was of primary interest and this artifact corrupted the rebar strain data beyond roughly $1.5P_d$. Improved methods of measuring rebar strains that avoid the structural fuse problem would make rebar strain measurements more reliable indicators of the wall strain.

Overall, the displacement data provided a much more accurate and reliable measure of the local membrane wall strains than the rebar gages. The displacement data could not, however, provide any insight into the local bending strains in the wall at locations such as the wall-base junction, the springline, and the buttresses.

The fiber-optic gages yielded much better results; however, these gages are relatively expensive and experienced a fairly high mortality rate. Improvements in the installation technique and reduction in hardware costs would make these gages a much more attractive option for future tests.

Most of the gage bars were damaged during construction or after prolonged exposure to the elements. The surviving gage bars did provide some useful data and demonstrated that the concept was sound. The expense of fabrication and difficulty of installation, however, do not make this an attractive option, compared to the fiber-optic gages, for future tests.

6.2.4 Tendon Strains/Forces

The major instrumentation challenge posed to SNL for the PCCV model test was to measure the force distribution in the tendons during prestressing and pressure testing. Efforts in previous testing programs to collect force distribution data on unbonded tendons had been generally unsuccessful. A significant effort was made to investigate, develop, and demonstrate the feasibility of measuring the tendon strains within the program schedule and budget constraints. Since this was not an instrumentation development program, the effort focused on adapting or modifying 'off-the-shelf' components for this task. SNL was also limited to using transducers that would not require any modification in the basic structural components or their arrangement. (Some minor modifications, such as increasing the instrumented tendon duct diameter from 35 to 40 mm, were accepted to accommodate the instrumentation.) While the results were not completely satisfactory due to the high mortality rate (>50%) of the strain gages, a significant amount of data unique for prestressed concrete structures was collected, and the feasibility of measuring the variation in tendon strain, and indirectly force, along the length was demonstrated.

As noted above, the data obtained during the test did not conclusively provide an understanding of the tendon response mechanism beyond yield to ultimate load. Future tests, if conducted, might resolve this issue using improved tendon instrumentation. The biggest challenge for the instrumentation was surviving the harsh mechanical environment imposed on the sensors and lead wires during the prestressing operations. A number of promising non-contact sensors were investigated for the PCCV test to avoid this problem, but they were ultimately abandoned due to cost, reliability problems, or difficulty integrating them into the model. If future tests are planned, improvements in these sensors or new types of sensors might make them an attractive alternative to the methods employed in the PCCV test, and should be considered seriously. The lessons learned and the techniques developed for the PCCV test provide a solid basis for the next step in understanding unbonded tendon behavior.

6.2.5 Acoustic

The Soundprint® acoustic monitoring system provided the only quantitative monitoring of the entire model as opposed to the individual transducers that monitored discrete model elements. The acoustic monitoring system detected concrete cracking, liner tearing and leakage, and tendon wire or rebar breaks. The system successfully met all of these objectives at a relatively low cost, and almost immediately detected a liner leak at the leak rate threshold established for the test, 1% mass/day. To a lesser extent, it was also able to identify the general location of the first liner tear/leak, although detection and location of the subsequent tears/leaks was less conclusive.

Posttest analysis of the acoustic data also suggested that it might be a viable means of detecting the onset of global tensile cracking (and associated loss of stiffness). Although the acoustic capabilities to locate events were degraded during the SFMT due to the existing concrete damage and the elimination of interior sensors, the Soundprint® system was still able to detect tendon wire breaks. Because of the extensive damage caused when the model ruptured, posttest inspection was

unable to confirm the number or location of the reported wire break events. However, the wire break events that did occur were detected.

Further analysis of the extensive acoustic data obtained from prestressing through all of the pressure tests might provide further insights into the capabilities of acoustic monitoring systems to monitor containments and similar structures.

6.2.6 Video/Still Photography

Each phase of the model construction, instrumentation, and testing was photographed in detail to provide a record that could subsequently aid in the interpretation of the model response to applied loads. Thousands of still photographs and hours of video were recorded and archived for future use. In spite of this effort, there were still some features of the model or procedures that could have been documented in more detail. Nevertheless, these records, which were obtained at a relatively low cost, proved invaluable.

The best example of the records' value was in providing a partial explanation of the liner tearing mechanisms. While it was a particularly painstaking effort, the decision to photograph the exterior surface of all the liner field welds in the cylinder wall and dome before placing the rebar and concrete provided graphic evidence of the local discontinuities influence on the response and tearing of the liner. After the tears were located on the inside of the model, the photographic database provided detailed information on the condition of the backside. This information was subsequently used in the posttest examination and analysis of the liner.

In a similar, although less dramatic, manner, photographs of the transducer installations also assisted the interpretation of some test data, especially with regard to the effect of placement and mounting details. Crack mapping of the concrete wall after prestressing and pressure testing was also greatly facilitated by tracing and photographing the surface.

Since the tests were essentially static in nature (except for the SFMT), no high-speed film or video photography was used. Use of standard video cameras during the LST was limited to providing visual input of the model response for test operations. Observing a few critical locations inside the model with close-up video in an attempt to observe local damage, e.g. liner tearing, was not successful, since the locations observed did not exhibit any visible damage.

The external digital cameras used during the SFMT, however, were invaluable in capturing the sequence of rupture and damage progression of the model. Even with normal speed video, the failure of several tendons and the location where the rupture started were recorded. It is unlikely that without this visual record the sequence of the model failure would have been as clearly understood. The interior video camera that observed the water surface also gave an early indication of the model rupture, as the water surface was observed to drop rapidly just prior to rupture, although this was not immediately recognized.

6.2.7 Data Acquisition

The DAS was specifically *not* designed as a high-speed DAS, but was designed to provide accurate, real-time information on the model's response during the application of relatively slow loading over an extended period of time, to operate unattended, and to efficiently manage the large volumes of data obtained. It performed this function admirably, and the robustness of the system was demonstrated several times during power outages and other challenges such as lightning strikes. The few minor system 'failures' that occurred did not take place during critical test periods, and recovery and restart of the system was always accomplished quickly and with a minimal loss of data.

The DAS was adapted to the challenge of the rapid loading during the SFMT with only some minor difficulties noted near the end of the test, when correlation of the pressure with a specific response value introduced some error due to the relatively slow scan rate (30 sec) compared to the time over which the model rupture occurred (<1 sec). This error is insignificant as long as the time lag is recognized. However, it does point out the need to ask if rapid data acquisition capabilities are required, should future tests be conducted.

6.3 Testing

The successful completion of the tests within the programmatic constraints, i.e. cost and schedule, attest to the adequacy of the test plans and procedures. However, a few points may require further consideration and discussion.

6.3.1 Loading

The reasons for conducting static, pneumatic overpressurization tests at ambient temperature were discussed in Section 1.2.2. While the tests successfully obtained data on the response to pressurization and, secondarily, to prestressing, the application and interpretation of these results should recall that the test load does not faithfully represent the complex loading environment that will exist during a severe accident. The effects of temperature, the temporal relationship between pressure and temperature, the composition of the internal atmosphere, and the rate of loading may all affect the response and failure modes and the sequence of these events and should be considered in any evaluation of containment capacity.

Other containment model tests [45] have attempted to consider some or all of these aspects of severe accident loads. Future efforts should consider evaluating the effects of these other loads on the response of the PCCV model and possibly the prototype, and the results of these efforts may indicate a need for additional testing that includes these loads.

6.3.2 Failure Criteria

As noted in Section 1.2.3, it was not the goal of these tests to establish failure criteria, either functional or structural, for prototypical containments. Nevertheless, the test did provide some insight into issues that should be considered when establishing failure criteria for actual containments.

First, the primary functional failure criteria defined in terms of a maximum leak rate cannot be applied directly to conventional mechanistic models of containment structures that output response in terms of displacement, strain, force, stress, etc. As a result, design philosophies have focused on limiting these response variables to ensure that no leakage occurs. Further study of the relationship between leakage and structural response may provide some insights that could be applied to regulations and design requirements based on functional criteria.

Secondly, predictions of containment capacity have often been based on the structural capacity of the components used in the construction; for example, using the ultimate strength or elongation of samples of prestressing tendons, liner, rebar, etc., as the limit criteria. The PCCV model test demonstrated, as noted in the discussion on material properties, that the strain levels measured at failure can be much lower than the limiting values obtained from standard tests of sample specimens. The test results should provide some guidance on the development of appropriate failure criteria for use in future capacity calculations.

6.3.3 Leak Rate Measurements

The SIT/ILRT data, conducted in accordance with the specified procedures currently used in both Japan and the U.S., demonstrated the difficulty of accurately measuring leak rates to guarantee that they do not exceed the specified limits. Even with the relatively simple, controlled structure represented by the PCCV model and the extensive suite of instruments available during testing, it was not possible to accurately measure leak rates on the order of 0.1% mass/day. An apparent leak rate of 0.5% mass/day at $1.5P_d$ during the LST was due to thermal expansion of the model in response to ambient temperature changes and the model's direct heating. In light of these results, a review of leak rate measurement methods and the leak rate test criteria should be considered.

One area to explore might be the use of acoustic monitoring to detect, locate, and, possibly, measure leak rates. The acoustic monitoring system was able to readily detect a leak rate of 1% mass/day. Further evaluation of the data and refinement of the monitoring system might determine the feasibility of detecting even smaller leaks and possibly correlating the acoustic signal levels with leak rate.

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35. R-SN-P-007, "Prestressed Concrete Containment Vessel Model Test Plan," Revision B, Sandia National Laboratories, Albuquerque, NM, September, 2000.
36. R-SI-P-005, "ES&H Operating Procedure - Testing of the Prestressed Concrete Containment Vessel (PCCV) Model," Revision B, Sandia National Laboratories, Albuquerque, NM, October 2000.
37. R-SI-P-006, "PCCV Pressurization System Data Package," Revision B, Sandia National Laboratories, Albuquerque, NM, October 2001.
38. Japanese Standard JEAC 4203-1994.
39. MITI Code 501, Article 104.
40. 10CFR50, Appendix J "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors."
41. American National Standards. "Leakage Rate Testing of Containment Structures for Nuclear Reactors." ANSI/ANS N45.2-1974.
42. American National Standards "Containment System Leakage Testing Requirements." ANSI/ANS N56.9-1987.
43. NUPEC Liner Examination Report (in Japanese)
44. Procedure of Equipment Hatch Cover Installation, Mitsubishi Heavy Industries, LTD, MH-K12-15, May 26, 2000.
45. Hessheimer, M. F., R. A. Dameron and W. A. von Riesemann, "A Summary of Containment Integrity Research," Presented at the *Seminar on Containment of Nuclear Reactors* held in conjunction with the 14th International Conference on Structural Mechanics in Reactor Technology (SMiRT 14), Saclay, France, August 15-26, 1997.

Appendix A: PCCV Model Design Drawings

A-2

List of PCCV Design Drawings

Number	Date	Rev	Description
PCCV-QCON-01	12/20/96	2	Model-General Arrangement Basemat Rebar Arrangement
PCCV-QCON-02	12/20/96	1	Basemat Tendon Gallery Access Tunnel Rebar Arrangement
PCCV-QCON-03	12/20/96	1	Prestressing Tendon General Arrangement
PCCV-QCON-04	12/20/96	1	Cylinder Prestressing Tendon Arrangement
PCCV-QCON-05	12/20/96	1	Cylinder Prestressing Tendon Arrangement
PCCV-QCON-06	12/20/96	1	Cylinder Prestressing Tendon Arrangement
PCCV-QCON-07	12/20/96	1	Prestressing Tendon Details (Equipment Hatch [E/H]) (Vertical Dome)
PCCV-QCON-08	12/20/96	1	Prestressing Tendon Details (E/H) (HOOP)
PCCV-QCON-09	12/20/96	1	Prestressing Tendon Details (Airlock [A/L])
PCCV-QCON-10	12/20/96	1	Prestressing Tendon Details (Main Steam [M/S] Feedwater [F/W])
PCCV-QCON-11	12/20/96	1	Dome Prestressing Tendon Arrangement-Prestressing System Hardware
PCCV-QCON-12	12/20/96	1	Cylinder & Dome Rebar General Arrangement (1)
PCCV-QCON-13	12/20/96	1	Cylinder & Dome Rebar General Arrangement (2)
PCCV-QCON-14	12/20/96	1	Cylinder & Dome Rebar Details
PCCV-QCON-15	12/20/96	2	Buttress Rebar Details
PCCV-QCON-16	12/20/96	1	Opening Rebar Details (E/H)
PCCV-QCON-17	12/20/96	2	Opening Rebar Details (A/L)
PCCV-QCON-18	12/20/96	3	Penetration Rebar Details (M/S F/W)
PCCV-QCON-19	12/20/96	2	Crane Bracket Rebar Details Rebar Arrangement Standards
M1-ZCD1001A		3	Liner General Arrangement
M1-ZCD1002A		0	Cylinder Liner Anchor Details
M1-ZCD1006A		0	Liner Plate Block Layout of Cylinder Portion
M1-ZCD1007A		2	Cylinder Liner Anchor Details #2-5 Blocks (0-90 Degrees)
M1-ZCD1008A		2	Cylinder Liner Anchor Details #2-5 Blocks (90-270 Degrees)
M1-ZCD1009A		2	Cylinder Liner Anchor Details #2-5 Blocks (270-360 Degrees)
M1-ZCD1010A		0	Cylinder Liner Anchor Details #2-5 Blocks (E/H)
M1-ZCD1011A		0	Cylinder Liner Anchor Details #2-5 Blocks (A/L)
M1-ZCD1012A		0	Cylinder Liner Anchor Details #2-5 Blocks (M/S)
M1-ZCD1013A		0	Cylinder Liner Anchor Details #2-5 Blocks (F/W)
M1-ZCD1014A		0	Cylinder Liner Anchor Details Polar Crane Bracket Details
M1-ZCD1015A		0	Liner Plate Block Layout of Dome
M1-ZCD1016A		0	Stud Layout of Dome
M1-ZCD1018A		0	Liner Plate Block and Stud Details of Dome Portion #6 Tiers
M1-ZCD1019A		0	Liner Plate Block and Stud Details of Dome Portion #7-8 Tiers
M1-ZCD1020A		0	Liner Plate Block and Stud Details of Dome Portion #9-10 Tiers
M1-ZCD1025A	03/26/97	1	Base Liner Plate Detail

DESIGN SPECIFICATIONS

STRUCTURE TYPE		REINFORCED CONCRETE PRESTRESSED CONCRETE
TOP HEIGHT		EL. 53'-9 11/16"
FOUNDATION SPEC.	TYPE	BASEMAT
	BOTTOM LEVEL	EL.-11'-5 13/16"
	BEARING CAPACITY	LONG TERM 0.34MPa (SHORT TERM 0.34MPa)
	GROUND LINE PREPERATION	CONCRETE WITHOUT REINFORCING

CONCRETE SPEC.

PORTION		TYPE	Fc
BASEMAT	GENERAL PORTION	NORMAL CONCRETE	Fc= 29.42MPa
	AROUND TENDON GALLERY	NORMAL CONCRETE (HIGH STRENGTH)	Fc= 44.13MPa
P C C V		NORMAL CONCRETE (HIGH STRENGTH)	Fc= 44.13MPa

REBAR SPEC.

PORTION		GRADE			JOINT TYPE	
		SD490	SD390	SD345	SPLICE	LAP
BASEMAT	MAIN BAR	○			○	
	SHEAR BAR		○		○	○
	BAR AROUND OPENING	○			○	
P C C V	MAIN BAR BAR AROUND OPENING		○		○	
	RADIAL TIE			○		

TENDON SPEC.

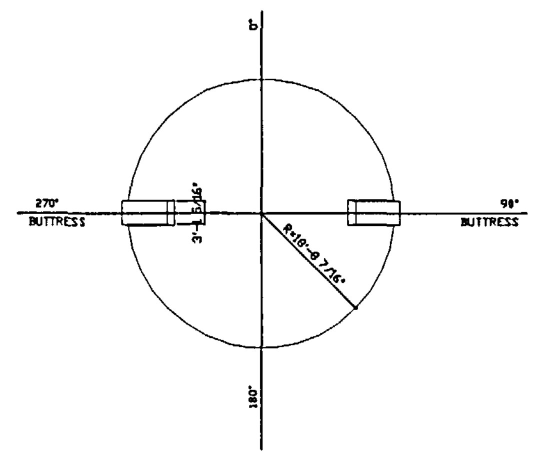
PORTION			SPEC.
P C C V	VERTICAL DOME TENDONS	45×2=90 (Φ2")	•POST TENSIONING SYSTEM(VSL) •13.7mmφ×3 (ORDERED STRAND)
	HOOP CYLINDER TENDONS	45×2=90 (Φ4 7/16")	
	HOOP DOME TENDONS	9×2=18 (Φ2.5")	

PS LOAD (KIPS)

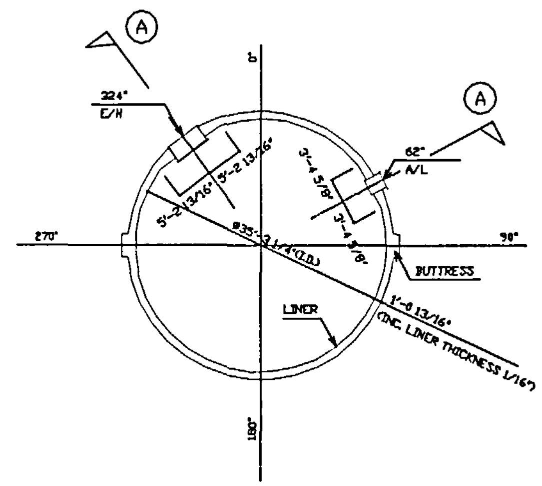
	TYPE	BEFORE ANCHORING	AFTER ANCHORING
P C C V	VERT. DOME TENDON	113.1	105.8
	HOOP TENDON	101.9	78.7

R2

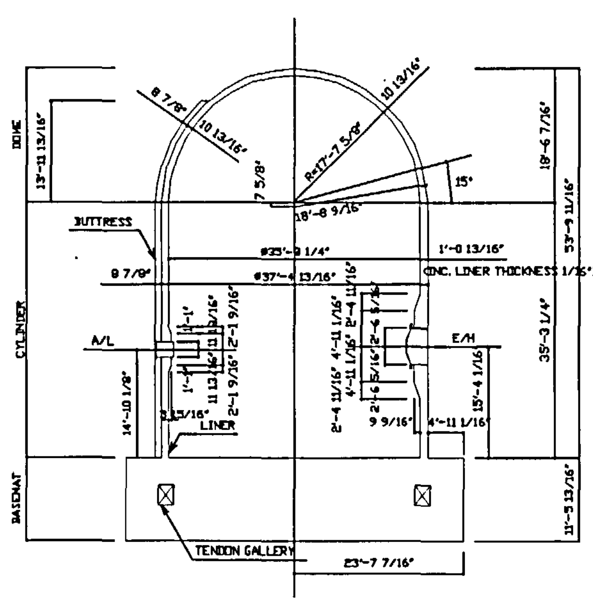
MODEL GENERAL ARRANGEMENT



DOME PLAN

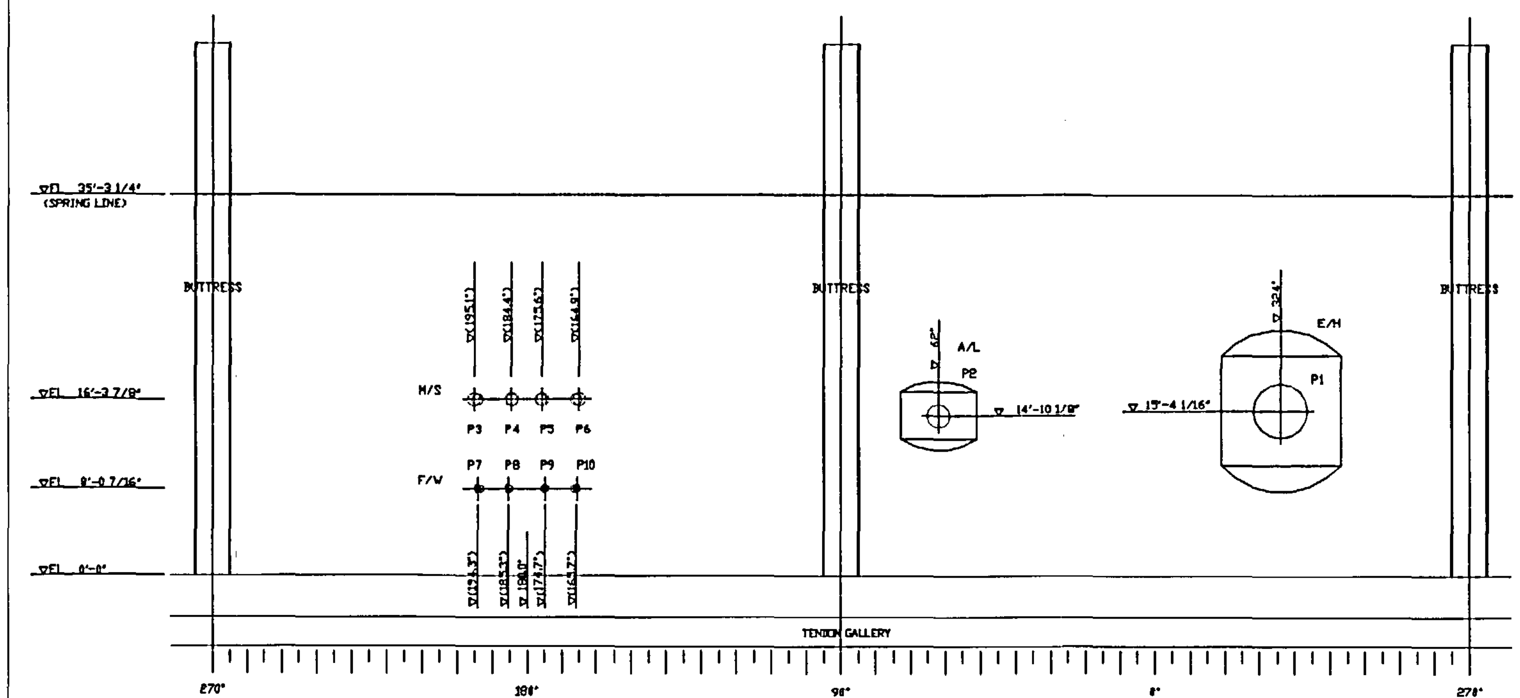


CYLINDER PLAN SECTION



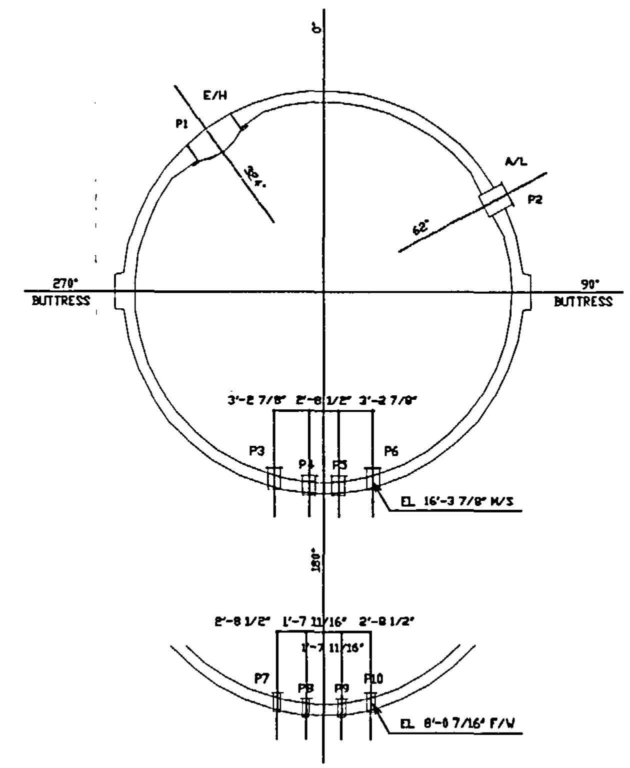
Ⓐ-Ⓐ VERTICAL SECTION S=1/150

OPENINGS, PENETRATIONS LAYOUT



OPENINGS, PENETRATIONS LAYOUT

NOTE : THE ANGLE IN BRACKETS SHOWS A POSITION ON THE LINER SURFACE.



CYLINDER PLAN SECTION S=1:100

OPENINGS, PENETRATIONS SCHEDULE

No.	SLEEVE O.D. NOMINAL DIAMETER	SLEEVE O.D. SIZE φ	REMARKS
P1	4'-11 1/16"	5'-0 5/8"	E/H
P2	2'-1 9/16"	2'-2"	A/L
P3	-	1'-1"	M/S
P4	-	1'-1"	M/S
P5	-	1'-1"	M/S
P6	-	1'-1"	M/S
P7	-	7 1/2"	F/W
P8	-	7 1/2"	F/W
P9	-	7 1/2"	F/W
P10	-	7 1/2"	F/W

R2

NUMBER OF OPENINGS, PENETRATIONS

OPENINGS, PENETRATIONS	NUMBER
E/H	1
A/L	1
M/S , F/W	8

REVISION

NO.	DATE	REVISION	BY
R2	'95 8.1	PS LOAD UPDATED M/S,F/W O.D. UPDATED	

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	○	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET
NUPEC	SYSTEMS SAFETY DEPT.	
S N L		COPY 1
M H I	NUCLEAR SYSTEMS ENGINEERING DEPT.	
	STEEL STRUCTURE DESIGNING SECT.	COPY 1
	EQUIP DESIGN SECT.	COPY 1
	TAKASAGO R&D CENTER	COPY 1
T A I S E I		COPY 1
OBAYASHI		ORIG.

NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL

MODEL-GENERAL ARRANGEMENT — SCALE 1/100, 1/150

MITSUBISHI HEAVY INDUSTRIES,LTD.

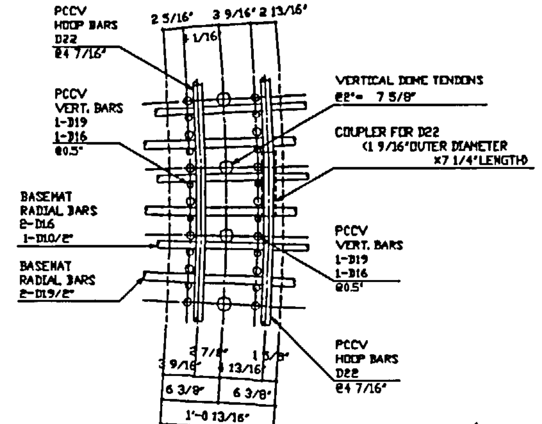
OBAYASHI CORPORATION

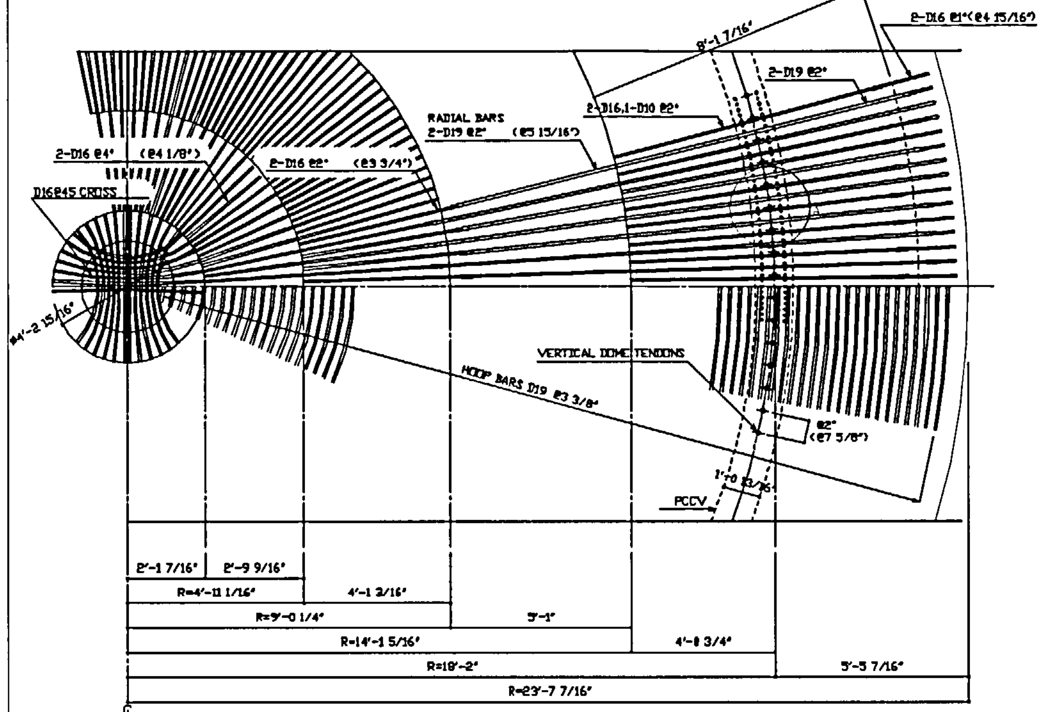
REVISION NO. R2

M H I | OBAYASHI: T. Iba K. Umeki H. Murano

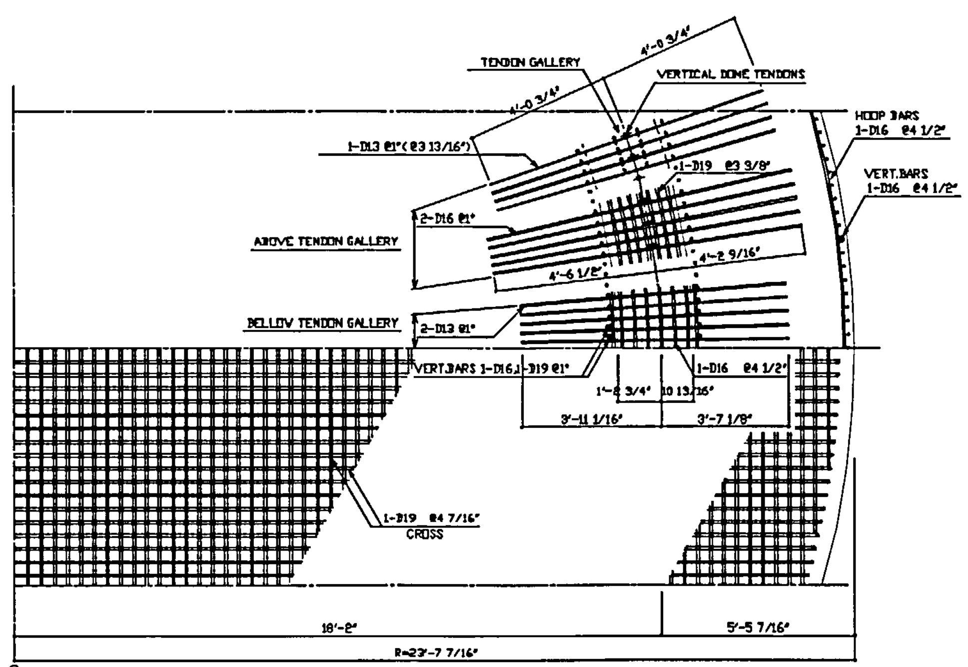
DRAWING NO. PCCV-QCON-01

DETAIL 'A' S=1/10

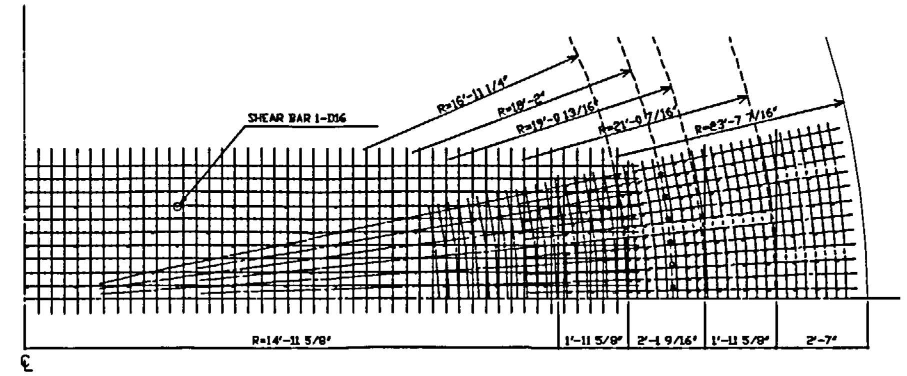




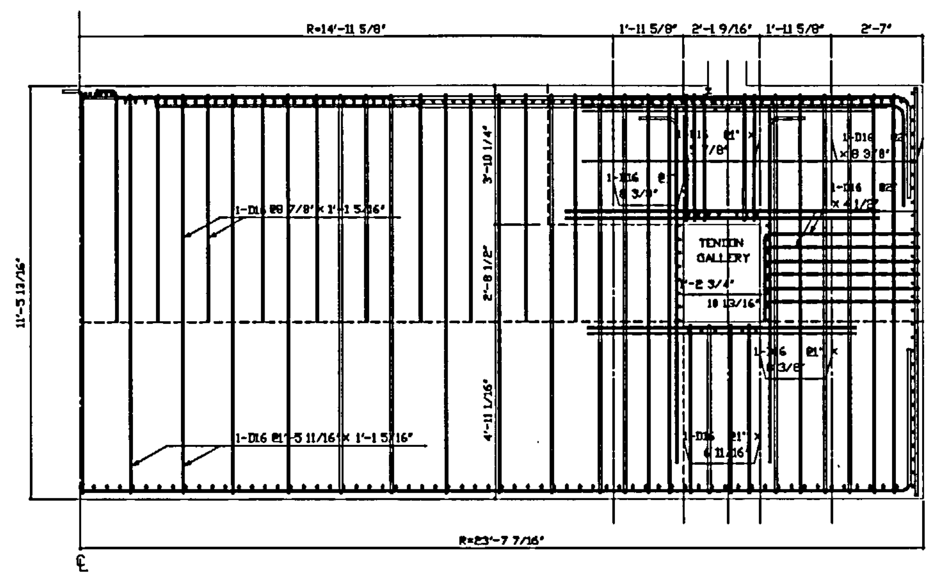
TOP BAR ARRANGEMENT S=1/30



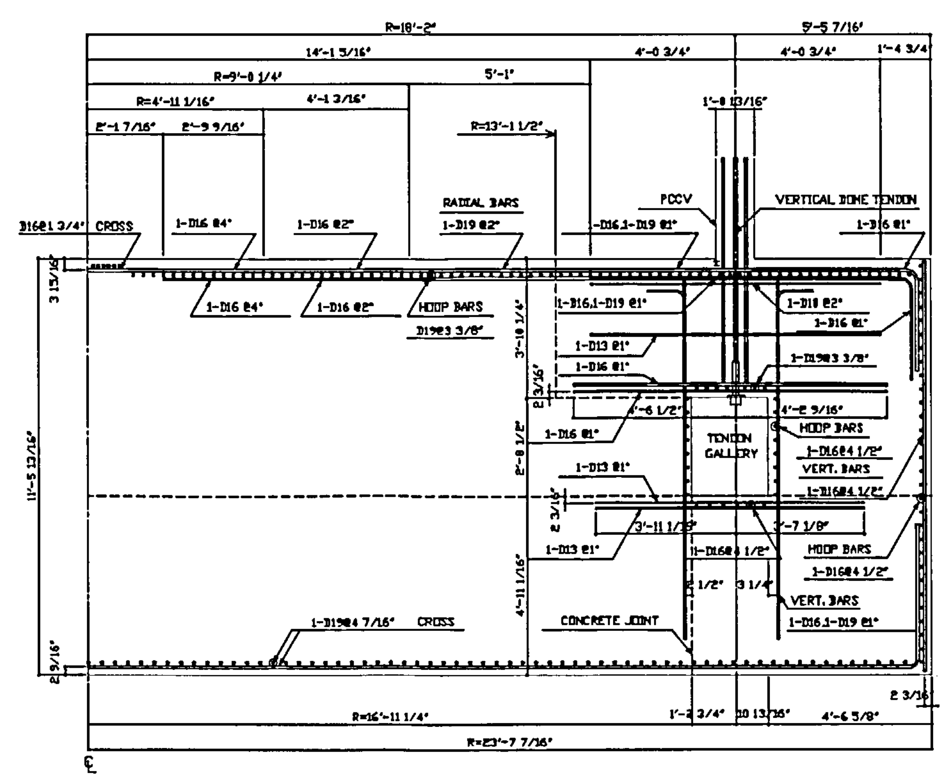
BOTTOM BAR ARRANGEMENT S=1/30



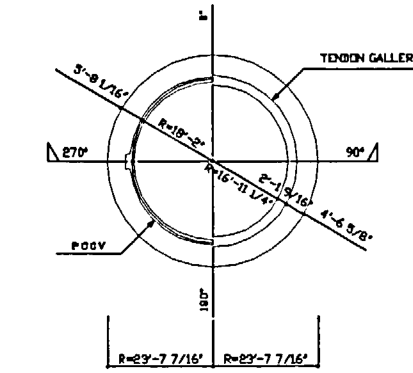
SHEAR REBAR PLAN S=1/30



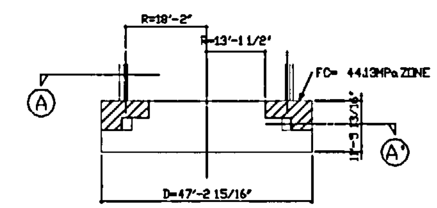
SHEAR REBAR VERTICAL SECTION S=1/30



VERTICAL SECTION S=1/30



KEY PLAN (A-A'SECTION)



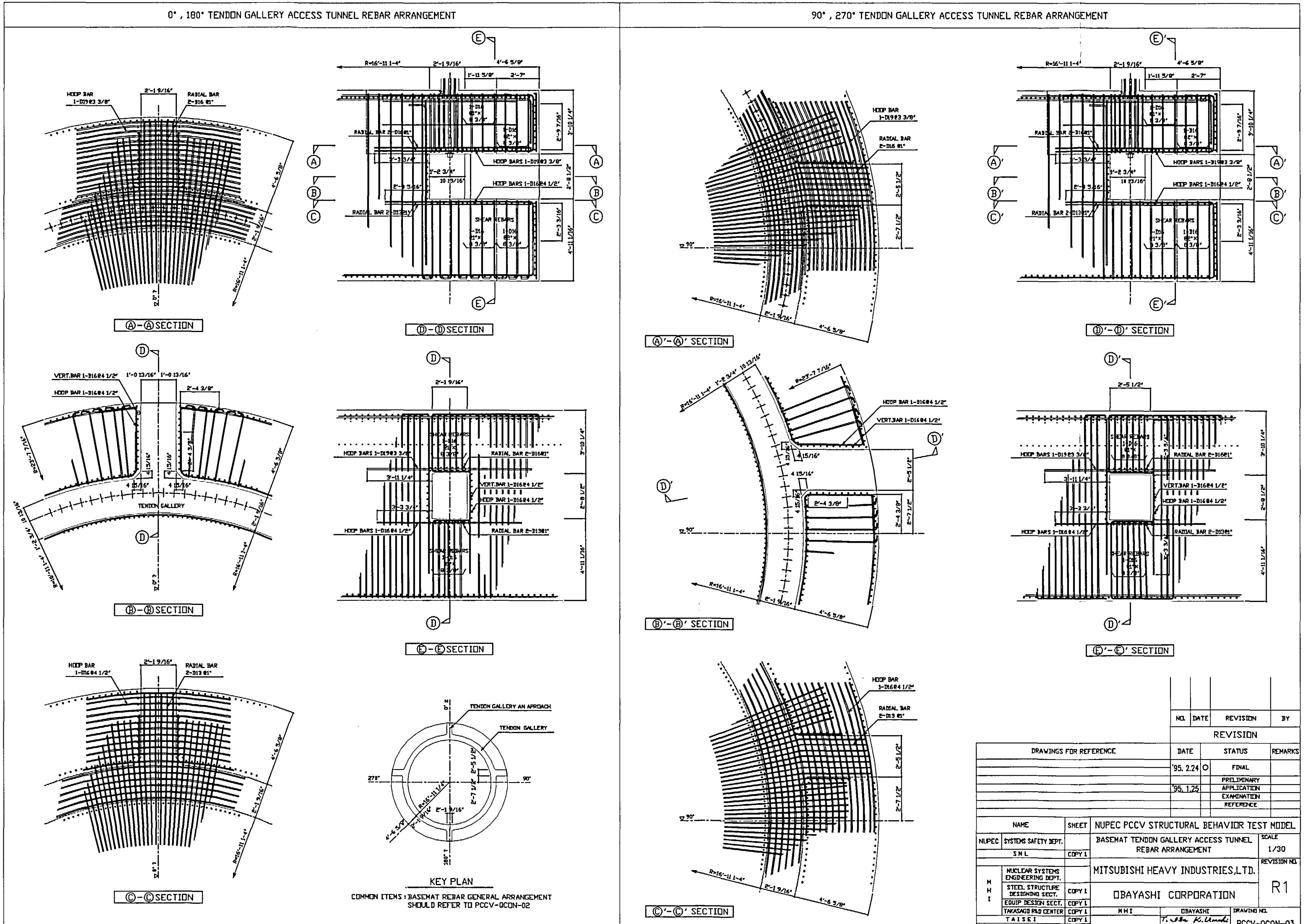
KEY SECTION(270°-90°SEC.)

NO.	DATE	REVISION	BY

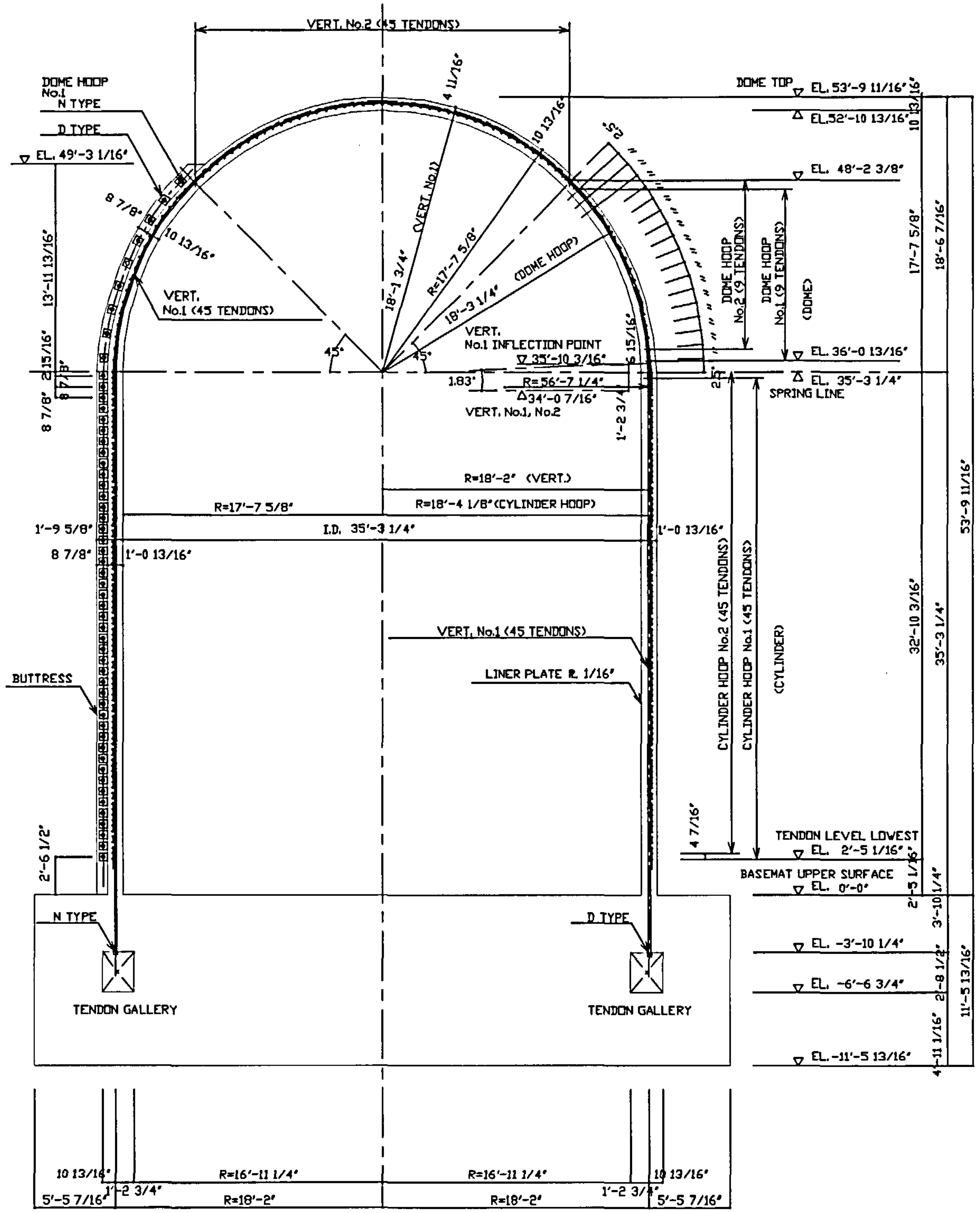
REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

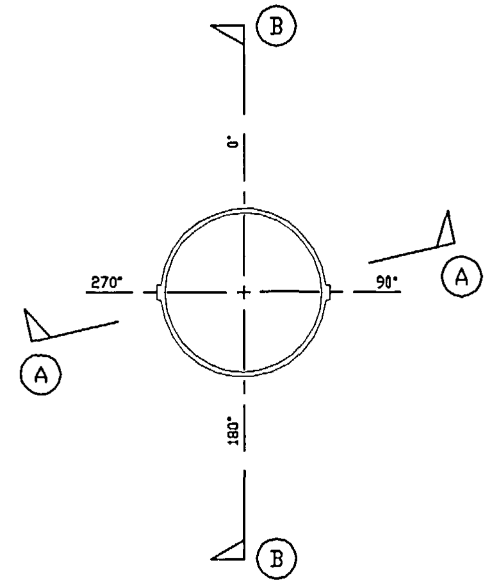
NAME		SHEET	NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL		
NUPEC	SYSTEMS SAFETY DEPT.		BASEMAT REBAR ARRANGEMENT		SCALE 1/10 1/30
S N L		COPY 1			
					REVISION NO.
M H I	NUCLEAR SYSTEMS ENGINEERING DEPT.		MITSUBISHI HEAVY INDUSTRIES,LTD.		R1
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	OBAYASHI CORPORATION		
	EQUIP DESIGN SECT.	COPY 1			
	TAKASAGO R&D CENTER	COPY 1	M H I	OBAYASHI	DRAWING NO.
T A I S E I		COPY 1		T. Iba K. Umeki H. Murano	PCCV-QCON-02
OBAYASHI		ORIG.			



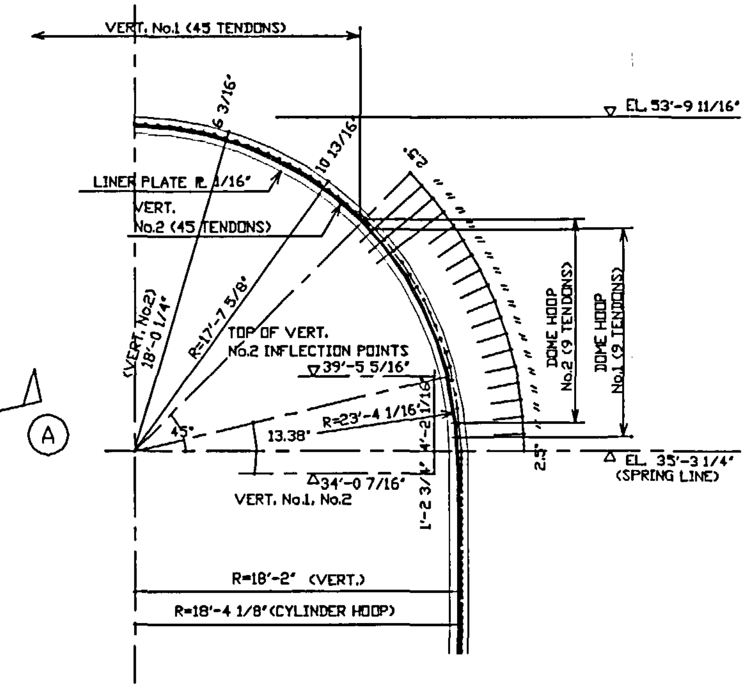
0°, 180° TENDON GALLERY ACCESS TUNNEL REBAR ARRANGEMENT
90°, 270° TENDON GALLERY ACCESS TUNNEL REBAR ARRANGEMENT
Ⓐ-Ⓐ SECTION
Ⓓ-Ⓓ SECTION
Ⓑ-Ⓑ SECTION
Ⓔ-Ⓔ SECTION
Ⓒ-Ⓒ SECTION
Ⓐ'-Ⓐ' SECTION
Ⓓ'-Ⓓ' SECTION
Ⓑ'-Ⓑ' SECTION
Ⓔ'-Ⓔ' SECTION
Ⓒ'-Ⓒ' SECTION
HOOP BAR 1-D19@3 3/8"
RADIAL BAR 2-D16 @1"
HOOP BARS 1-D19@3 3/8"
HOOP BARS 1-D16@4 1/2"
SHEAR REBARS
VERT.BAR 1-D16@4 1/2"
HOOP BAR 1-D16@4 1/2"
RADIAL BAR 2-D13 @1"
TENDON GALLERY
TENDON GALLERY AN APROACH
KEY PLAN
COMMON ITEMS : BASEMAT REBAR GENERAL ARRANGEMENT SHOULD REFER TO PCCV-QCON-02
DRAWINGS FOR REFERENCE
NO. DATE REVISION BY
REVISION
DATE STATUS REMARKS
'95. 2.24 ○ FINAL
PRELIMINARY
'95. 1.25 APPLICATION
EXAMINATION
REFERENCE
NAME SHEET
NUPEC SYSTEMS SAFETY DEPT.
SNL COPY 1
MHI NUCLEAR SYSTEMS ENGINEERING DEPT.
STEEL STRUCTURE DESIGNING SECT. COPY 1
EQUIP DESIGN SECT. COPY 1
TAKASAGO R&D CENTER COPY 1
TAISEI COPY 1
OBAYASHI ORIG.
NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL
BASEMAT TENDON GALLERY ACCESS TUNNEL REBAR ARRANGEMENT
SCALE 1/30
MITSUBISHI HEAVY INDUSTRIES,LTD.
REVISION NO. R1
OBAYASHI CORPORATION
MHI OBAYASHI
DRAWING NO. PCCV-QCON-03



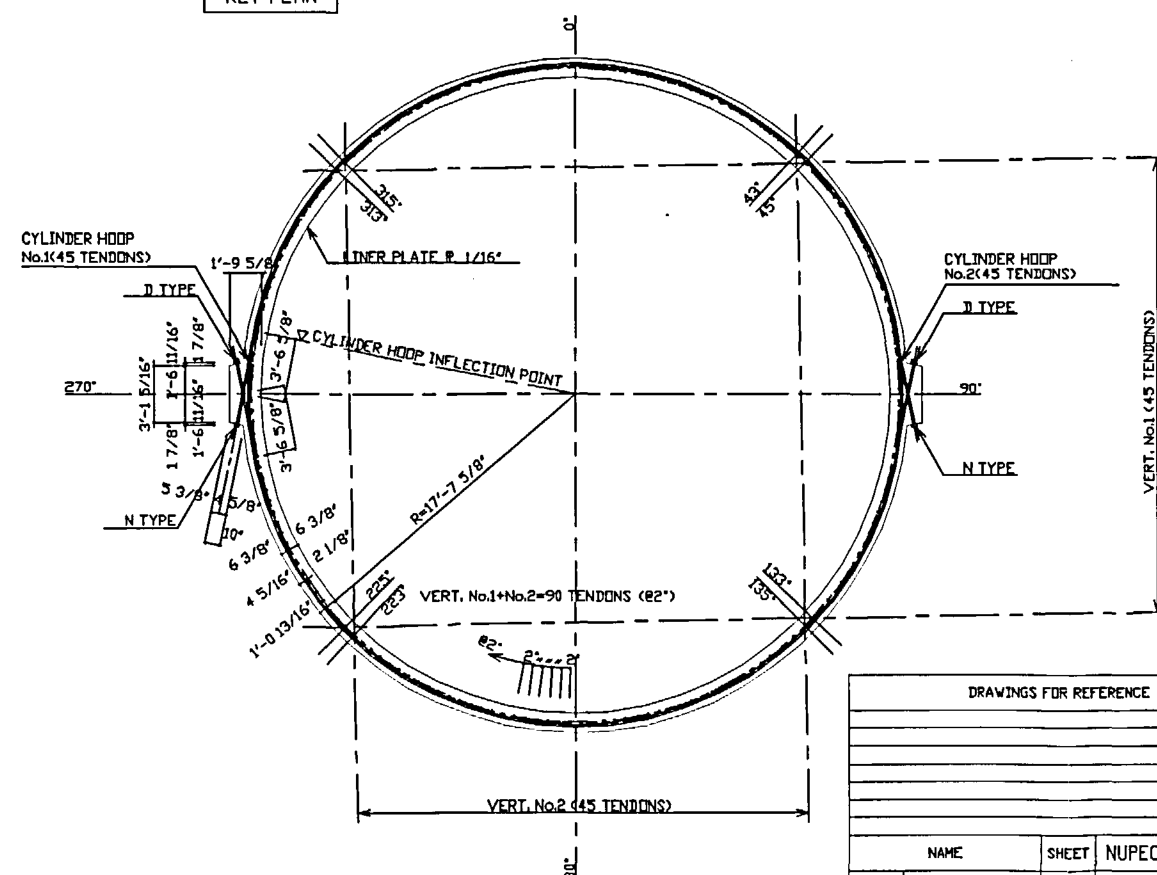
Ⓐ-Ⓐ SECTION TENDON LAYOUT



KEY PLAN



Ⓑ-Ⓑ SECTION TENDON LAYOUT



TENDON LAYOUT IN CYLINDER

NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

	NAME	SHEET
NUPEC	SYSTEMS SAFETY DEPT.	
	SNL	COPY 1
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.	
	STEEL STRUCTURE DESIGNING SECT.	COPY 1
	EQUIP. DESIGN SECT.	COPY 1
	TAKASAGO R&D CENTER	COPY 1
	TAISEI	COPY 1
	OBAYASHI	ORIG.

NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL

PRESTRESSING TENDON GENERAL ARRANGEMENT

SCALE 1/60

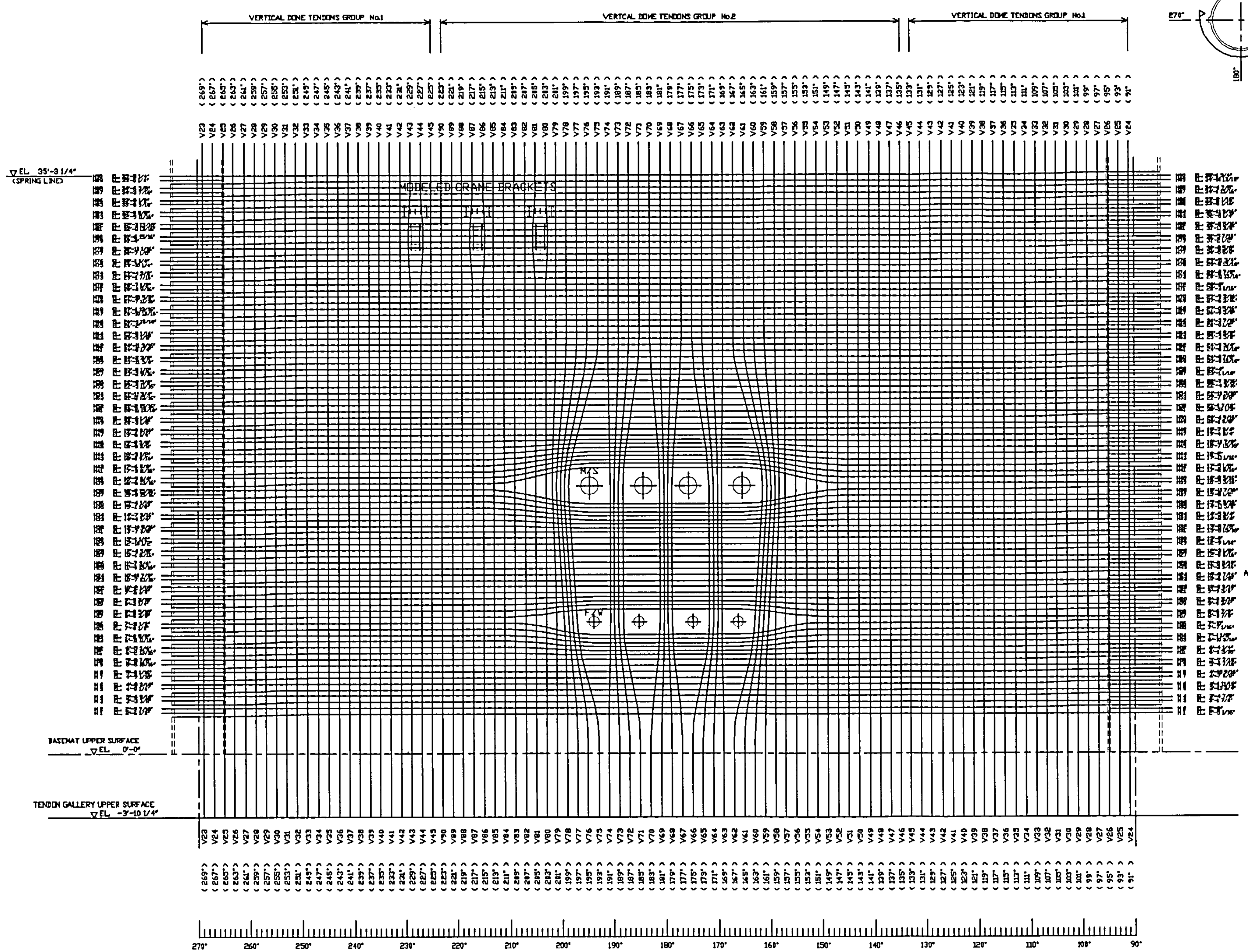
MITSUBISHI HEAVY INDUSTRIES, LTD.

OBAYASHI CORPORATION

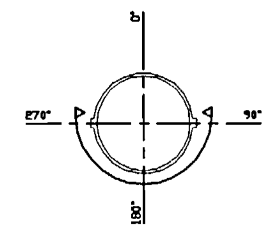
REVISION NO. R1

MHI | OBAYASHI: T. [signature] K. Umeki, H. Murano [signatures]

DRAWING NO. PCCV-QCON-04

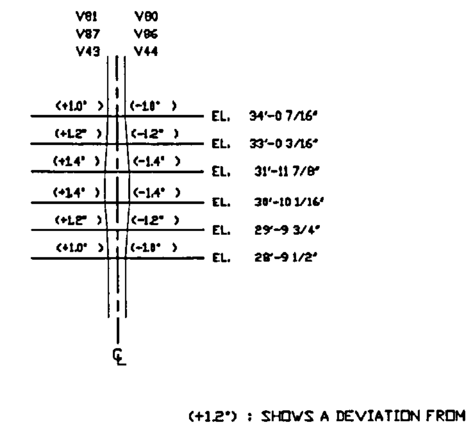


CYLINDER TENDON LAYOUT (270°~90°)

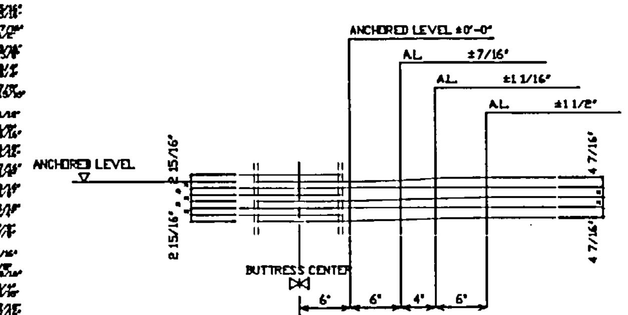


PRESTRESSING SYSTEM ARRANGMENT RULE

1. PARALLEL SHEATH PITCH IS NOT LESS THAN 2 15/16".
2. THE DISTANCE BETWEEN SHEATH CENTER AND PENETRATION SLEEVE OUTER PORTION IS NOT LESS THAN
   - ① E/H : 5 7/8"
   - ② A/L : 4 15/16"
   - ③ M/S,F/W : 2 7/16"
3. THE CLEARANCE BETWEEN SHEATH OUTER PORTION AND SLEEVE STIFFENER IS NOT LESS THAN 9/16".
4. THE CLEARANCE BETWEEN SHEATH OUTER PORTION AND CRANE BRACKET IS NOT LESS THAN 1".
5. THE CLEARANCE BETWEEN BEARING PLATES IS NOT LESS THAN 3/16".



VERTICAL DOME TENDON LAYOUT NEAR CRANE BRACKET
(COMMON IN 3 BRACKETS)



CYLINDER HOOP TENDON LAYOUT NEAR BUTTRESS

NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET
NUPEC	SYSTEMS SAFETY DEPT.	
S N L		COPY 1
M H I	NUCLEAR SYSTEMS ENGINEERING DEPT.	
	STEEL STRUCTURE DESIGNING SECT.	COPY 1
	EQUIP DESIGN SECT.	COPY 1
	TAKASAGO R&D CENTER	COPY 1
T A I S E I		COPY 1
OBAYASHI		ORIG.

NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL

CYLINDER PRESTRESING TENDON ARRANGEMENT (270°~90°)

SCALE 1/40

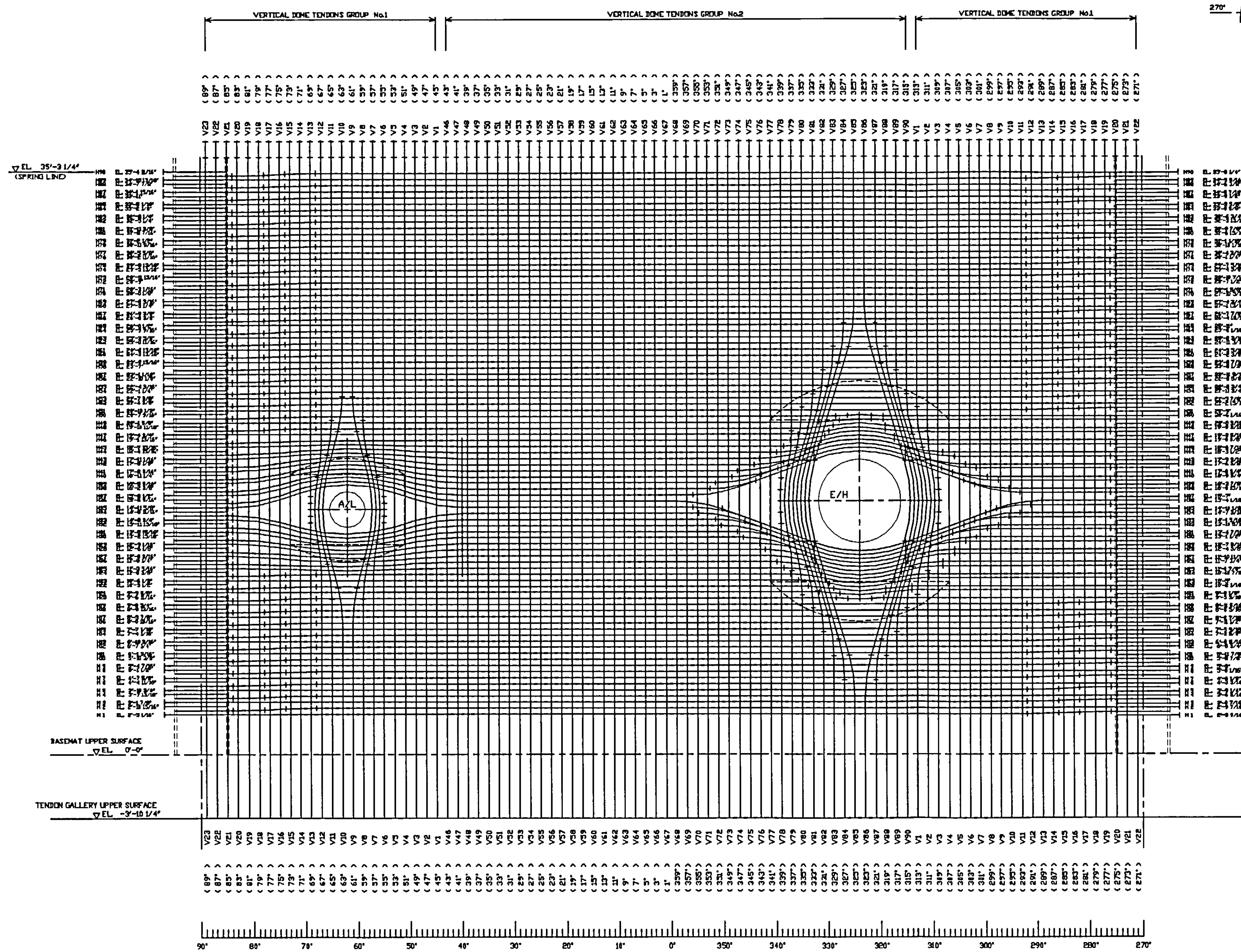
MITSUBISHI HEAVY INDUSTRIES,LTD.

OBAYASHI CORPORATION

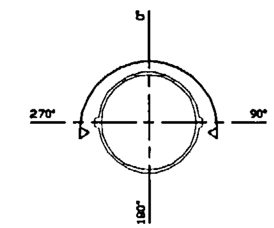
REVISION NO. R1

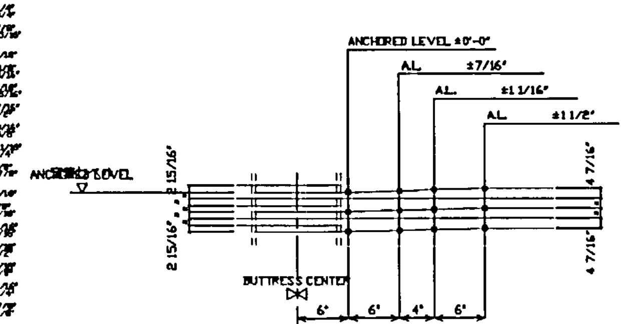
MHI | OBAYASHI: T. Iba K. Umeki H. Murano

DRAWING NO. PCCV-QCON-05



CYLINDER TENDON LAYOUT (90°~270°)





CYLINDER HOOP TENDON LAYOUT NEAR BUTTRESS

NO.	DATE	REVISION	BY
		REVISION	

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET	NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL	
NUPEC	SYSTEMS SAFETY DEPT.		CYLINDER PRESTRESSING TENDON ARRANGEMENT(90°~270°)	SCALE 1/40
SNL		COPY 1		
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.		MITSUBISHI HEAVY INDUSTRIES,LTD.	REVISION NO. R1
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	OBAYASHI CORPORATION	
	EQUIP DESIGN SECT.	COPY 1		
	TAKASAGO R&D CENTER	COPY 1	MHI / OBAYASHI	DRAWING NO.
TAISEI		COPY 1	T. Iba K. Umeki H. Murano	PCCV-QCON-06
OBAYASHI		ORIG.		

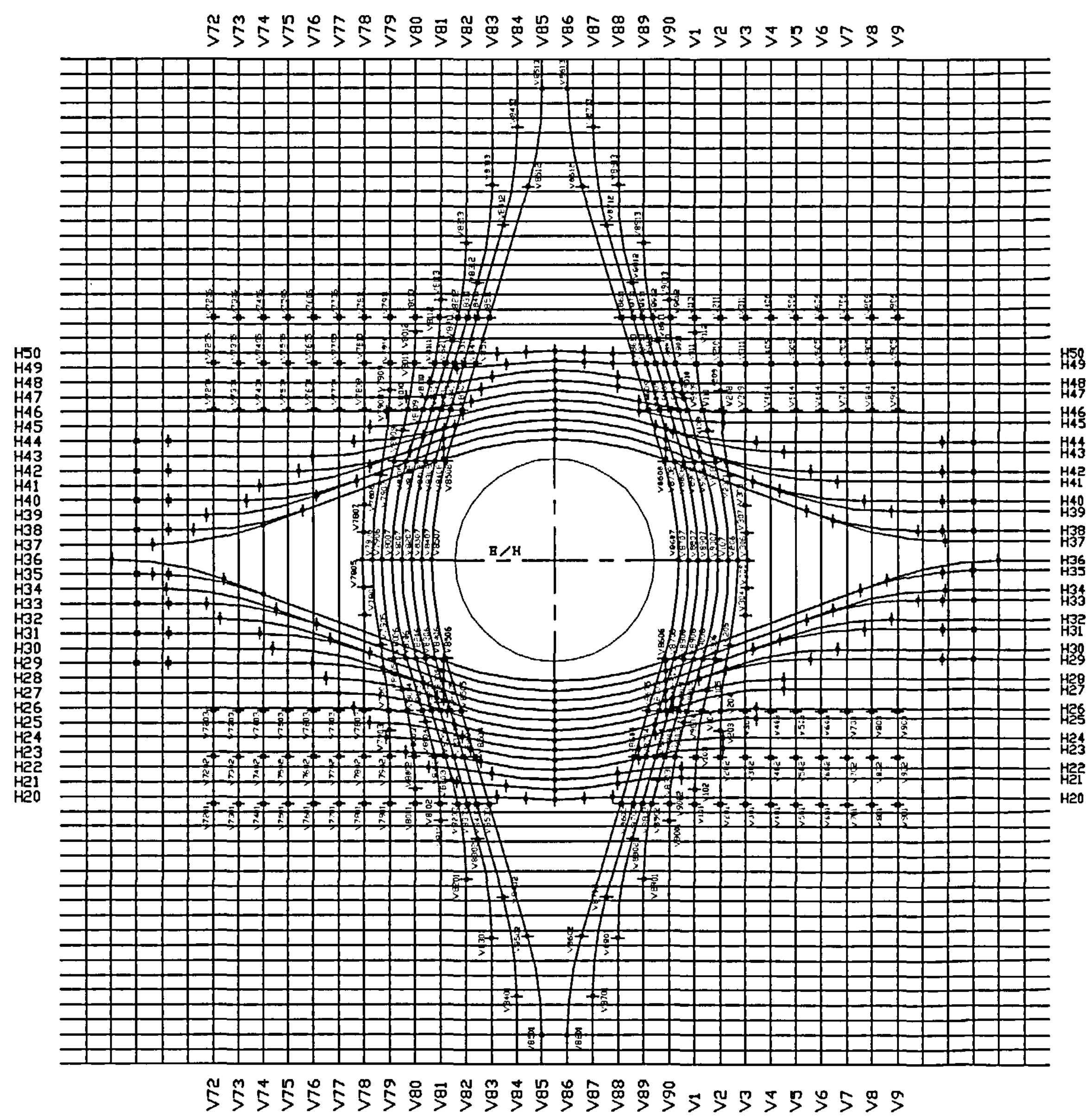
THE INFLECTION POINTS IN CYLINDRICAL COORDINATES (VERTICAL DOME)

TENDON NO. \ POINT NO.	01			02			03			04			05			06			07			08			09			10			11			12			13		
	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R
V9	9'-3 1/4"	297°		10'-5 1/8"	297°	18'-1 7/8"	11'-7"	297°	18'-1 11/16"	19'-1 1/8"	297°	18'-1 11/16"	20'-3"	297°	18'-1 7/8"	21'-4 7/8"	297°																						
V8	9'-3 1/4"	299°		10'-5 1/8"	299°	18'-1 11/16"	11'-7"	299°	18'-1 5/16"	19'-1 1/8"	299°	18'-1 5/16"	20'-3"	299°	18'-1 11/16"	21'-4 7/8"	299°																						
V7	9'-3 1/4"	301°		10'-5 1/8"	301°	18'-1 1/2"	11'-7"	301°	18'-1"	19'-1 1/8"	301°	18'-1"	20'-3"	301°	18'-1 1/2"	21'-4 7/8"	301°																						
V6	9'-3 1/4"	303°		10'-5 1/8"	303°	18'-1 3/8"	11'-7"	303°	18'-0 11/16"	19'-1 1/8"	303°	18'-0 11/16"	20'-3"	303°	18'-1 3/8"	21'-4 7/8"	303°																						
V5	9'-3 1/4"	305°		10'-5 1/8"	305°	18'-1 1/4"	11'-7"	305°	18'-0 7/16"	19'-1 1/8"	305°	18'-0 7/16"	20'-3"	305°	18'-1 1/4"	21'-4 7/8"	305°																						
V4	9'-3 1/4"	307°		10'-5 1/8"	307°	18'-1 1/8"	11'-7"	307°	18'-0 3/16"	19'-1 1/8"	307°	18'-0 3/16"	20'-3"	307°	18'-1 1/8"	21'-4 7/8"	307°																						
V3	9'-3 1/4"	309°		10'-5 1/8"	309°	18'-1"	11'-7"	309°	17'-11 15/16"	13'-11 9/16"	309°	17'-11 15/16"	14'-7 13/16"	308.91°	18'	15'-4 1/16"	308.82°	18'	16'-0 5/16"	308.91°	18'	16'-0 9/16"	309°	17'-11 15/16"	19'-1 1/8"	309°	17'-11 15/16"	20'-3"	309°	18'-1"	21'-4 7/8"	309°							
V2	9'-3 1/4"	311°		10'-5 1/8"	311°	18'-0 7/8"	11'-1 1/8"	311°	17'-11 13/16"	11'-7"	310.96°	17'-11 3/4"	13'-2 9/16"	310.30°	17'-11 13/16"	15'-4 1/16"	309.64°	17'-11 7/8"	17'-5 1/2"	310.30°	17'-11 13/16"	19'-4 1/8"	310.96°	17'-11 3/4"	19'-7"	311°	17'-11 13/16"	20'-3"	311°	18'-0 7/8"	21'-4 7/8"	311°							
V1	9'-3 1/4"	313°		9'-7 5/8"	313°	18'-1 15/16"	10'-5 1/8"	312.96°	18'-0 13/16"	11'-7"	312.38°	17'-11 5/8"	12'-1 3/16"	312.01°	17'-11 11/16"	12'-10 1/2"	311.37°	17'-11 3/4"	15'-4 1/16"	310.38°	17'-11 13/16"	17'-9 9/16"	311.37°	17'-11 3/4"	18'-6 15/16"	312.01°	17'-11 11/16"	19'-1 1/8"	312.38°	17'-11 5/8"	20'-3"	312.90°	18'-0 13/16"	21'-0 1/2"	313°	18'-1 15/16"	21'-4 7/8"	313°	
V90	8'-10"	315°		9'-3 1/4"	314.97°		10'-5 1/8"	314.52°	18'-0 3/4"	11'-3 9/16"	313.84°	17'-11 5/8"	11'-7"	313.57°	17'-11 9/16"	12'-10 1/2"	312.32°	17'-11 11/16"	15'-4 1/16"	311.16°	17'-11 3/4"	17'-9 9/16"	312.32°	17'-11 11/16"	19'-1 1/8"	313.57°	17'-11 9/16"	19'-4 9/16"	313.84°	17'-11 5/8"	20'-3"	314.52°	18'-0 3/4"	21'-4 7/8"	314.97°		21'-10 1/16"	315°	
V89	7'-4 11/16"	317°		9'-3 1/4"	316.35°		9'-10 1/4"	315.88°	18'-1 11/16"	10'-5 1/8"	315.35°	18'-0 3/4"	11'-7"	314.27°	17'-11 1/2"	12'-10 1/2"	313.06°	17'-11 5/8"	15'-4 1/16"	311.94°	17'-11 11/16"	17'-9 9/16"	313.06°	17'-11 5/8"	19'-1 1/8"	314.27°	17'-11 1/2"	20'-3"	315.35°	18'-0 3/4"	20'-9 7/8"	315.88°	18'-1 11/16"	21'-4 7/8"	316.35°		23'-3 7/16"	317°	
V88	5'-11 1/4"	319°		8'-4 3/4"	317.90°		9'-3 1/4"	317.11°		10'-5 1/8"	316.05°	18'-0 11/16"	11'-7"	315.00°	17'-11 7/16"	12'-10 1/2"	313.82°	17'-11 9/16"	15'-4 1/16"	312.72°	17'-11 5/8"	17'-9 9/16"	313.82°	17'-11 9/16"	19'-1 1/8"	315.00°	17'-11 7/16"	20'-3"	316.05°	18'-0 11/16"	21'-4 7/8"	317.11°		22'-3 3/8"	317.90°		24'-8 7/8"	319°	
V87	4'-5 7/8"	321°		6'-11 7/16"	319.92°		9'-3 1/4"	317.81°		10'-5 1/8"	316.79°	18'-0 11/16"	11'-7"	315.75°	17'-11 7/16"	12'-10 1/2"	314.59°	17'-11 1/2"	15'-4 1/16"	313.50°	17'-11 9/16"	17'-9 9/16"	314.59°	17'-11 1/2"	19'-1 1/8"	315.75°	17'-11 7/16"	20'-3"	316.79°	18'-0 11/16"	21'-4 7/8"	317.81°		23'-8 11/16"	319.92°		26'-2 3/16"	321°	
V86	3'-6 3/16"	323°		5'-11 3/4"	321.87°		9'-3 1/4"	318.79°		10'-5 1/8"	317.71°	18'-0 11/16"	11'-7"	316.62°	17'-11 3/8"	12'-10 1/2"	315.41°	17'-11 7/16"	15'-4 1/16"	314.28°	17'-11 1/2"	17'-9 9/16"	315.41°	17'-11 7/16"	19'-1 1/8"	316.62°	17'-11 3/8"	20'-3"	317.71°	18'-0 11/16"	21'-4 7/8"	318.79°		24'-8 3/8"	321.87°		27'-1 7/8"	323°	
V85	3'-6 3/16"	325°		5'-11 3/4"	326.13°		9'-3 1/4"	329.21°		10'-5 1/8"	330.29°	18'-0 11/16"	11'-7"	331.38°	17'-11 3/8"	12'-10 1/2"	332.59°	17'-11 7/16"	15'-4 1/16"	333.72°	17'-11 1/2"	17'-9 9/16"	332.59°	17'-11 7/16"	19'-1 1/8"	331.38°	17'-11 3/8"	20'-3"	330.29°	18'-0 11/16"	21'-4 7/8"	329.21°		24'-8 3/8"	326.13°		27'-1 7/8"	325°	
V84	4'-5 7/8"	327°		6'-11 7/16"	328.09°		9'-3 1/4"	330.17°		10'-5 1/8"	331.21°	18'-0 11/16"	11'-7"	332.25°	17'-11 7/16"	12'-10 1/2"	333.42°	17'-11 1/2"	15'-4 1/16"	334.50°	17'-11 9/16"	17'-9 9/16"	333.42°	17'-11 1/2"	19'-1 1/8"	332.25°	17'-11 7/16"	20'-3"	331.21°	18'-0 11/16"	21'-4 7/8"	330.17°		23'-8 11/16"	328.09°		26'-2 3/16"	327°	
V83	5'-11 1/4"	329°		8'-4 3/4"	330.10°		9'-3 1/4"	330.89°		10'-5 1/8"	331.95°	18'-0 11/16"	11'-7"	333.00°	17'-11 7/16"	12'-10 1/2"	334.18°	17'-11 9/16"	15'-4 1/16"	335.28°	17'-11 5/8"	17'-9 9/16"	334.18°	17'-11 9/16"	19'-1 1/8"	333.00°	17'-11 7/16"	20'-3"	331.95°	18'-0 11/16"	21'-4 7/8"	330.89°		22'-3 3/8"	330.10°		24'-8 7/8"	329°	
V82	7'-4 11/16"	331°		9'-3 1/4"	331.65°		9'-10 1/4"	332.12°	18'-1 11/16"	10'-5 1/8"	332.65°	18'-0 3/4"	11'-7"	333.73°	17'-11 1/2"	12'-10 1/2"	334.94°	17'-11 5/8"	15'-4 1/16"	336.06°	17'-11 11/16"	17'-9 9/16"	334.94°	17'-11 5/8"	19'-1 1/8"	333.73°	17'-11 1/2"	20'-3"	332.65°	18'-0 3/4"	20'-9 7/8"	332.12°	18'-1 11/16"	21'-4 7/8"	331.65°		23'-3 7/16"	331°	
V81	8'-10"	333°		9'-3 1/4"	333.04°		10'-5 1/8"	333.48°	18'-0 3/4"	11'-3 9/16"	334.16°	17'-11 5/8"	11'-7"	334.43°	17'-11 9/16"	12'-10 1/2"	335.68°	17'-11 11/16"	15'-4 1/16"	336.84°	17'-11 3/4"	17'-9 9/16"	335.68°	17'-11 11/16"	19'-1 1/8"	334.43°	17'-11 9/16"	19'-4 9/16"	334.16°	17'-11 5/8"	20'-3"	333.48°	18'-0 3/4"	21'-4 7/8"	333.04°		21'-10 1/16"	333°	
V80	9'-3 1/4"	335°		9'-7 5/8"	335°	18'-1 15/16"	10'-5 1/8"	335.18°	18'-0 13/16"	11'-7"	335.61°	17'-11 5/8"	12'-1 3/16"	335.99°	17'-11 11/16"	12'-10 1/2"	336.63°	17'-11 3/4"	15'-4 1/16"	337.62°	17'-11 13/16"	17'-9 9/16"	336.63°	17'-11 3/4"	18'-6 15/16"	335.99°	17'-11 11/16"	19'-1 1/8"	335.61°	17'-11 5/8"	20'-3"	335.10°	18'-0 13/16"	21'-0 1/2"	335°	18'-1 15/16"	21'-4 7/8"	335°	
V79	9'-3 1/4"	337°		10'-5 1/8"	337°	18'-0 7/8"	11'-1 1/8"	337°	17'-11 13/16"	11'-7"	337.04°	17'-11 3/4"	13'-2 9/16"	337.70°	17'-11 13/16"	15'-4 1/16"	338.46°	17'-11 7/8"	17'-5 1/2"	337.70°	17'-11 13/16"	19'-1 1/8"	337.04°	17'-11 3/4"	19'-7"	337°	17'-11 13/16"	20'-3"	337°	18'-0 7/8"	21'-4 7/8"	337°							
V78	9'-3 1/4"	339°		10'-5 1/8"	339°	18'-1"	11'-7"	339°	17'-11 15/16"	13'-11 9/16"	339°	17'-11 15/16"	14'-7 13/16"	339.09°	18'	15'-4 1/16"	339.18°	18'	16'-0 5/16"	339.09°	18'	16'-0 9/16"	339°	17'-11 15/16"	19'-1 1/8"	339°	17'-11 15/16"	20'-3"	339°	18'-1"	21'-4 7/8"	339°							
V77	9'-3 1/4"	341°		10'-5 1/8"	341°	18'-1 1/8"	11'-7"	341°	18'-0 3/16"	19'-1 1/8"	341°	18'-0 3/16"	20'-3"	341°	18'-1 1/8"	21'-4 7/8"	341°																						
V76	9'-3 1/4"	343°		10'-5 1/8"	343°	18'-1 1/4"	11'-7"	343°	18'-0 7/16"	19'-1 1/8"	343°	18'-0 7/16"	20'-3"	343°	18'-1 1/4"	21'-4 7/8"	343°																						
V75	9'-3 1/4"	345°		10'-5 1/8"	345°	18'-1 3/8"	11'-7"	345°	18'-0 11/16"	19'-1 1/8"	345°	18'-0 11/16"	20'-3"	345°	18'-1 3/8"	21'-4 7/8"	345°																						
V74	9'-3 1/4"	347°		10'-5 1/8"	347°	18'-1 1/2"	11'-7"	347°	18'-1"	19'-1 1/8"	347°	18'-1"	20'-3"	347°	18'-1 1/2"	21'-4 7/8"	347°																						
V73	9'-3 1/4"	349°		10'-5 1/8"	349°	18'-1 11/16"	11'-7"	349°	18'-1 5/16"	19'-1 1/8"	349°	18'-1 5/16"	20'-3"	349°	18'-1 11/16"	21'-4 7/8"	349°																						
V72	9'-3 1/4"	351°		10'-5 1/8"	351°	18'-1 7/8"	11'-7"	351°	18'-1 11/16"	19'-1 1/8"	351°	18'-1 11/16"	20'-3"	351°	18'-1 7/8"	21'-4 7/8"	351°																						

EL:LEVEL

θ:AZIMUTH ANGLE

R:RADIUS (R SHOULD BE 18'-2", NORMAL CYLINDER HOOP TENDON POSITION, IN CASE OF BLANK)



PRESTRESSING TENDON DETAILS (E/H) (VERTICAL DOME) S=1/25

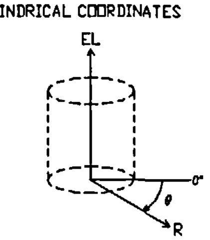
NOTE:

1) ⊕ : INFLECTION POINT (IN-PLANE)

2) ⊕ : INFLECTION POINT (OUT OF PLANE)

3) V00 00 — POINT NO. / TENDON NO.

4) CYLINDRICAL COORDINATES



NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET	
NUPEC	SYSTEMS SAFETY DEPT.		
	SNL	COPY 1	
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.		
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	
	EQUIP DESIGN SECT.	COPY 1	
	TAKASAGO R&D CENTER	COPY 1	
	TAISEI	COPY 1	
	OBAYASHI	ORIG.	

NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL

PRESTRESSING TENDON DETAILS (E/H) (VERTICAL DOME)

SCALE 1/25

MITSUBISHI HEAVY INDUSTRIES,LTD.

OBAYASHI CORPORATION

REVISION NO. R1

MHI | OBAYASHI | DRAWING NO. PCCV-QCON-07

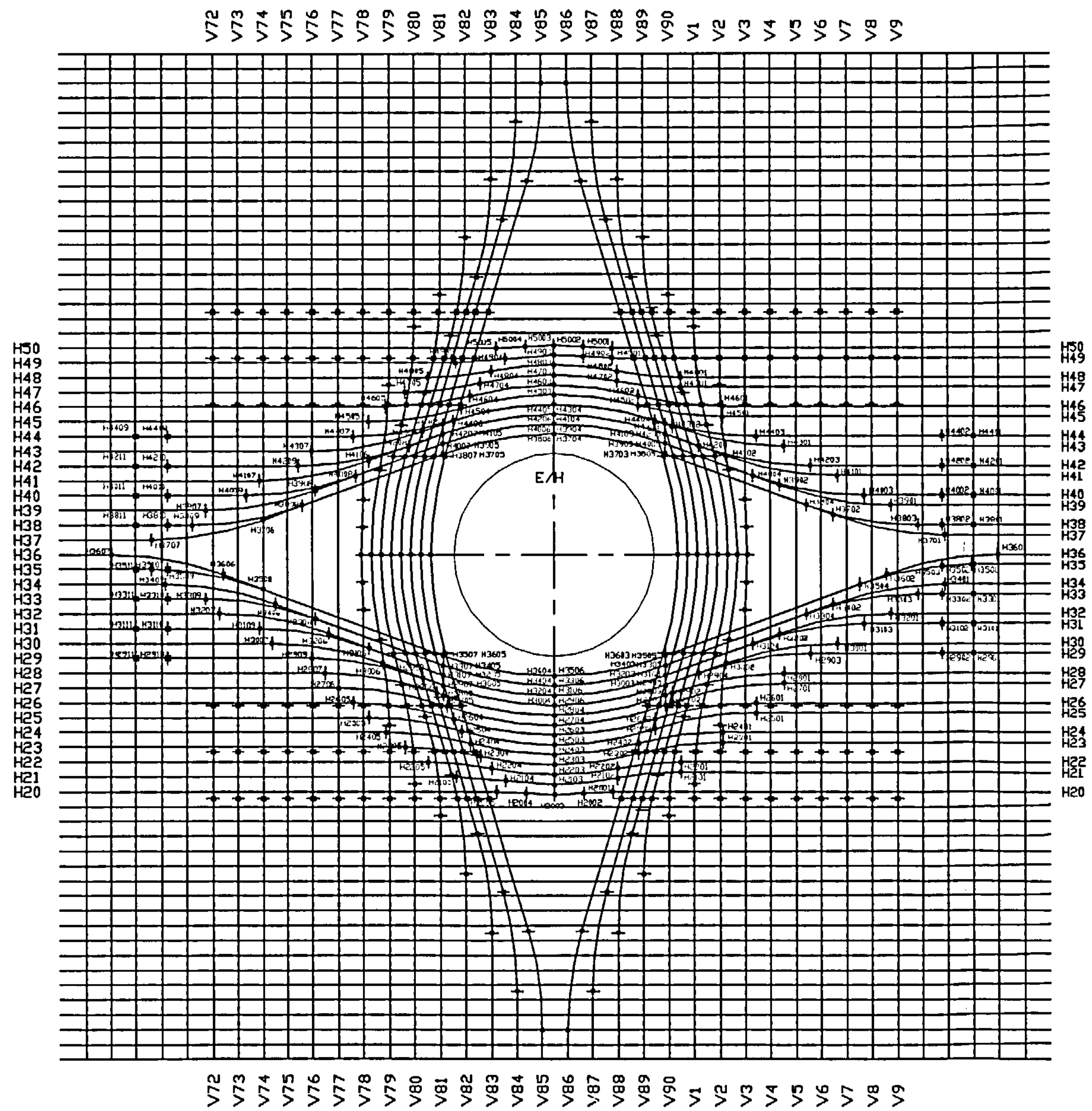
THE INFLECTION POINTS IN CYLINDRICAL COORDINATES (HOOP)

POINT NO. / TENDON NO.	01			02			03			04			05			06			07			08			09			10			11		
	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R	EL	θ	R
H20	9'-5 3/16"	319.42°		9'-4 13/16"	321.71°		9'-4 3/8"	324°		9'-4 13/16"	326.29°		9'-5 3/16"	328.58°																			
H21	9'-11 1/8"	314.06°		9'-9 3/16"	319.03°		9'-7 3/8"	324°		9'-8 1/2"	327.87°		9'-9 5/8"	331.75°																			
H22	10'-2 1/16"	314.06°		10'-0 3/16"	319.03°		9'-10 5/16"	324°		10'-0 3/16"	328.97°		10'-2 1/16"	333.94°																			
H23	10'-7 15/16"	310.75°		10'-4 5/8"	317.38°		10'-1 1/4"	324°		10'-3 7/8"	329.86°		10'-6 1/2"	335.72°																			
H24	10'-10 7/8"	310.75°		10'-7 9/16"	317.38°		10'-4 3/16"	324°		10'-7 9/16"	330.62°		10'-10 7/8"	337.25°																			
H25	11'-4 13/16"	308.16°		10'-11 15/16"	316.08°		10'-7 3/16"	324°		10'-11 1/4"	331.30°		11'-3 5/16"	338.61°																			
H26	11'-7 3/4"	308.16°		11'-2 15/16"	316.08°		10'-10 1/8"	324°		11'-2 15/16"	331.92°		11'-7 3/4"	339.84°																			
H27	12'-1 11/16"	305.96°		11'-7 3/4"	314.72°		11'-7"	315.24°		11'-1 1/16"	324°		11'-6 5/8"	332.49°		12'-0 3/16"	340.98°																
H28	12'-4 5/8"	305.96°		11'-10 11/16"	314.72°		11'-9 15/16"	315.24°		11'-4"	324°		11'-9 15/16"	332.76°		11'-10 11/16"	333.28°		12'-4 5/8"	348.04°													
H29	12'-10 1/2"	291°		12'-10 1/2"	293.48°	18'-3 7/8"	12'-10 1/2"	303.84°	18'-2 1/16"	12'-4 9/16"	312.61°	18'-1"	12'-0 15/16"	315.24°	18'-0 15/16"	11'-7"	324°	18'-0 11/16"	12'-0 15/16"	332.76°	18'-0 15/16"	12'-3 1/8"	334.34°	18'-1 1/16"	12'-9 1/16"	343.10°	18'-1 15/16"	12'-9 1/16"	354.52°	18'-3 7/8"	12'-9 1/16"	357°	
H30	13'-1 1/2"	301.73°		12'-7 9/16"	310.50°		12'-0 15/16"	315.24°		11'-7"	324°		12'-0 15/16"	332.76°		12'-7 9/16"	337.51°		13'-1 1/2"	346.27°													
H31	13'-7 3/8"	291°		13'-7 3/8"	293.48°	18'-3 7/8"	13'-7 3/8"	299.62°	18'-2 3/4"	13'-1 7/16"	308.38°	18'-1 1/2"	12'-3 7/8"	315.24°	18'-0 15/16"	11'-9 15/16"	324°	18'-0 11/16"	12'-3 7/8"	332.76°	18'-0 15/16"	13'	338.56°	18'-1 7/16"	13'-5 13/16"	347.32°	18'-2 9/16"	13'-5 13/16"	354.52°	18'-3 7/8"	13'-5 13/16"	357°	
H32	13'-10 5/16"	297.51°		13'-4 3/8"	306.27°		12'-3 7/8"	315.24°		11'-9 15/16"	324°		12'-3 7/8"	332.76°		13'-4 3/8"	341.73°		13'-10 5/16"	350.49°													
H33	14'-4 1/4"	291°		14'-4 1/4"	293.48°	18'-3 7/8"	14'-4 1/4"	295.40°	18'-3 1/2"	13'-10 5/16"	304.16°	18'-2 1/16"	12'-6 13/16"	315.24°	18'-0 15/16"	12'-0 7/8"	324°	18'-0 11/16"	12'-6 13/16"	332.76°	18'-0 15/16"	13'-8 13/16"	342.78°	18'-1 7/8"	14'-2 3/4"	351.55°	18'-3 5/16"	14'-2 3/4"	354.52°	18'-3 7/8"	14'-2 3/4"	357°	
H34	14'-7 3/16"	293.29°		14'-1 1/4"	302.05°		12'-6 13/16"	315.24°		12'-0 7/8"	324°		12'-6 13/16"	332.76°		14'-1 1/4"	345.95°		14'-7 3/16"	354.71°													
H35	15'-1 1/8"	291°		15'-1 1/8"	291.18°		15'-0 11/16"	293.48°	18'-3 7/8"	14'-7 3/16"	299.94°	18'-2 11/16"	12'-9 3/4"	315.24°	18'-0 15/16"	12'-3 13/16"	324°	18'-0 11/16"	12'-9 3/4"	332.76°	18'-0 15/16"	14'-5 11/16"	347.01°	18'-2 1/2"	14'-11 1/2"	354.52°	18'-3 7/8"	14'-11 5/8"	355.77°		14'-11 5/8"	357°	
H36	15'-4 1/16"	289.06°		14'-10 1/8"	297.83°		12'-9 3/4"	315.24°		12'-3 13/16"	324°		12'-9 3/4"	332.76°		14'-10 1/8"	350.18°		15'-4 1/16"	358.94°													
H37	15'-9 15/16"	293.29°		16'-3 7/8"	302.05°		17'-10 5/16"	315.24°		18'-4 1/4"	324°		17'-10 5/16"	332.76°		16'-2 7/16"	347.01°		15'-8 1/2"	355.77°													
H38	16'-0 15/16"	291°		16'-0 15/16"	293.48°	18'-3 7/8"	16'-0 15/16"	295.40°	18'-3 1/2"	16'-6 7/8"	304.16°	18'-2 1/16"	17'-10 5/16"	315.24°	18'-0 15/16"	18'-4 1/4"	324°	18'-0 11/16"	17'-10 5/16"	332.76°	18'-0 15/16"	16'-6 7/8"	343.84°	18'-2 1/16"	16'-0 15/16"	352.68°	18'-3 1/2"	16'-0 15/16"	354.52°	18'-3 7/8"	16'-0 15/16"	357°	
H39	16'-6 13/16"	297.51°		17'-0 3/4"	306.27°		18'-1 5/16"	315.24°		18'-7 1/4"	324°		18'-1 5/16"	332.76°		16'-11 1/4"	342.78°		16'-5 5/16"	351.55°													
H40	16'-9 3/4"	291°		16'-9 3/4"	293.48°	18'-3 7/8"	16'-9 3/4"	299.62°	18'-2 3/4"	17'-3 11/16"	308.38°	18'-1 1/2"	18'-1 5/16"	315.24°	18'-0 15/16"	18'-7 1/4"	324°	18'-0 11/16"	18'-1 5/16"	332.76°	18'-0 15/16"	17'-3 11/16"	339.62°	18'-1 1/2"	16'-9 3/4"	348.38°	18'-2 3/4"	16'-9 3/4"	354.52°	18'-3 7/8"	16'-9 3/4"	357°	
H41	17'-3 11/16"	301.73°		17'-9 5/8"	310.50°		18'-4 1/4"	315.24°		18'-10 3/16"	324°		18'-4 1/4"	332.76°		17'-0 1/8"	338.56°		17'-2 3/16"	347.32°													
H42	17'-6 5/8"	291°		17'-6 5/8"	293.48°	18'-3 7/8"	17'-6 5/8"	303.84°	18'-2 1/16"	18'-0 9/16"	312.61°	18'-1 1/8"	18'-4 1/4"	315.24°	18'-0 15/16"	18'-10 3/4"	324°	18'-0 11/16"	18'-4 1/4"	332.76°	18'-0 15/16"	18'-0 9/16"	335.39°	18'-1 1/8"	17'-6 5/8"	344.16°	18'-2 1/16"	17'-6 5/8"	354.52°	18'-3 7/8"	17'-6 5/8"	357°	
H43	18'-0 9/16"	305.96°		18'-6 1/2"	314.72°		18'-7 3/16"	315.24°		19'-1 1/8"	324°		18'-8 5/16"	331.92°		18'-5"	334.34°		17'-11 1/16"	343.10°													
H44	18'-3 1/2"	291°		18'-3 1/2"	293.48°	18'-3 7/8"	18'-3 1/2"	308.16°	18'-1 9/16"	18'-8 5/16"	316.08°	18'-0 7/8"	19'-1 1/8"	324°	18'-0 11/16"	18'-0 5/16"	331.92°	18'-0 7/8"	18'-3 1/2"	339.84°	18'-1 9/16"	18'-3 1/2"	354.52°	18'-3 7/8"	18'-3 1/2"	357°								
H45	18'-9 3/8"	310.75°		17'-0 3/4"	317.38°		17'-4 1/16"	324°		17'	331.30°		18'-7 15/16"	338.61°																			
H46	19'-0 3/8"	310.75°		19'-3 11/16"	317.38°		19'-7 1/16"	324°		19'-3 11/16"	330.62°		19'-0 3/8"	337.25°																			
H47	19'-6 1/4"	314.06°		19'-8 1/8"	319.03°		19'-10"	324°		19'-7 3/8"	329.86°		19'-4 3/4"	335.72°																			
H48	19'-9 3/16"	314.06°		19'-11 1/16"	319.03°		20'-0 15/16"	324°		19'-11 1/16"	328.97°		19'-9 3/16"	333.94°																			
H49	20'-3 1/8"	319.42°		20'-3 1/2"	321.71°		20'-3 7/8"	324°		20'-2 3/4"	327.87°		20'-1 5/8"	331.75°																			
H50	20'-6 1/16"	319.42°		20'-6 7/16"	321.71°		20'-6 7/8"	324°		20'-6 7/16"	326.29°		20'-6 1/16"	328.58°																			

EL : LEVEL

θ : AZIMUTH ANGLE

R : RADIUS (R SHOULD BE 18'-4 1/8", NORMAL CYLINDER HOOP TENDON POSITION, IN CASE OF BLANK)



PRESTRESSING TENDON DETAILS (E/H) (HOOP) S=1/25

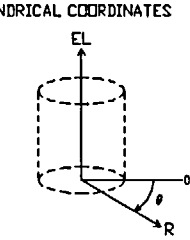
NOTE :

1) ⌖ : INFLECTION POINT (IN-PLANE)

2) ⌖ : INFLECTION POINT (OUT OF PLANE)

3) H00 00 — POINT NO. / TENDON NO.

4) CYLINDRICAL COORDINATES

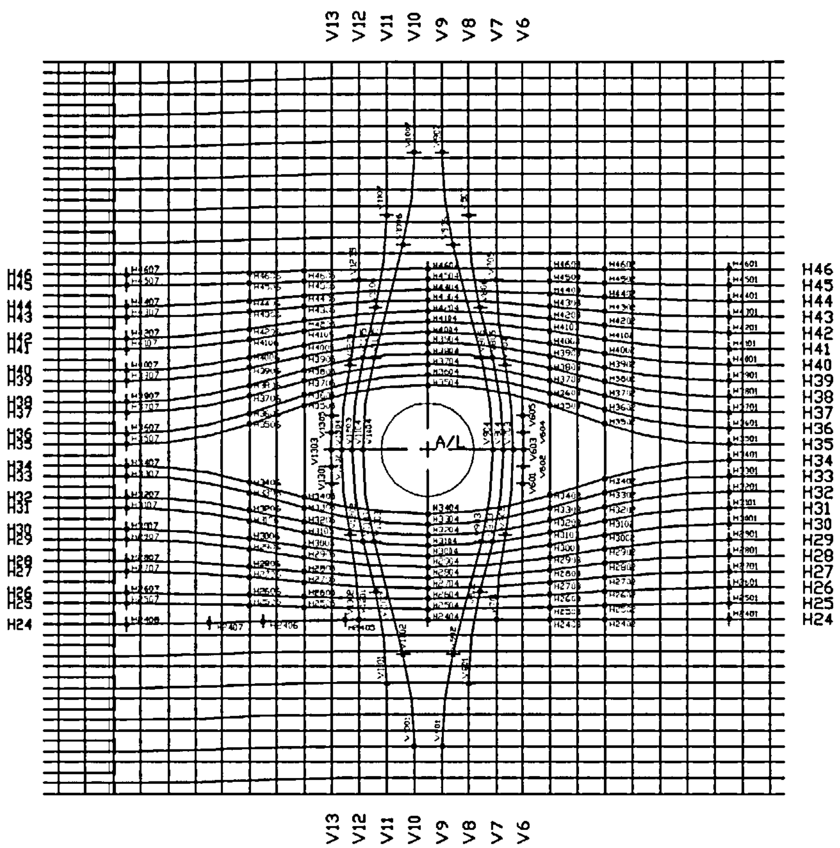


NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET	
NUPEC	SYSTEMS SAFETY DEPT.		NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL
	S N L	COPY 1	PRESTRESSING TENDON DETAILS (E/H) (HOOP) — SCALE 1/25
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.		MITSUBISHI HEAVY INDUSTRIES, LTD.
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	OBAYASHI CORPORATION — REVISION NO. R1
	EQUIP DESIGN SECT.	COPY 1	
	TAKASAGO R&D CENTER	COPY 1	MHI / OBAYASHI — DRAWING NO. PCCV-QCON-08
	T A I S E I	COPY 1	T. Iba K. Umeki H. Murano
	OBAYASHI	ORIG.	



PRESTRESSING TENDON DETAILS (A/L) S=1/25

THE INFLECTION POINTS IN CYLINDRICAL COORDINATES (VERTICAL DOME TENDONS)

TENDON NO. \ POINT NO.	01		02		03		04		05		06		07	
	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ
V6	14'-0 5/8"	55°	14'-5 3/8"	54.97°	14'-10 1/8"	54.94°	15'-2 15/16"	54.97°	15'-7 11/16"	55°				
V7	10'-10 7/8"	57°	12'-10 1/2"	56.36°	14'-10 1/8"	55.72°	16'-9 3/4"	56.36°	18'-9 7/16"	57°				
V8	9'-4 15/16"	59°	11'-6 1/2"	58.20°	12'-8 9/16"	57.30°	14'-10 1/8"	56.50°	16'-11 3/4"	57.30°	18'-1 13/16"	58.20°	20'-3 3/8"	59°
V9	7'-11 1/2"	61°	10'-1 1/16"	60.17°	12'-8 9/16"	58.11°	14'-10 1/8"	57.28°	16'-11 3/4"	58.11°	19'-7 1/4"	60.17°	21'-8 13/16"	61°
V10	7'-11 1/2"	63°	10'-1 1/16"	63.83°	12'-8 9/16"	65.89°	14'-10 1/8"	66.72°	16'-11 3/4"	65.89°	19'-7 1/4"	63.83°	21'-8 13/16"	63°
V11	9'-4 15/16"	65°	11'-6 1/2"	65.80°	12'-8 9/16"	66.70°	14'-10 1/8"	67.50°	16'-11 3/4"	66.70°	18'-1 13/16"	65.80°	20'-3 3/8"	65°
V12	10'-10 7/8"	67°	12'-10 1/2"	67.64°	14'-10 1/8"	68.28°	16'-9 3/4"	67.64°	18'-9 7/16"	67°				
V13	14'-0 5/8"	69°	14'-5 3/8"	69.03°	14'-10 1/8"	69.06°	15'-2 15/16"	69.03°	15'-7 11/16"	69°				

EL : LEVEL

θ : AZIMUTH ANGLE

R : 18'-2"

THE INFLECTION POINTS IN CYLINDRICAL COORDINATES (HOOP TENDONS)

TENDON NO. \ POINT NO.	01		02		03		04		05		06		07		08	
	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ
H24	10'-10 7/8"	40°	10'-10 13/16"	49°	10'-10 3/4"	53°	10'-10 11/16"	62°	10'-10 11/16"	68°	10'-10 5/16"	74°	10'-9 13/16"	78°	10'-9 7/16"	84°
H25	11'-3 5/16"	40°	11'-2 3/4"	49°	11'-2 3/16"	53°	11'-1 5/8"	62°	11'-2 3/16"	71°	11'-2 3/4"	75°	11'-3 5/16"	84°		
H26	11'-7 3/4"	40°	11'-6 11/16"	49°	11'-5 11/16"	53°	11'-4 5/8"	62°	11'-5 3/16"	71°	11'-5 11/16"	75°	11'-6 5/16"	84°		
H27	12'-0 3/16"	40°	11'-10 5/8"	49°	11'-9 1/8"	53°	11'-7 9/16"	62°	11'-9 1/8"	71°	11'-10 5/8"	75°	12'-0 3/16"	84°		
H28	12'-4 5/8"	40°	12'-2 1/2"	49°	12'-0 5/8"	53°	11'-10 1/2"	62°	12'-0 1/8"	71°	12'-1 9/16"	75°	12'-3 1/8"	84°		
H29	12'-9 1/16"	40°	12'-6 7/16"	49°	12'-4 1/16"	53°	12'-1 7/16"	62°	12'-4 1/16"	71°	12'-6 7/16"	75°	12'-9 1/16"	84°		
H30	13'-1 1/2"	40°	12'-10 5/16"	49°	12'-7 9/16"	53°	12'-4 3/8"	62°	12'-7"	71°	12'-9 3/8"	75°	13'	84°		
H31	13'-5 15/16"	40°	13'-2 1/4"	49°	12'-11"	53°	12'-7 3/8"	62°	12'-11"	71°	13'-2 1/4"	75°	13'-5 15/16"	84°		
H32	13'-10 5/16"	40°	13'-6 3/16"	49°	13'-2 7/16"	53°	12'-10 5/16"	62°	13'-1 15/16"	71°	13'-5 1/4"	75°	13'-8 7/8"	84°		
H33	14'-2 3/4"	40°	13'-10 1/8"	49°	13'-5 15/16"	53°	13'-1 1/4"	62°	13'-5 15/16"	71°	13'-10 1/8"	75°	14'-2 3/4"	84°		
H34	14'-7 3/16"	40°	14'-2 1/16"	49°	13'-9 3/8"	53°	13'-4 3/16"	62°	13'-8 7/8"	71°	14'-1 1/16"	75°	14'-5 3/4"	84°		
H35	14'-11 5/8"	40°	15'-5 1/4"	49°	15'-10 7/16"	53°	16'-4 1/16"	62°	15'-10 7/16"	71°	15'-5 1/4"	75°	14'-11 5/8"	84°		
H36	15'-4 1/16"	40°	15'-9 3/16"	49°	16'-1 7/8"	53°	16'-7 1/16"	62°	16'-1 3/8"	71°	15'-8 1/4"	75°	15'-2 9/16"	84°		
H37	15'-8 1/2"	40°	16'-1 1/8"	49°	16'-5 5/16"	53°	16'-10"	62°	16'-5 5/16"	71°	16'-1 1/8"	75°	15'-8 1/2"	84°		
H38	16'-0 15/16"	40°	16'-5 1/16"	49°	16'-8 13/16"	53°	17'-0 15/16"	62°	16'-8 1/4"	71°	16'-4 1/8"	75°	15'-11 7/16"	84°		
H39	16'-5 5/16"	40°	16'-9"	49°	17'-0 1/4"	53°	17'-3 7/8"	62°	17'-0 1/4"	71°	16'-9"	75°	16'-5 5/16"	84°		
H40	16'-9 3/4"	40°	17'-0 15/16"	49°	17'-3 11/16"	53°	17'-6 7/8"	62°	17'-3 3/16"	71°	16'-11 15/16"	75°	16'-8 5/16"	84°		
H41	17'-2 3/16"	40°	17'-4 13/16"	49°	17'-7 3/16"	53°	17'-9 13/16"	62°	17'-7 3/16"	71°	17'-4 13/16"	75°	17'-2 3/16"	84°		
H42	17'-6 5/8"	40°	17'-8 3/4"	49°	17'-10 5/8"	53°	18'-0 3/4"	62°	17'-10 1/8"	71°	17'-7 3/4"	75°	17'-5 1/8"	84°		
H43	17'-11 1/16"	40°	18'-0 5/8"	49°	18'-2 1/8"	53°	18'-3 11/16"	62°	18'-2 1/8"	71°	18'-0 5/8"	75°	17'-11 1/16"	84°		
H44	18'-3 1/2"	40°	18'-4 9/16"	49°	18'-5 9/16"	53°	18'-6 11/16"	62°	18'-5 1/16"	71°	18'-3 5/8"	75°	18'-2"	84°		
H45	18'-7 15/16"	40°	18'-8 1/2"	49°	18'-9 1/16"	53°	18'-9 5/8"	62°	18'-9 1/16"	71°	18'-8 1/2"	75°	18'-7 15/16"	84°		
H46	19'-0 3/8"	40°	19'-0 7/16"	49°	19'-0 1/2"	53°	19'-0 9/16"	62°	19'	71°	18'-11 7/16"	75°	18'-10 7/8"	84°		

EL : LEVEL

θ : AZIMUTH ANGLE

R : 18'-4 1/8"

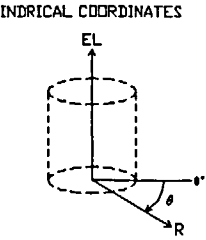
NOTE :

1) ⌖ : INFLECTION POINT (IN-PLANE)

2) H00 00 — POINT NO. / TENDON NO.

3) V00 00 — POINT NO. / TENDON NO.

4) CYLINDRICAL COORDINATES

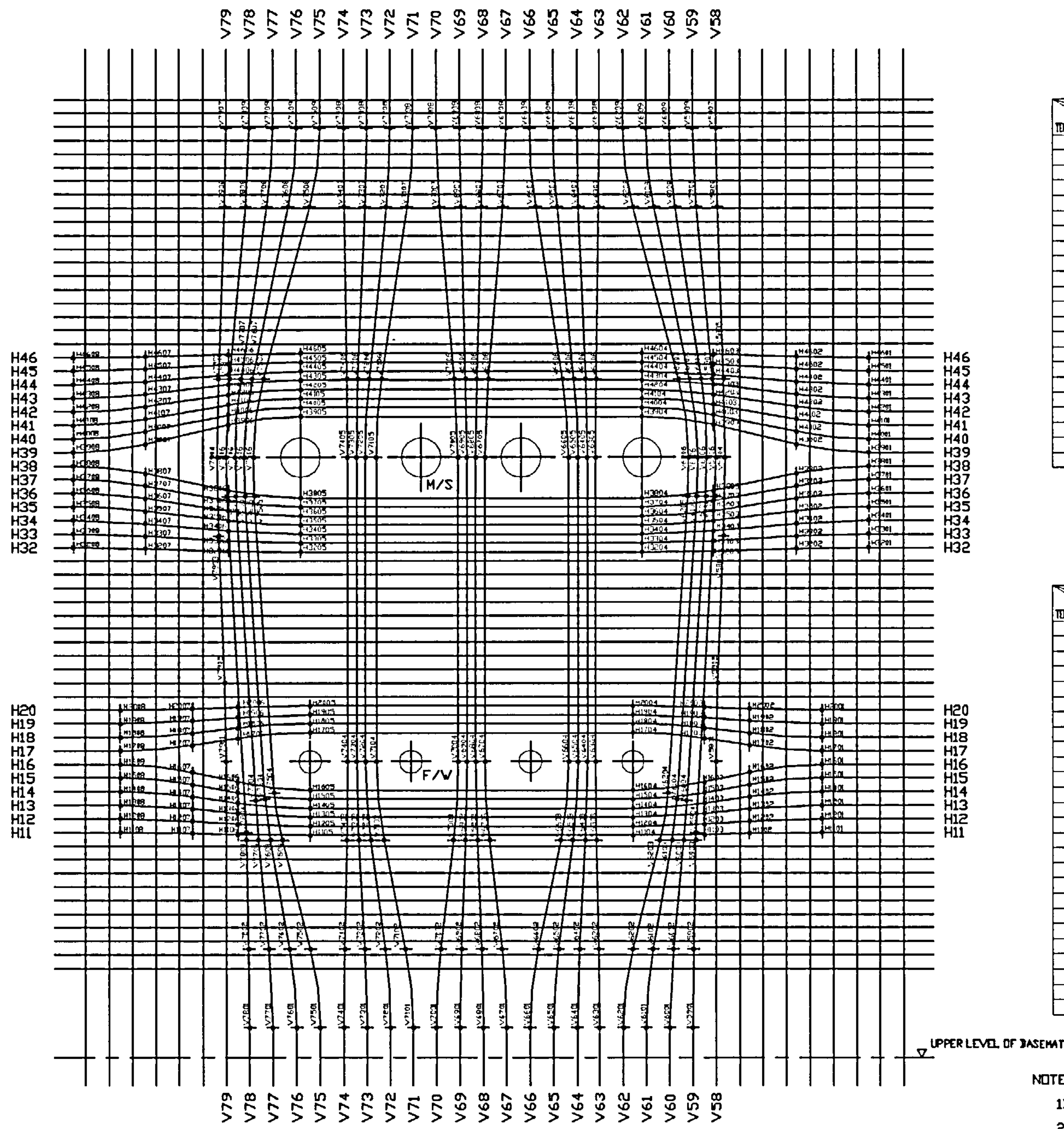


NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET	
NUPEC	SYSTEMS SAFETY DEPT.		NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL
	S N L	COPY 1	PRESTRESSING TENDON DETAILS (A/L) — SCALE 1/25
M H I	NUCLEAR SYSTEMS ENGINEERING DEPT.		MITSUBISHI HEAVY INDUSTRIES, LTD.
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	OBAYASHI CORPORATION — REVISION NO. R1
	EQUIP DESIGN SECT.	COPY 1	
	TAKASAGO R&D CENTER	COPY 1	MHI / OBAYASHI / DRAWING NO.
	T A I S E I	COPY 1	PCCV-QCON-09
	OBAYASHI	ORIG.	



PRESTRESSING TENDON DETAILS (M/S·F/W) S=1/25

THE INFLECTION POINTS IN CYLINDRICAL COORDINATES (VERTICAL DOME TENDONS)

TENDON NO. \ POINT NO.	01		02		03		04		05		06		07		08		09	
	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ
V58	8'-0 7/16"	159°	10'-2 1/16"	158.87°	14'-2 1/4"	158.36°	16'-3 7/8"	158.22°	18'-5 7/16"	158.34°	23'-1 9/16"	158.98°	25'-3 1/8"	159°				
V59	9 13/16"	161°	2'-11 7/16"	160.93°	5'-10 7/8"	160.73°	6'-1 5/16"	160.72°	15'-3 1/16"	159.87°	16'-3 7/8"	159.00°	18'-5 7/16"	159.31°	23'-1 9/16"	160.69°	25'-3 1/8"	161°
V60	9 13/16"	163°	2'-11 7/16"	162.67°	5'-10 7/8"	161.77°	6'-11 5/8"	161.52°	15'-3 1/16"	159.85°	16'-3 7/8"	159.78°	18'-5 7/16"	160.28°	23'-1 9/16"	162.50°	25'-3 1/8"	163°
V61	9 13/16"	165°	2'-11 7/16"	164.42°	5'-10 7/8"	162.80°	7'-0 3/16"	162.35°	15'-3 1/16"	160.63°	16'-3 7/8"	160.56°	18'-5 7/16"	161.25°	23'-1 9/16"	164.31°	25'-3 1/8"	165°
V62	9 13/16"	167°	2'-11 7/16"	166.17°	5'-10 7/8"	163.83°	7'-2 1/8"	163.13°	15'-3 1/16"	161.41°	16'-3 7/8"	161.34°	18'-5 7/16"	162.22°	23'-1 9/16"	166.12°	25'-3 1/8"	167°
V63	9 13/16"	169°	2'-11 7/16"	169.07°	5'-10 7/8"	169.27°	8'-0 7/16"	169.34°	16'-3 7/8"	169.34°	18'-5 7/16"	169.29°	23'-1 9/16"	169.05°	25'-3 1/8"	169°		
V64	9 13/16"	171°	2'-11 7/16"	170.82°	5'-10 7/8"	170.30°	8'-0 7/16"	170.12°	16'-3 7/8"	170.12°	18'-5 7/16"	170.26°	23'-1 9/16"	170.86°	25'-3 1/8"	171°		
V65	9 13/16"	173°	2'-11 7/16"	172.56°	5'-10 7/8"	171.34°	8'-0 7/16"	170.90°	16'-3 7/8"	170.90°	18'-5 7/16"	171.23°	23'-1 9/16"	172.67°	25'-3 1/8"	173°		
V66	9 13/16"	175°	2'-11 7/16"	174.31°	5'-10 7/8"	172.37°	8'-0 7/16"	171.68°	16'-3 7/8"	171.68°	18'-5 7/16"	172.20°	23'-1 9/16"	174.48°	25'-3 1/8"	175°		
V67	9 13/16"	177°	2'-11 7/16"	177.38°	5'-10 7/8"	178.45°	8'-0 7/16"	178.83°	16'-3 7/8"	178.83°	18'-5 7/16"	178.54°	23'-1 9/16"	177.29°	25'-3 1/8"	177°		
V68	9 13/16"	179°	2'-11 7/16"	179.13°	5'-10 7/8"	179.48°	8'-0 7/16"	179.61°	16'-3 7/8"	179.61°	18'-5 7/16"	179.51°	23'-1 9/16"	179.10°	25'-3 1/8"	179°		
V69	9 13/16"	181°	2'-11 7/16"	180.87°	5'-10 7/8"	180.52°	8'-0 7/16"	180.39°	16'-3 7/8"	180.39°	18'-5 7/16"	180.49°	23'-1 9/16"	180.90°	25'-3 1/8"	181°		
V70	9 13/16"	183°	2'-11 7/16"	182.62°	5'-10 7/8"	181.55°	8'-0 7/16"	181.17°	16'-3 7/8"	181.17°	18'-5 7/16"	181.46°	23'-1 9/16"	182.71°	25'-3 1/8"	183°		
V71	9 13/16"	185°	2'-11 7/16"	183.69°	5'-10 7/8"	187.63°	8'-0 7/16"	188.32°	16'-3 7/8"	188.32°	18'-5 7/16"	188.80°	23'-1 9/16"	185.52°	25'-3 1/8"	185°		
V72	9 13/16"	187°	2'-11 7/16"	187.44°	5'-10 7/8"	188.66°	8'-0 7/16"	189.10°	16'-3 7/8"	189.10°	18'-5 7/16"	188.77°	23'-1 9/16"	187.33°	25'-3 1/8"	187°		
V73	9 13/16"	189°	2'-11 7/16"	189.18°	5'-10 7/8"	189.70°	8'-0 7/16"	189.88°	16'-3 7/8"	189.88°	18'-5 7/16"	189.74°	23'-1 9/16"	189.14°	25'-3 1/8"	189°		
V74	9 13/16"	191°	2'-11 7/16"	190.93°	5'-10 7/8"	190.73°	8'-0 7/16"	190.66°	16'-3 7/8"	190.66°	18'-5 7/16"	190.71°	23'-1 9/16"	190.95°	25'-3 1/8"	191°		
V75	9 13/16"	193°	2'-11 7/16"	193.83°	5'-10 7/8"	196.17°	7'-2 1/8"	196.87°	15'-3 1/16"	198.59°	16'-3 7/8"	198.66°	18'-5 7/16"	197.78°	23'-1 9/16"	193.88°	25'-3 1/8"	193°
V76	9 13/16"	195°	2'-11 7/16"	195.58°	5'-10 7/8"	197.20°	7'-0 3/16"	197.65°	15'-3 1/16"	199.37°	16'-3 7/8"	199.44°	18'-5 7/16"	198.75°	23'-1 9/16"	195.69°	25'-3 1/8"	195°
V77	9 13/16"	197°	2'-11 7/16"	197.33°	5'-10 7/8"	198.23°	6'-11 5/8"	198.48°	15'-3 1/16"	200.15°	16'-3 7/8"	200.22°	18'-5 7/16"	199.72°	23'-1 9/16"	197.50°	25'-3 1/8"	197°
V78	9 13/16"	199°	2'-11 7/16"	199.07°	5'-10 7/8"	199.27°	6'-1 5/16"	199.28°	15'-3 1/16"	200.93°	16'-3 7/8"	201.00°	18'-5 7/16"	200.69°	23'-1 9/16"	199.31°	25'-3 1/8"	199°
V79	8'-0 7/16"	201°	10'-2 1/16"	201.13°	14'-2 1/4"	201.64°	16'-3 7/8"	201.78°	18'-5 7/16"	201.66°	23'-1 9/16"	201.12°	25'-3 1/8"	201°				

EL : LEVEL

θ : AZIMUTH ANGLE

R : 18'-2"

THE INFLECTION POINTS IN CYLINDRICAL COORDINATES (HOOP TENDONS)

TENDON NO. \ POINT NO.	01		02		03		04		05		06		07		08	
	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ	EL	θ
H11	6'-1 5/16"	150°	6'-1 1/16"	156.15°	6'-0 5/8"	160.01°	6'-0 5/16"	166.16°	6'-0 5/16"	193.84°	6'-0 5/8"	199.99°	6'-1 1/16"	203.85°	6'-1 5/16"	210°
H12	6'-5 3/4"	150°	6'-5"	156.15°	6'-4 1/16"	160.01°	6'-3 5/16"	166.16°	6'-3 5/16"	193.84°	6'-4 1/16"	199.99°	6'-5"	203.85°	6'-5 3/4"	210°
H13	6'-10 3/16"	150°	6'-9"	156.15°	6'-7 7/16"	160.01°	6'-6 1/4"	166.16°	6'-6 1/4"	193.84°	6'-7 7/16"	199.99°	6'-9"	203.85°	6'-10 3/16"	210°
H14	7'-2 5/8"	150°	7'-0 15/16"	156.15°	6'-10 7/8"	160.01°	6'-9 3/16"	166.16°	6'-9 3/16"	193.84°	6'-10 7/8"	199.99°	7'-0 15/16"	203.85°	7'-2 5/8"	210°
H15	7'-7 1/16"	150°	7'-4 15/16"	156.15°	7'-2 1/4"	160.01°	7'-0 1/8"	166.16°	7'-0 1/8"	193.84°	7'-2 1/4"	199.99°	7'-4 15/16"	203.85°	7'-7 1/16"	210°
H16	7'-11 1/2"	150°	7'-8 15/16"	156.15°	7'-5 5/8"	160.01°	7'-3 1/8"	166.16°	7'-3 1/8"	193.84°	7'-5 5/8"	199.99°	7'-8 15/16"	203.85°	7'-11 1/2"	210°
H17	8'-3 7/8"	150°	8'-5 11/16"	156.15°	8'-8"	160.01°	8'-9 13/16"	166.16°	8'-9 13/16"	193.84°	8'-8"	199.99°	8'-5 11/16"	203.85°	8'-3 7/8"	210°
H18	8'-8 5/16"	150°	8'-9 11/16"	156.15°	8'-11 3/8"	160.01°	9'-0 3/4"	166.16°	9'-0 3/4"	193.84°	8'-11 3/8"	199.99°	8'-9 11/16"	203.85°	8'-8 5/16"	210°
H19	9'-0 3/4"	150°	9'-1 11/16"	156.15°	9'-2 13/16"	160.01°	9'-3 11/16"	166.16°	9'-3 11/16"	193.84°	9'-2 13/16"	199.99°	9'-1 11/16"	203.85°	9'-0 3/4"	210°
H20	9'-5 3/16"	150°	9'-5 11/16"	156.15°	9'-6 3/16"	160.01°	9'-6 11/16"	166.16°	9'-6 11/16"	193.84°	9'-6 3/16"	199.99°	9'-5 11/16"	203.85°	9'-5 3/16"	210°
H32	13'-10 5/16"	146°	13'-10"	152.15°	13'-9 3/16"	159.21°	13'-8 7/8"	165.36°	13'-8 7/8"	194.64°	13'-9 3/16"	200.79°	13'-10"	207.85°	13'-10 5/16"	214°
H33	14'-2 3/4"	146°	14'-2 1/16"	152.15°	14'-0 1/2"	159.21°	13'-11 13/16"	165.36°	13'-11 13/16"	194.64°	14'-0 1/2"	200.79°	14'-2 1/16"	207.85°	14'-2 3/4"	214°
H34	14'-7 3/16"	146°	14'-6 3/16"	152.15°	14'-3 13/16"	159.21°	14'-2 3/4"	165.36°	14'-2 3/4"	194.64°	14'-3 13/16"	200.79°	14'-6 3/16"	207.85°	14'-7 3/16"	214°
H35	14'-11 5/8"	146°	14'-10 1/4"	152.15°	14'-7 1/16"	159.21°	14'-5 3/4"	165.36°	14'-5 3/4"	194.64°	14'-7 1/16"	200.79°	14'-10 1/4"	207.85°	14'-11 5/8"	214°
H36	15'-4 1/16"	146°	15'-2 5/16"	152.15°	14'-10 3/8"	159.21°	14'-8 11/16"	165.36°	14'-8 11/16"	194.64°	14'-10 3/8"	200.79°	15'-2 5/16"	207.85°	15'-4 1/16"	214°
H37	15'-8 1/2"	146°	15'-6 7/16"	152.15°	15'-1 11/16"	159.21°	14'-11 5/8"	165.36°	14'-11 5/8"	194.64°	15'-1 11/16"	200.79°	15'-6 7/16"	207.85°	15'-8 1/2"	214°
H38	16'-0 15/16"	146°	15'-10 1/2"	152.15°	15'-4 15/16"	159.21°	15'-2 9/16"	165.36°	15'-2 9/16"	194.64°	15'-4 15/16"	200.79°	15'-10 1/2"	207.85°	16'-0 15/16"	214°
H39	16'-5 5/16"	146°	16'-0 1/16"	152.15°	17'-2 7/16"	159.21°	17'-5 1/8"	165.36°	17'-5 1/8"	194.64°	17'-2 7/16"	200.79°	16'-0 1/16"	207.85°	16'-5 5/16"	214°
H40	16'-9 3/4"	146°	17'-0 3/16"	152.15°	17'-5 3/4"	159.21°	17'-8 1/8"	165.36°	17'-8 1/8"	194.64°	17'-5 3/4"	200.79°	17'-0 3/16"	207.85°	16'-9 3/4"	214°
H41	17'-2 3/16"	146°	17'-4 1/4"	152.15°	17'-9"	159.21°	17'-11 1/16"	165.36°	17'-11 1/16"	194.64°	17'-9"	200.79°	17'-4 1/4"	207.85°	17'-2 3/16"	214°
H42	17'-6 5/8"	146°	17'-8 3/8"	152.15°	18'-0 5/16"	159.21°	18'-2"	165.36°	18'-2"	194.64°	18'-0 5/16"	200.79°	17'-8 3/8"	207.85°	17'-6 5/8"	214°
H43	17'-11 1/16"	146°	18'-0 7/16"	152.15°	18'-3 5/8"	159.21°	18'-4 15/16"	165.36°	18'-4 15/16"	194.64°	18'-3 5/8"	200.79°	18'-0 7/16"	207.85°	17'-11 1/16"	214°
H44	18'-3 1/2"	146°	18'-4 1/2"	152.15°	18'-6 7/8"	159.21°	18'-7 15/16"	165.36°	18'-7 15/16"	194.64°	18'-6 7/8"	200.79°	18'-4 1/2"	207.85°	18'-3 1/2"	214°
H45	18'-7 15/16"	146°	18'-8 5/8"	152.15°	18'-10 3/16"	159.21°	18'-10 7/8"	165.36°	18'-10 7/8"	194.64°	18'-10 3/16"	200.79°	18'-8 5/8"	207.85°	18'-7 15/16"	214°
H46	19'-0 3/8"	146°	19'-0 11/16"	152.15°	19'-1 1/2"	159.21°	19'-1 13/16"	165.36°	19'-1 13/16"	194.64°	19'-1 1/2"	200.79°	19'-0 11/16"	207.85°	19'-0 3/8"	214°

EL : LEVEL

θ : AZIMUTH ANGLE

R : 18'-4 1/8"

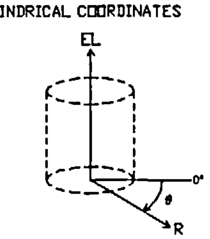
NOTE :

1) ⌖ : INFLECTION POINT (IN-PLANE)

2) H00 00 — POINT NO. / TENDON NO.

3) V00 00 — POINT NO. / TENDON NO.

4) CYLINDRICAL COORDINATES

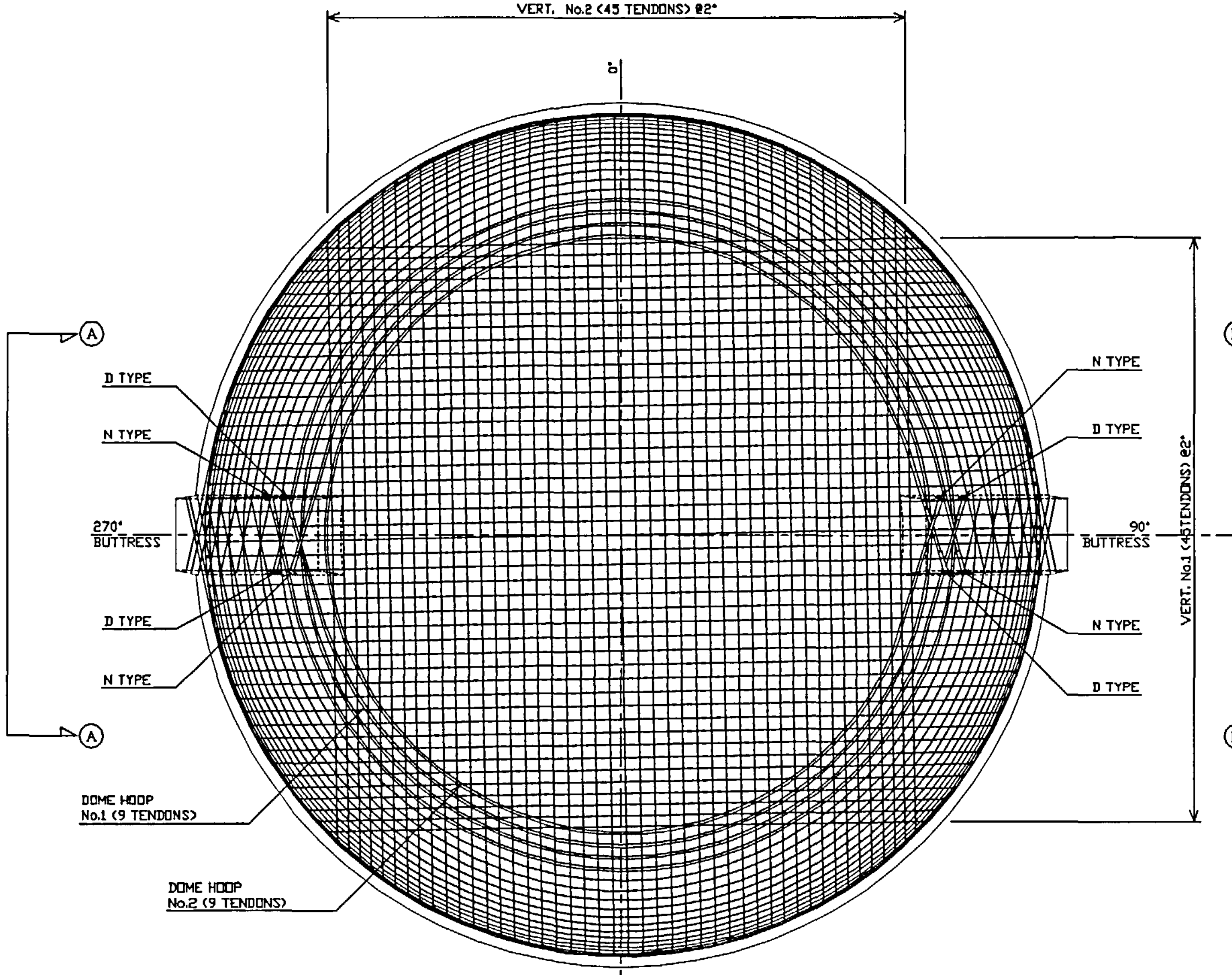


NO.	DATE	REVISION	BY

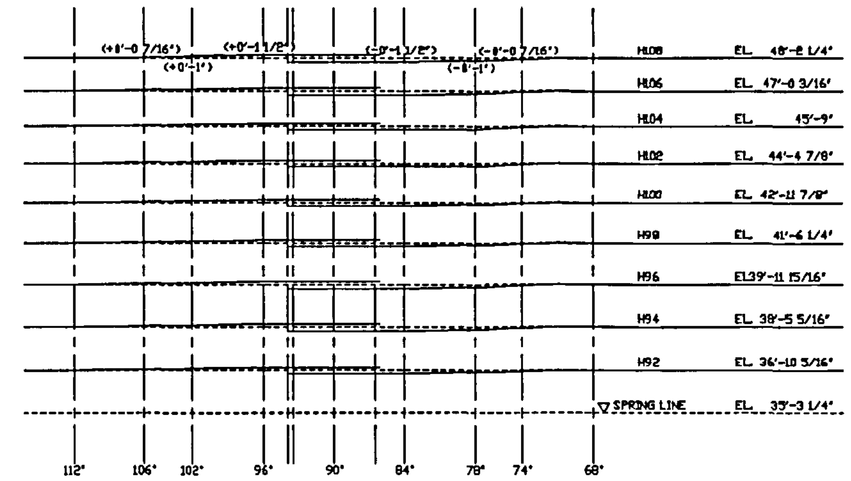
REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

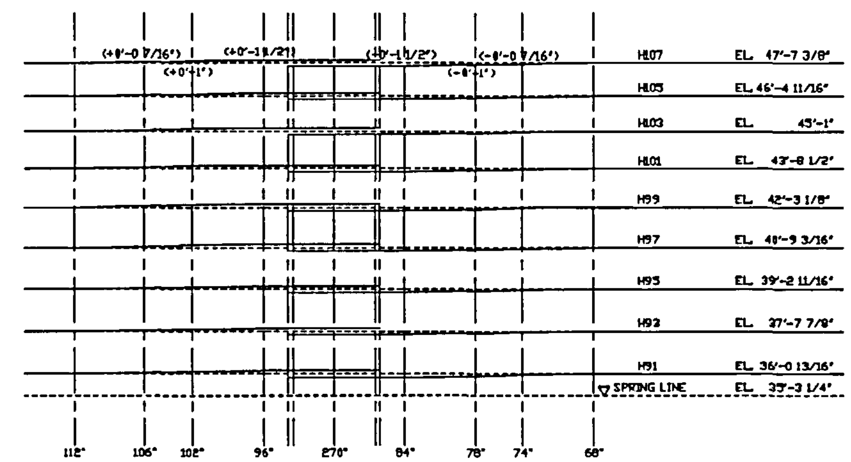
	NAME	SHEET	
NUPEC	SYSTEMS SAFETY DEPT.		NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL
	S N L	COPY 1	PRESTRESSING TENDON DETAILS (M/S·F/W) — SCALE 1/25
M H I	NUCLEAR SYSTEMS ENGINEERING DEPT.		MITSUBISHI HEAVY INDUSTRIES,LTD. — REVISION NO. R1
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	OBAYASHI CORPORATION
	EQUIP DESIGN SECT.	COPY 1	
	TAKASAGO R&D CENTER	COPY 1	MHI / OBAYASHI — DRAWING NO.
	T A I S E I	COPY 1	PCCV-QCON-10
	OBAYASHI	ORIG.	



DOME TENDON LAYOUT S=1/40



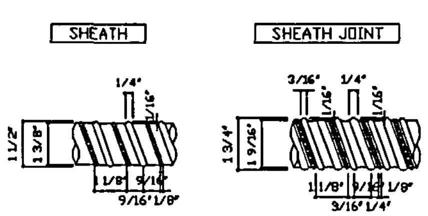
B-B S=1/15
DOME HOOP No.2



A-A S=1/15
DOME HOOP No.1

NOTE :
1) SHEATH CENTERS ARE SHOWN
2) ( ) ; OFFSET VALUE FROM NOMAL POSITION AT HOOP TENDON ANCHORED PORTIONS

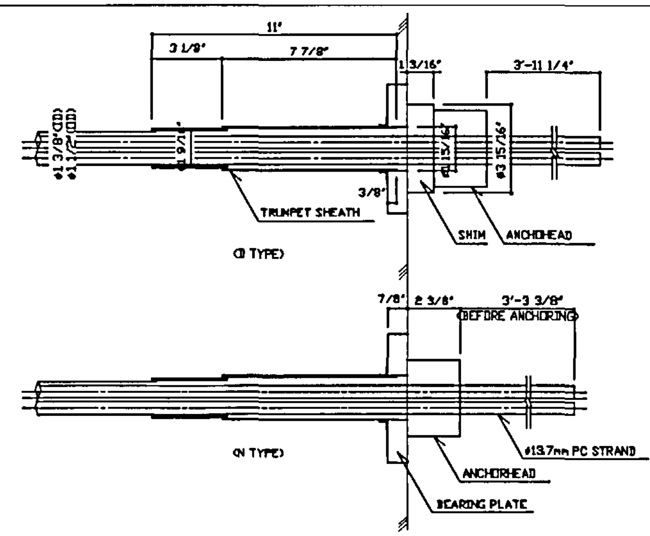
PS SYSTEM HARDWARE



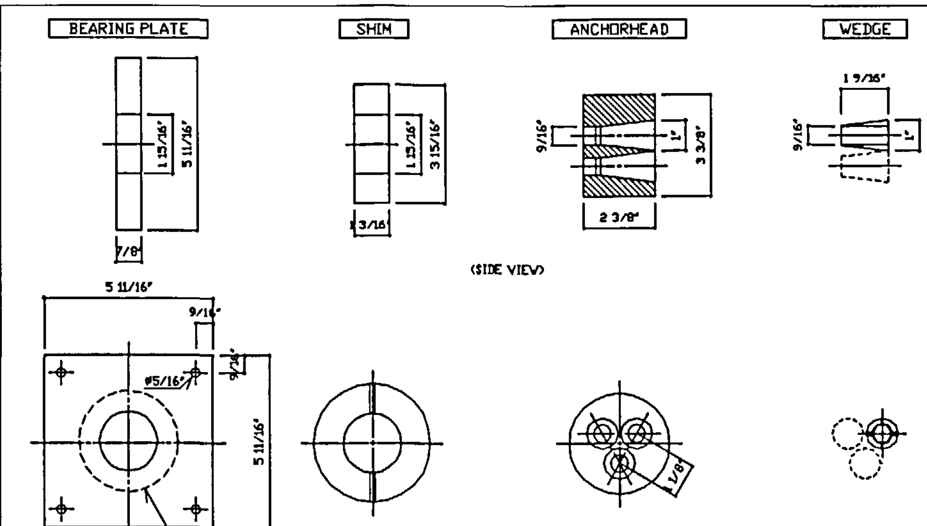
SHEATH DETAIL S=1/3

• MATERIAL SPECIFICATIONS

ANCHORHEAD	: S55C	JIS G 4051
BEARING PLATE	: SS400	JIS G 3101
WEDGE	: SCM415	JIS G 4105
SHEATH	: SGCC	JIS G 3302
TRUMPET SHEATH	: SGCV	JIS G 3442
SHIM	: SS400	JIS G 3101



ANCHORED PORTION SECTION S=1/4



ANCHORED PORTION DETAIL S=1/3

NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET
NUPEC	SYSTEMS SAFETY DEPT.	
SNL		COPY 1
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.	
MHI	STEEL STRUCTURE DESIGNING SECT.	COPY 1
MHI	EQUIP DESIGN SECT.	COPY 1
MHI	TAKASAGO R&D CENTER	COPY 1
TAISEI		COPY 1
OBAYASHI		ORIG.

NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL

DOME PRESTRESSING TENDON ARRANGEMENT • PRESTRESSING SYSTEM HARDWARE

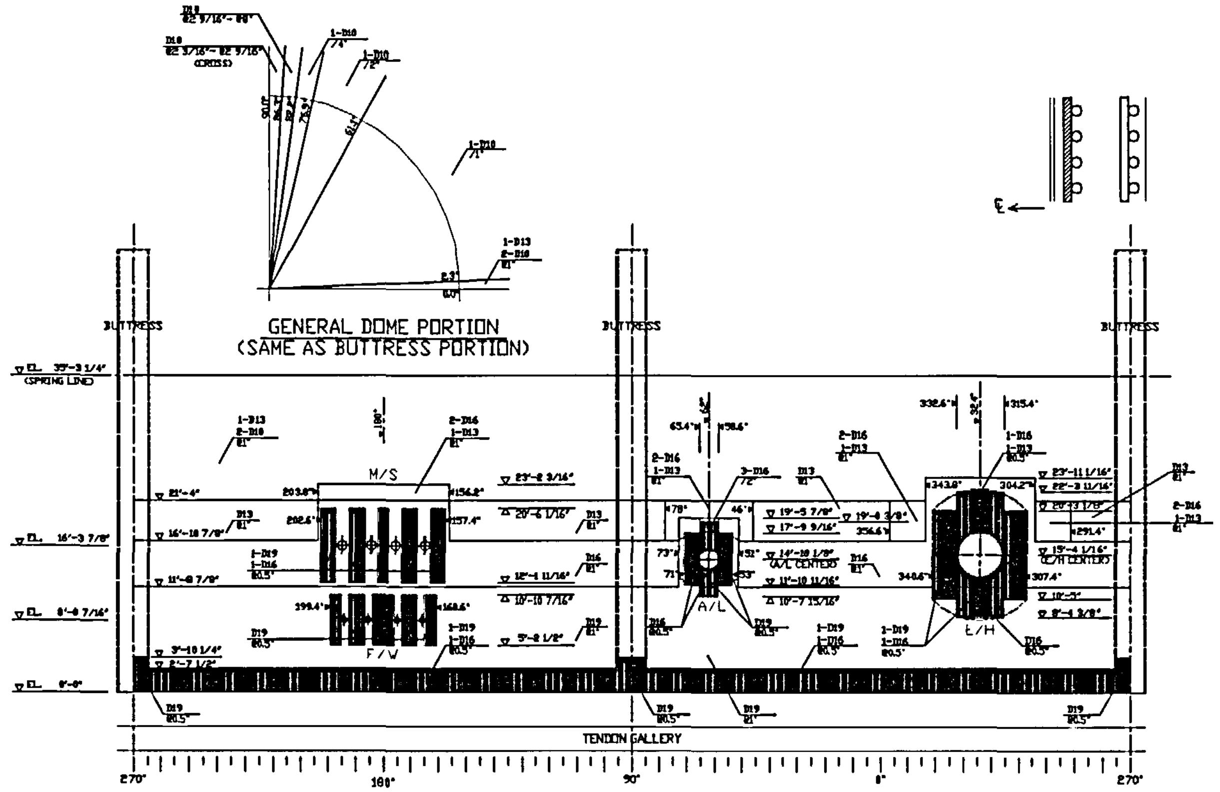
SCALE 1/40, 1/3, 1/4

MITSUBISHI HEAVY INDUSTRIES,LTD.

OBAYASHI CORPORATION

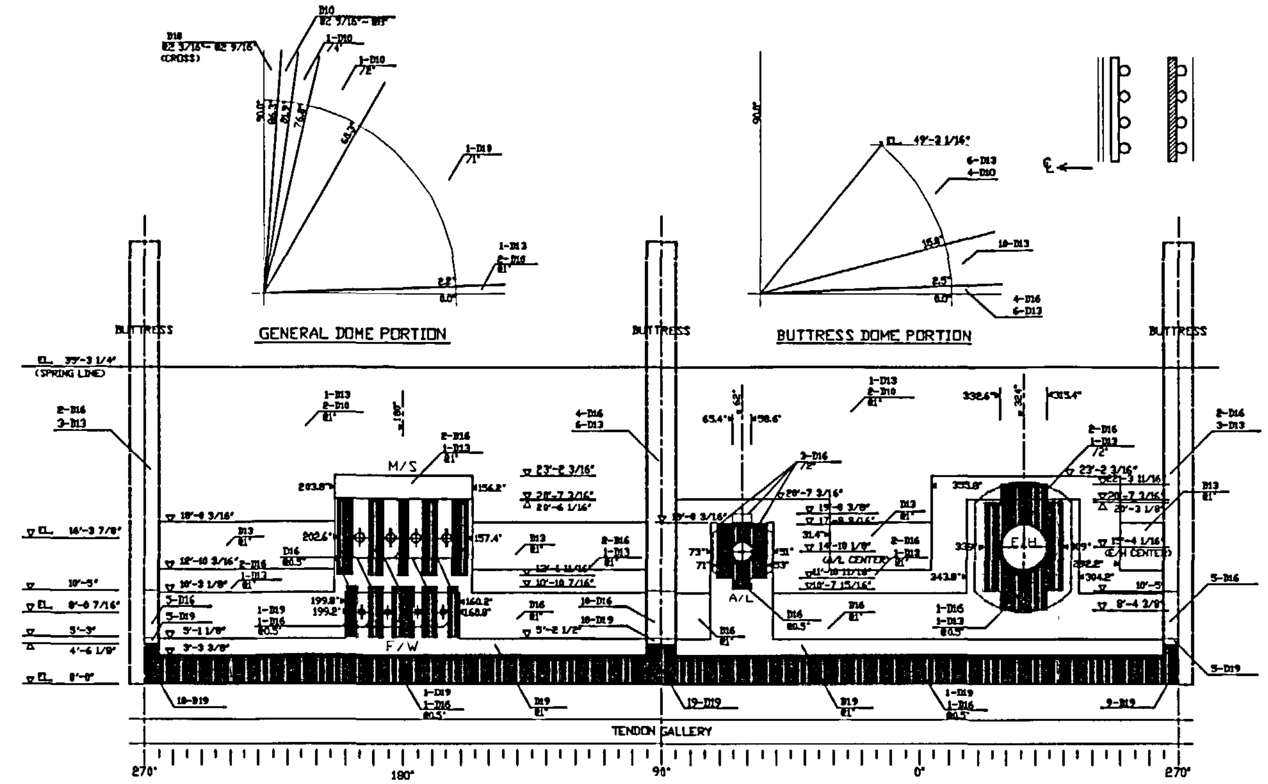
REVISION NO. R1

MHI	OBAYASHI	DRAWING NO.
	T. Iba K. Umeki H. Marana	PCCV-QCON-11



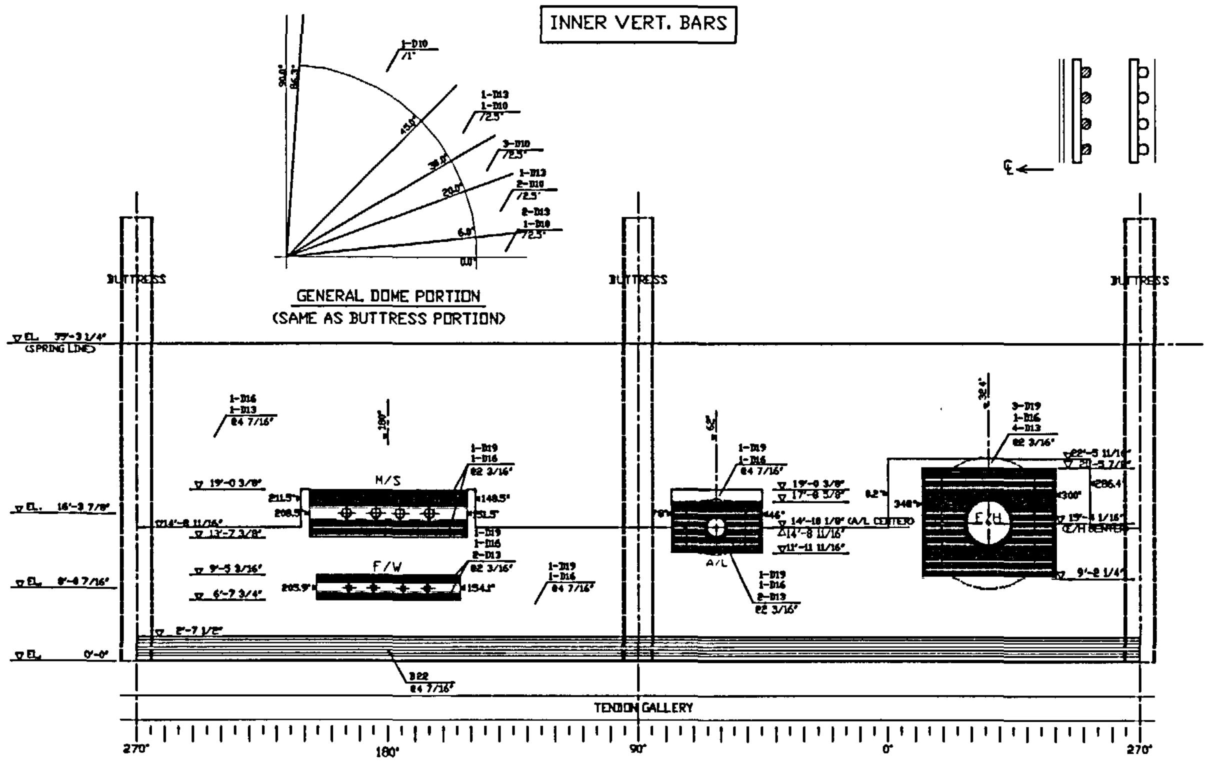
CYLINDER

INNER VERT. BARS



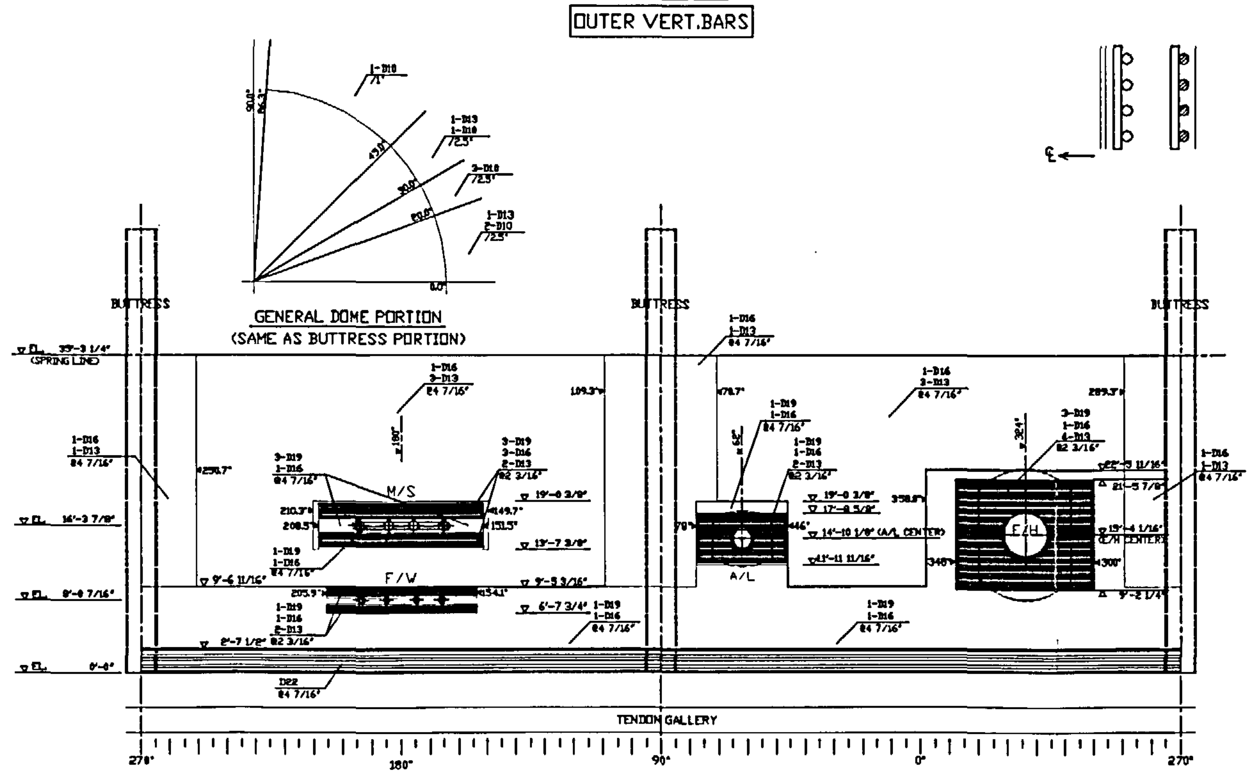
CYLINDER

OUTER VERT. BARS



CYLINDER

INNER HOOP BARS



CYLINDER

OUTER HOOP BARS

REBAR ARRANGEMENT GENERAL DESCRIPTION

(TYPICALS)

1. 1-D13 / 2-D10 / 81° — EACH D13,D10,D10 PITCH 1° EACH
2. 1-D13 / 2-D10 / 72.5° — : D13, D10, D10 PER 2.5°
3. 1-D19 / 1-D16 / 2-D13 / 83/16° — EACH D19,D16,D13,D13 PITCH 56.25 EACH
4. 1-D10 / 4°

NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET
NUPEC	SYSTEMS SAFETY DEPT.	
SNL		COPY 1
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.	
MHI	STEEL STRUCTURE DESIGNING SECT.	COPY 1
MHI	EQUIP DESIGN SECT.	COPY 1
MHI	TAKASAGO R&D CENTER	COPY 1
TAISEI		COPY 1
OBAYASHI		ORIG.

NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL

CYLINDER & DOME REBAR GENERAL ARRANGEMENT (1)

SCALE 1/120

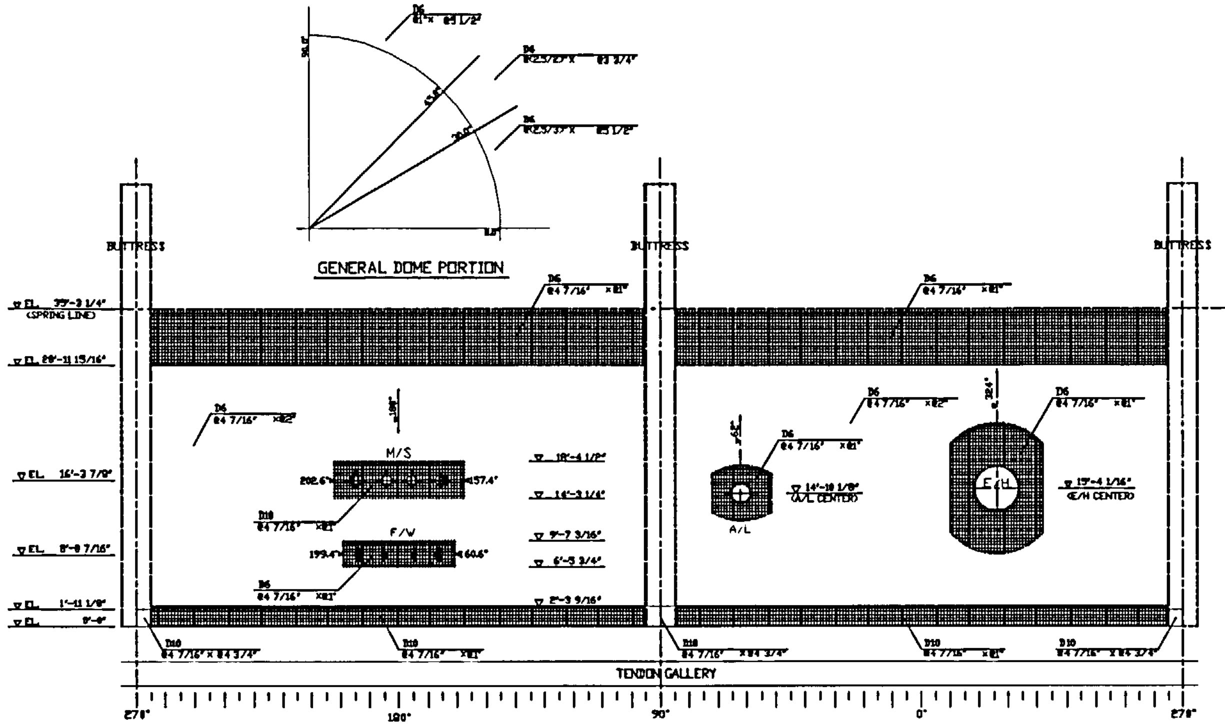
MITSUBISHI HEAVY INDUSTRIES,LTD.

OBAYASHI CORPORATION

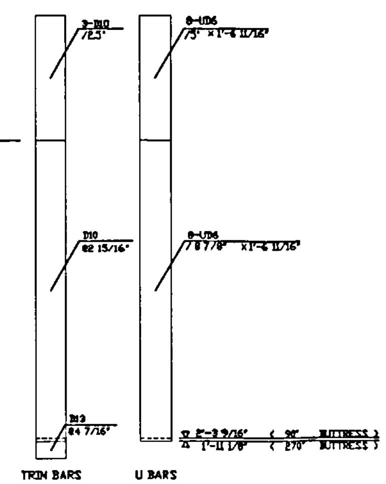
REVISION NO. R1

MHI | OBAYASHI: T. Iba K. Umeki H. Murano

DRAWING NO. PCCV-QCON-12



CYLINDER
RADIAL TIE



BUTTRESS
TRIM BARS · U BARS

GENERAL PORTION
REBAR ARRANGEMENT SCHEDULE

PORTIONS	VERT.BARS INNER	VERT.BARS OUTER	HOOP BARS INNER	HOOP BARS OUTER
DOME	D10 @2 3/16"~@2 9/16" CROSS D10 @2 9/16"~@0" 1-D10/4" 1-D10/2" 1-D10/1"	D10 @2 3/16"~@2 9/16" CROSS D10 @2 9/16"~@0" 1-D10/4" 1-D10/2" 1-D10/1"	——— 1-D10/1" 1-D13 1-D10 /2.5" 3-D10 /2.5" 1-D13 2-D10 /2.5"	——— 1-D10/1" 1-D13 1-D10 /2.5" 3-D10 /2.5" 1-D13 2-D10 /2.5"
CYLINDER	1-D13 2-D10 @1" D13 @1" D16 @1" D19 @1" 1-D19 1-D16 @0.5"	1-D13 2-D10 @1" D13 @1" 2-D16 1-D13 @1" D16 @1" D19 @1" 1-D19 1-D16 @0.5"	2-D13 1-D10 /2.5" 1-D16 1-D13 @4 7/16" 1-D19 1-D16 @4 7/16" D22 @4 7/16"	1-D16 3-D13 @4 7/16" (1-D16 1-D13 @4 7/16") 1-D19 1-D16 @4 7/16" D22 @4 7/16"

BUTTRESS PORTION
REBAR ARRANGEMENT SCHEDULE

PORTIONS	VERT.BARS INNER	VERT.BARS OUTER	HOOP BARS INNER	HOOP BARS OUTER	HOOP BARS TRIM BARS
DOME	——— 1-D10/1"	——— 6-D13 4-D10 10-D13	——— 1-D10/1" 1-D13 1-D10 /2.5" 3-D10 /2.5" 1-D13 2-D10 /2.5"	——— 1-D10/1" 1-D13 1-D10 /2.5" 3-D10 /2.5" 1-D13 2-D10 /2.5"	——— 3-D10 /2.5"
CYLINDER	1-D13 2-D10 @1" D13 @1" D16 @1" D19 @1" D19 @0.5"	4-D16 6-D13 10-D16 10-D19 19-D19	2-D13 1-D10 /2.5" 1-D16 1-D13 @4 7/16" 1-D19 1-D16 @4 7/16" D22 @4 7/16"	1-D16 1-D13 @4 7/16" 1-D19 1-D16 @4 7/16" D22 @4 7/16"	D10 @2 15/16" D13 @4 7/16"

REBAR ARRANGEMENT GENERAL DESCRIPTION

(TYPICALS)

5. RADIAL TIE IN DOME PORTION	D6 @(2.5/3)" x @5 1/2"	: D6	LONGITUDINAL DIRECTION HOOP DIRECTION	PITCH (2.5/3)" PITCH 5 1/2"
6. RADIAL TIE IN BUTTRESS PORTION	D10 @4 7/16" x @4 3/4"	: D10	LONGITUDINAL DIRECTION HOOP DIRECTION	PITCH 4 7/16" PITCH 4 3/4"
7. U BAR	8-UD6 @8 7/8" x @1'-6 11/16"	: U-D6	LONGITUDINAL DIRECTION HOOP DIRECTION	8 7/8" 1'-6 11/16"

NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

	NAME	SHEET
NUPEC	SYSTEMS SAFETY DEPT.	
	S N L	COPY 1
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.	
	STEEL STRUCTURE DESIGNING SECT.	COPY 1
	EQUIP. DESIGN SECT.	COPY 1
	TAKASAGO R&D CENTER	COPY 1
	T A I S E I	COPY 1
	OBAYASHI	ORIG.

NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL

CYLINDER & DOME REBAR GENERAL ARRANGEMENT (2)

SCALE 1/120

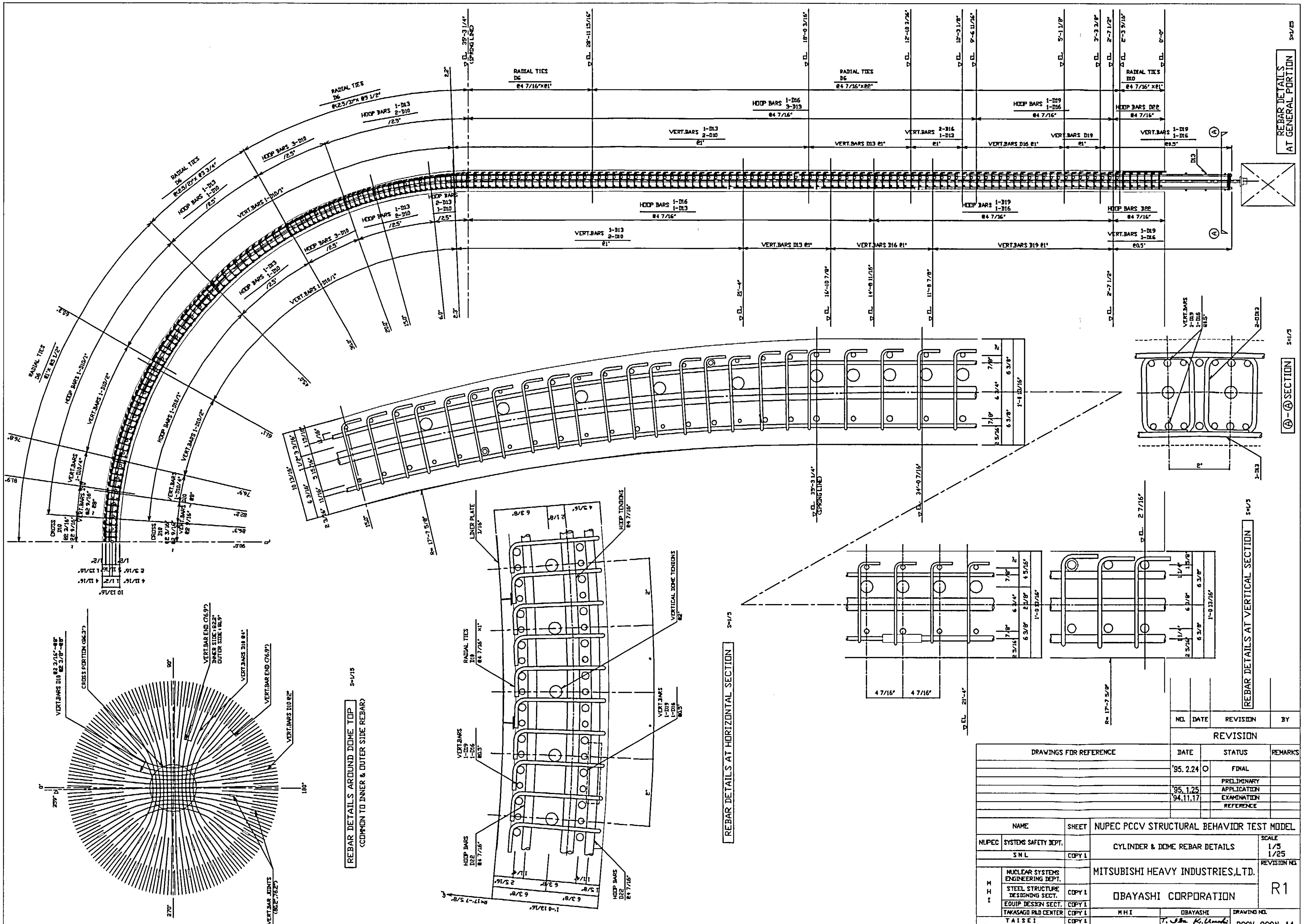
MITSUBISHI HEAVY INDUSTRIES,LTD.

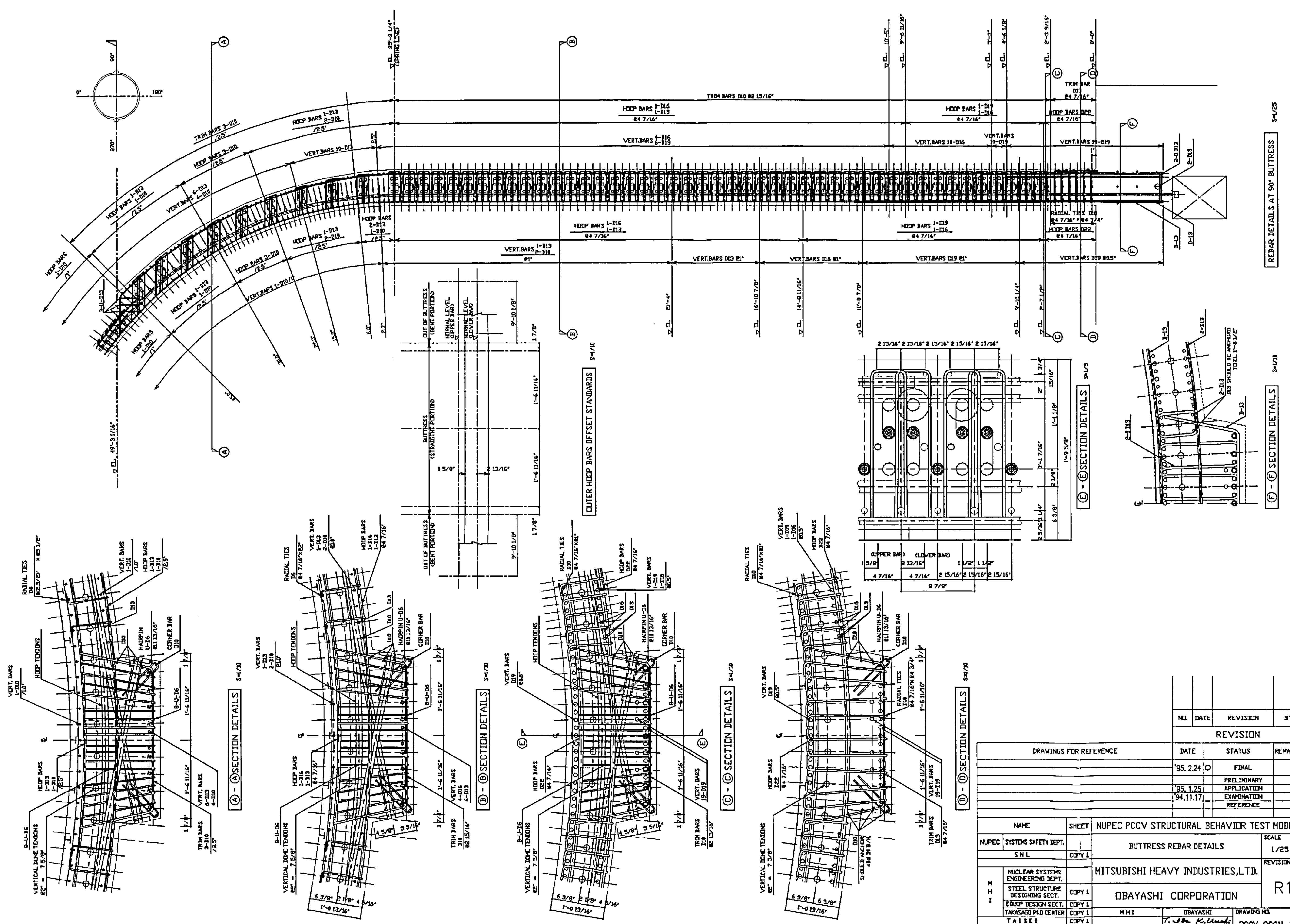
OBAYASHI CORPORATION

REVISION NO. R1

MHI | OBAYASHI

DRAWING NO. PCCV-QCON-13


REBAR DETAILS AT GENERAL PORTION
S=1/25
A-A SECTION
S=1/5
REBAR DETAILS AT VERTICAL SECTION
S=1/5
REBAR DETAILS AT HORIZONTAL SECTION
S=1/5
REBAR DETAILS AROUND DOME TOP
(COMMON TO INNER & OUTER SIDE REBAR)
S=1/15
RADIAL TIES
HOOP BARS
VERT.BARS
HOOP TENDONS
VERTICAL DOME TENDONS
LINER PLATE
VERT.BAR JOINTS
CROSS PORTION
NO.
DATE
REVISION
BY
REVISION
DRAWINGS FOR REFERENCE
DATE
STATUS
REMARKS
'95. 2.24
FINAL
PRELIMINARY
'95. 1.25
APPLICATION
'94.11.17
EXAMINATION
REFERENCE
NAME
SHEET
NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL
NUPEC
SYSTEMS SAFETY DEPT.
CYLINDER & DOME REBAR DETAILS
SCALE
1/5
1/25
S N L
COPY 1
REVISION NO.
MITSUBISHI HEAVY INDUSTRIES,LTD.
M H I
NUCLEAR SYSTEMS ENGINEERING DEPT.
STEEL STRUCTURE DESIGNING SECT.
COPY 1
OBAYASHI CORPORATION
R1
EQUIP DESIGN SECT.
COPY 1
TAKASAGO R&D CENTER
COPY 1
M H I
OBAYASHI
DRAWING NO.
T A I S E I
COPY 1
OBAYASHI
ORIG.
PCCV-QCON-14



NO.	DATE	REVISION	BY

REVISION

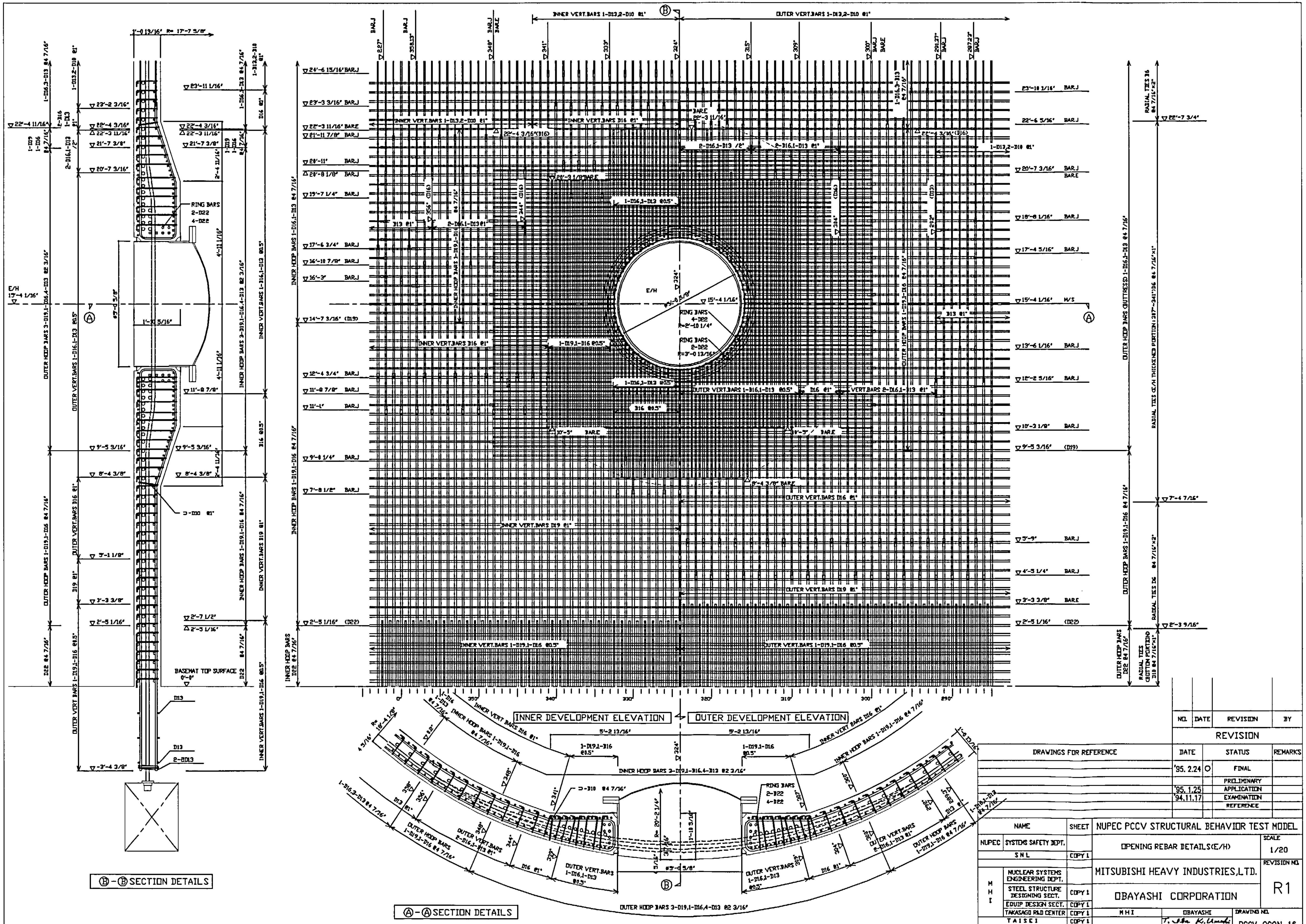
DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET	
NUPEC	SYSTEMS SAFETY DEPT.		NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL
SNL		COPY 1	BUTTRESS REBAR DETAILS
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.		MITSUBISHI HEAVY INDUSTRIES,LTD.
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	OBAYASHI CORPORATION
	EQUIP DESIGN SECT.	COPY 1	
	TAKASAGO R&D CENTER	COPY 1	MHI / OBAYASHI
TAISEI		COPY 1	
OBAYASHI		ORIG.	

SCALE 1/25

REVISION NO. R1

DRAWING NO. PCCV-QCON-15

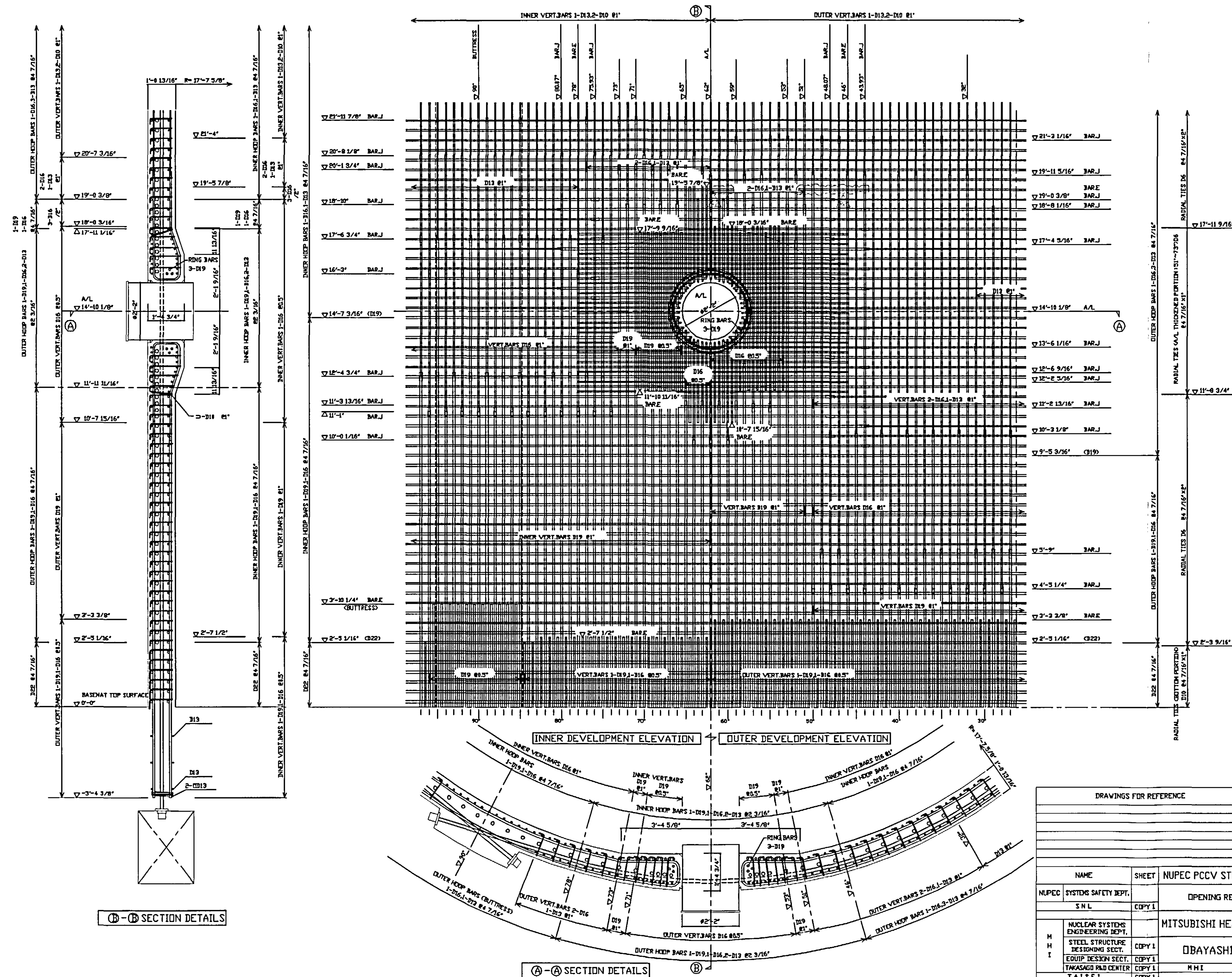


NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET		
NUPEC	SYSTEMS SAFETY DEPT.		NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL	
S N L		COPY 1	OPENING REBAR DETAILS(E/H)	SCALE 1/20
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.		MITSUBISHI HEAVY INDUSTRIES,LTD.	REVISION NO. R1
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	OBAYASHI CORPORATION	
	EQUIP DESIGN SECT.	COPY 1	MHI / OBAYASHI	DRAWING NO.
	TAKASAGO R&D CENTER	COPY 1	T. Iba K. Umeki H. Murano	PCCV-QCON-16
T A I S E I		COPY 1		
OBAYASHI		ORIG.		

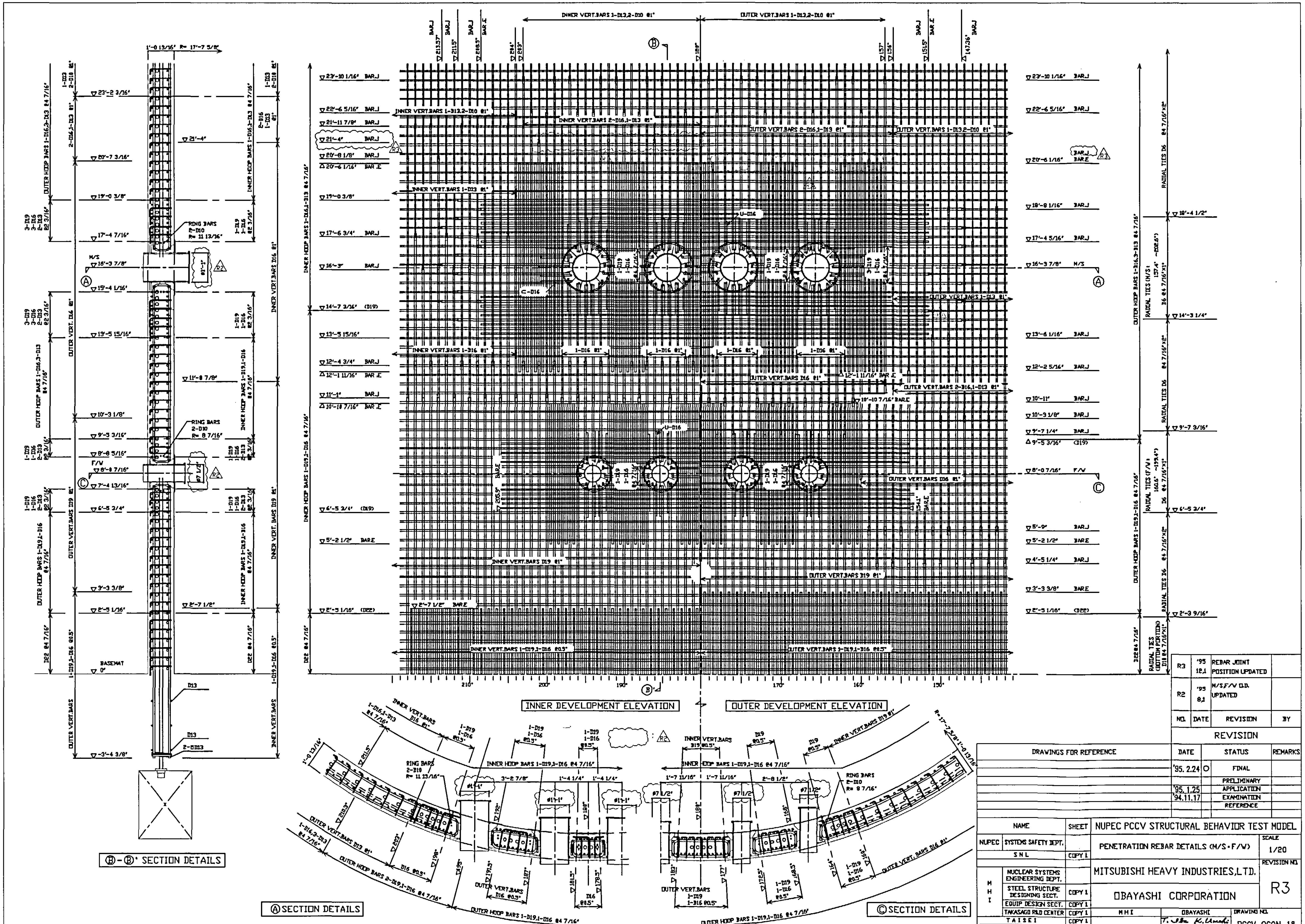


R2	'95 12.1	REBAR JOINT POSITION UPDATED	
NO.	DATE	REVISION	BY

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	○	FINAL	
			PRELIMINARY	
	'95.1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

	NAME	SHEET	NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL	
NUPEC	SYSTEMS SAFETY DEPT.		OPENING REBAR DETAILS (A/L)	SCALE 1/20
	SNL	COPY 1		
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.		MITSUBISHI HEAVY INDUSTRIES,LTD.	REVISION NO. R2
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	OBAYASHI CORPORATION	
	EQUIP DESIGN SECT.	COPY 1		
	TAKASAGO R&D CENTER	COPY 1	MHI / OBAYASHI	DRAWING NO.
	TAISEI	COPY 1		PCCV-QCON-17
	OBAYASHI	ORIG.		



NO.	DATE	REVISION	BY
R3	'95 12.1	REBAR JOINT POSITION UPDATED	
R2	'95 8.1	M/S,F/V D.D. UPDATED	

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	○	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

	NAME	SHEET
NUPEC	SYSTEMS SAFETY DEPT.	
	SNL	COPY 1
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.	
	STEEL STRUCTURE DESIGNING SECT.	COPY 1
	EQUIP DESIGN SECT.	COPY 1
	TAKASAGO R&D CENTER	COPY 1
	TAISEI	COPY 1
	OBAYASHI	ORIG.

NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL

PENETRATION REBAR DETAILS (M/S・F/W) — SCALE 1/20

MITSUBISHI HEAVY INDUSTRIES,LTD.

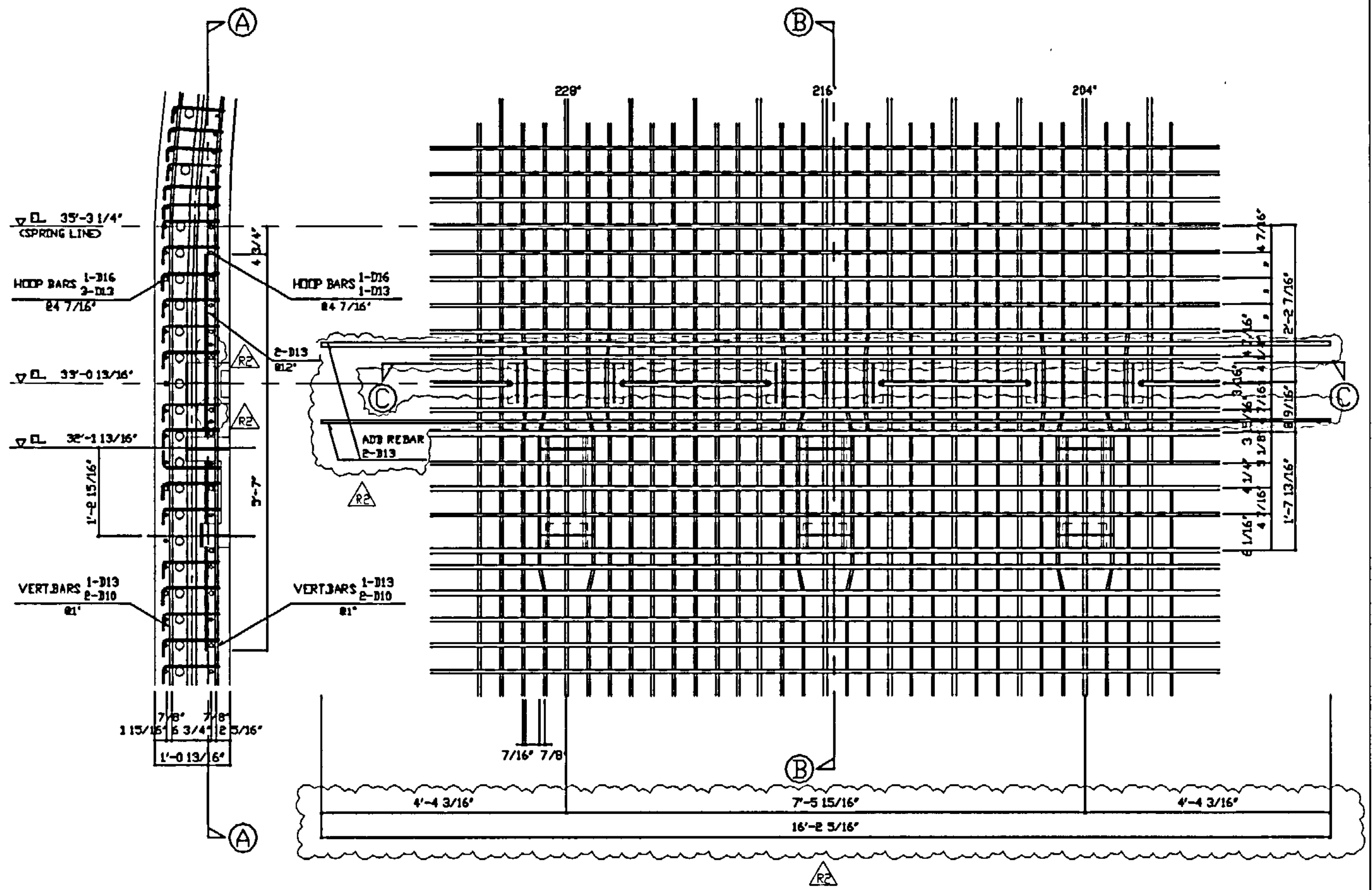
OBAYASHI CORPORATION

REVISION NO. R3

MHI | OBAYASHI

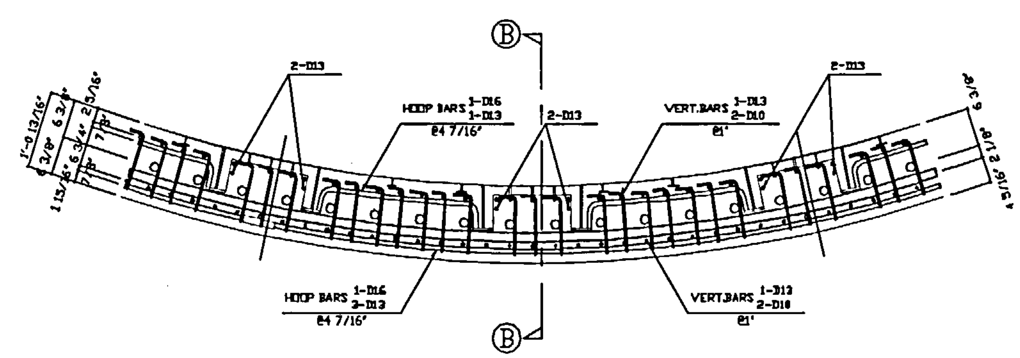
DRAWING NO. PCCV-QCON-18

CRANE BRACKET REBAR DETAILS



Ⓑ-Ⓑ SECTION DETAILS

Ⓐ-Ⓐ SECTION DETAILS



Ⓒ-Ⓒ SECTION DETAILS

CRANE BRACKET REBAR DETAILS S=1/15

REBAR ARRANGEMENT STANDARDS

1. GENERAL DESCRIPTION

1.1 MATERIALS

- REBARS: SD345, SD390, SD490, DEFORMED BARS (JIS G3112)
- CONCRETE: Fc= 29.42MPa, Fc= 44.13MPa
- PORTIONS: REFER TO DESIGN SPEC. AT 'PCCV-QCON-01 MODEL-GENERAL ARRANGEMENT'

2. REBAR PREPERATIONS

2.1 BENDING STANDARDS & EXTRA LENGTH

1) BENDING SHAPES & DIMENSIONS AT END PORTIONS

(a) RADIAL TIE END PORTION : L.E. D10
(b) BASEMAT SHEAR BAR END PORTION : L.E. D16

TABLE 2-1 HOOK BENDING SHAPES & DIMENSIONS

ANGLES	SHAPE	GRADE	PIN DIAMETER (D)	EXTRA LENGTH	PORTIONS
180°		SD345	4d	G.E. 4d	
		SD390	5d	G.E. 4d	
135°		SD345	4d	G.E. 6d	
		SD390	5d	G.E. 6d	
90°		SD345	4d	G.E. 8d	RADIAL TIES
		SD390	5d	G.E. 8d	VERTICAL DOME TENDON ANCHORED PORTION BASEMAT SHEAR BAR END PORTION

NOTE : d=NOMINAL DIAMETER

2) BENDING SHAPES & DIMENSIONS AT INTERMEDIATE PORTION

TABLE 2-2 BENDING SHAPES & DIMENSIONS AT INTERMEDIATE PORTION

ANGLES	SHAPE	PORTION	REBAR DIAMETER	GRADE	PIN DIAMETER (D)
L.E. 90°		U BAR TRIM BAR REBAR (AT CORNERS)	D6~D16	SD390 SD490	G.E. 4d
		WALL REBAR BASEMAT RADIAL BAR REBAR ANCHORED PORTION AT THE UPPER PART OF TENDON GALLERY	D19~D22		G.E. 6d

3. REBAR ANCHORING & JOINT

3.1 REBAR ANCHORING

IN CASE OF BENT ANCHORING, REBAR SHOULD BE BENT BEYOND THE MEMBER CENTER LINE.

TABLE 3-1 MINIMUM ANCHORED LENGTH

PORTION	GRADE	CONCRETE STRENGTH Fc(MPa)	REBAR DIAMETER	ANCHORED LENGTH
BASEMAT	SD390	29.42MPa	D16	50d
		44.13MPa		45d
	SD490	29.42MPa	D10~D19	63d
		44.13MPa		52d

NOTE : REBAR ANCHORED LENGTH SHOULD REFER TO DETAIL DRAWINGS

3.2 REBAR JOINT

1) EXTRA PROBLEMS SHOULD BE SOLVED WITH NUPEC
2) TABLE 3-2 ; JOINT PROPER USE
3) TABLE 3-3 ; LAP LENGTH
4) REBAR SPLICE SPACING DISTANCES

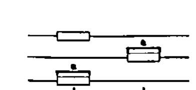


TABLE 3-2 PORTIONS

PORTIONS \ REBAR DIA.	L.E. D22
PCCV	SPLICE
BASEMAT	BASICALLY SPLICE BUT LAP ACCEPTABLE

TABLE 3-3 MINIMUM LAP LENGTH

PORTION	GRADE	CONCRETE STRENGTH Fc(MPa)	REBAR DIAMETER	LAP LENGTH
BASEMAT	SD390	29.42MPa	D10~D19	45d
		44.13MPa		

4. REBAR COVER DEPTH

4.1 MINIMUM COVER DEPTH

MINIMUM COVER DEPTH SHOULD BE THE MAXIMUM VALUE AMONG THOSE VALUES DESCRIBED BELOW.

1) REQUIRED DEPTH DEPENDS ON REBAR DIAMETER

TABLE 4-1 MINIMUM REBAR COVER DEPTH (UNIT : INCH)

REBAR DIAMETER	D6	D10	D13	D16	D19	D22
COVER DEPTH	3/8"	9/16"	13/16"	1"	1 3/16"	1 3/8"

2) REQUIRED DEPTH DEPENDS ON THE MAXIMUM AGGREGATE DIAMETER 3/8"

5. REBAR SPACING

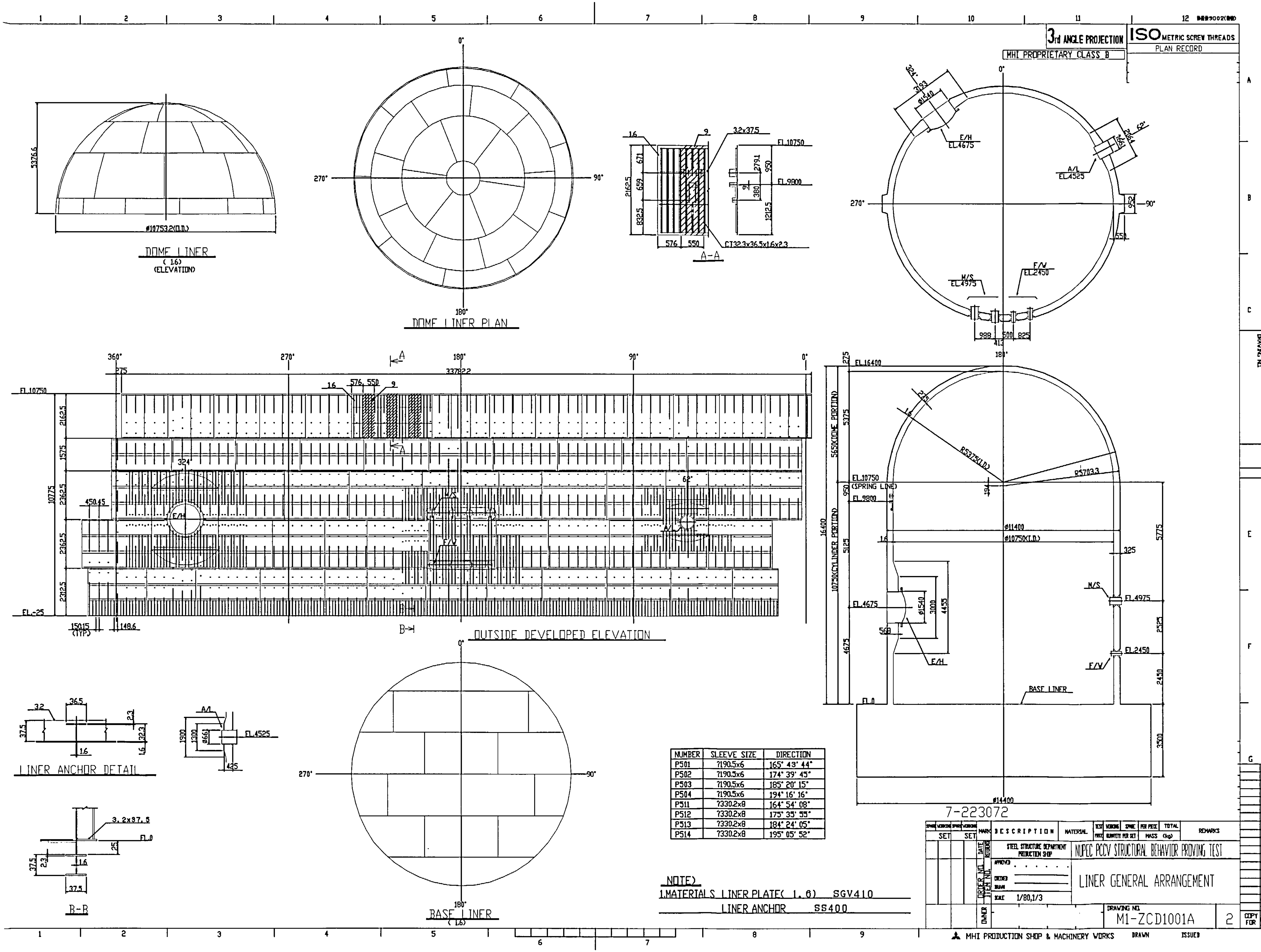
REBAR SPACING : G.E. 1.5 TIMES THE MAX COARSE AGGREGATE DIAMETER
: G.E. 9/16"
: G.E. 1.5 TIMES THE NOMINAL REBAR DIAMETER

NO.	DATE	REVISION	BY
R2	'95 8.1	CRANE BRACKET ANCHOR - HOOP REBAR WELDING TERMINATED 2-REBARS ADDED 2-REBARS DIA. CHANGED	

REVISION

DRAWINGS FOR REFERENCE	DATE		STATUS	REMARKS
	'95. 2.24	O	FINAL	
			PRELIMINARY	
	'95. 1.25		APPLICATION	
	'94.11.17		EXAMINATION	
			REFERENCE	

NAME		SHEET	
NUPEC	SYSTEMS SAFETY DEPT.		NUPEC PCCV STRUCTURAL BEHAVIOR TEST MODEL
SNL		COPY 1	CRANE BRACKET REBAR DETAILS REBAR ARRANGEMENT STANDARDS — SCALE 1/15
MHI	NUCLEAR SYSTEMS ENGINEERING DEPT.		MITSUBISHI HEAVY INDUSTRIES,LTD.
	STEEL STRUCTURE DESIGNING SECT.	COPY 1	OBAYASHI CORPORATION — REVISION NO. R2
	EQUIP DESIGN SECT.	COPY 1	
	TAKASAGO R&D CENTER	COPY 1	MHI / OBAYASHI / DRAWING NO.
TAISEI		COPY 1	T. Iba K. Umeki H. Murano — PCCV-QCON-19
OBAYASHI		ORIG.	



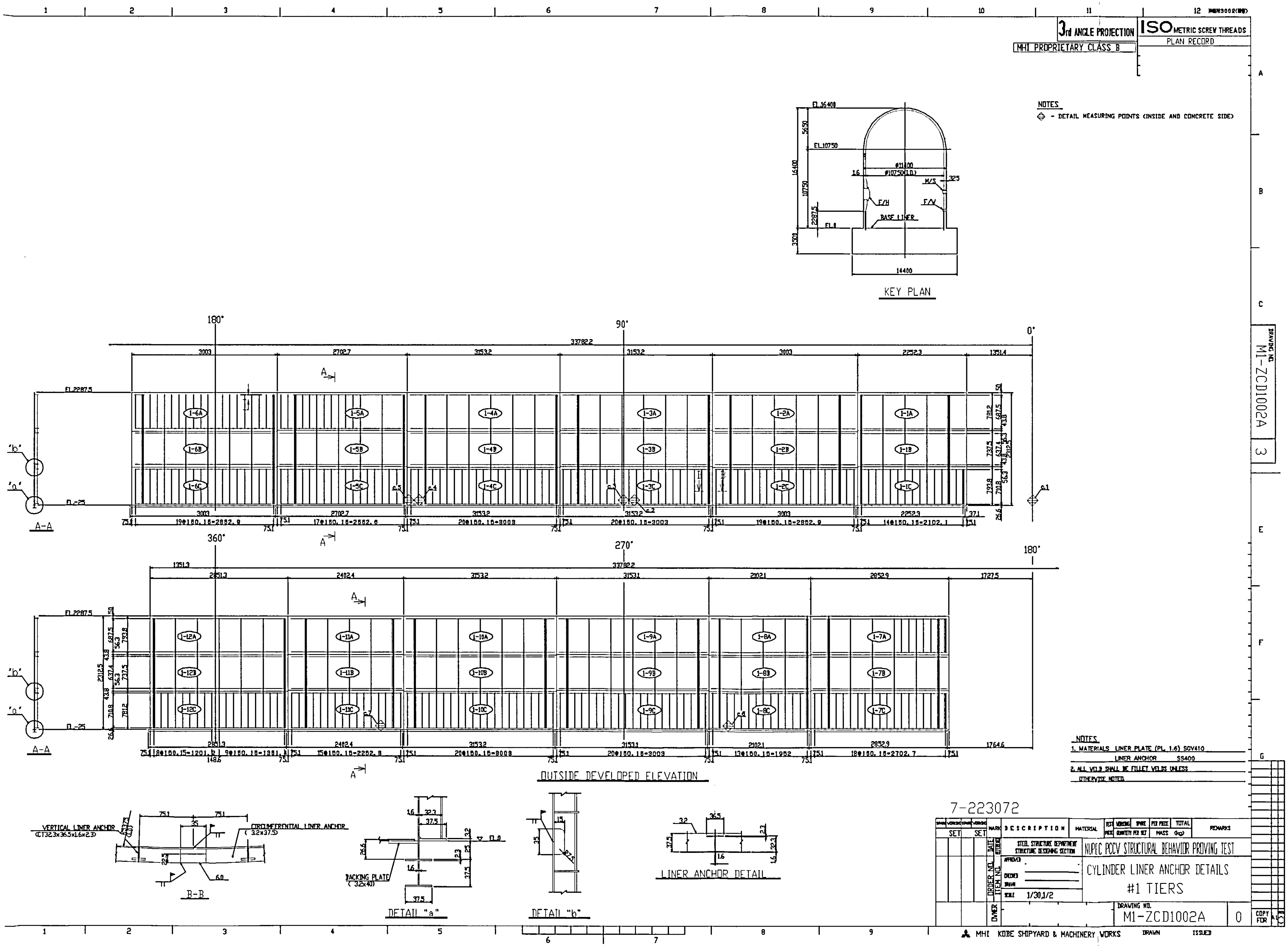
NUMBER	SLEEVE SIZE	DIRECTION
P501	?190.5x6	165° 43' 44"
P502	?190.5x6	174° 39' 45"
P503	?190.5x6	185° 20' 15"
P504	?190.5x6	194° 16' 16"
P511	?330.2x8	164° 54' 08"
P512	?330.2x8	175° 35' 55"
P513	?330.2x8	184° 24' 05"
P514	?330.2x8	195° 05' 52"

NOTE)
1.MATERIALS LINER PLATE(1.6) SGV410
LINER ANCHOR SS400

7-223072

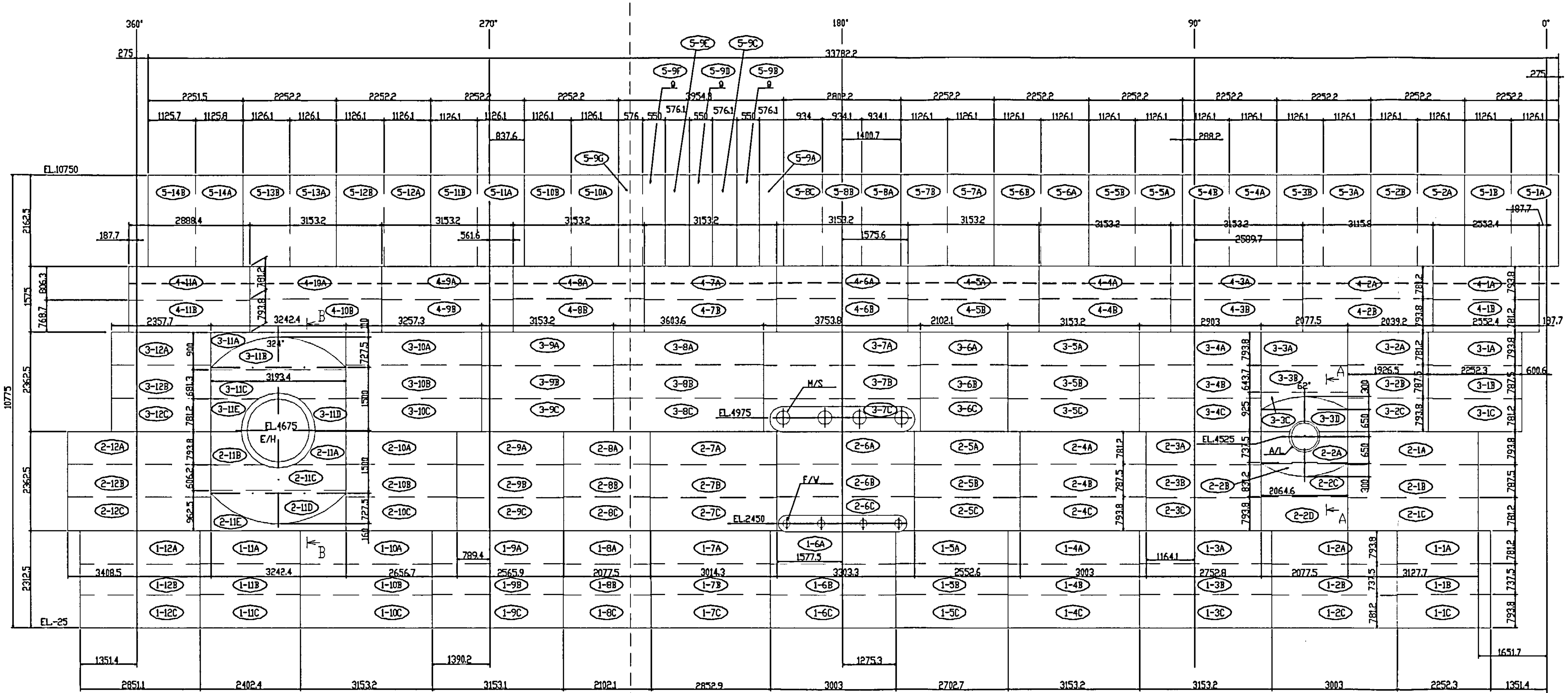
STEEL STRUCTURE DEPARTMENT PRODUCTION SHOP
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
LINER GENERAL ARRANGEMENT
SCALE 1/80,1/3
DRAWING NO. M1-ZCD1001A 2

MHI PRODUCTION SHOP & MACHINERY WORKS

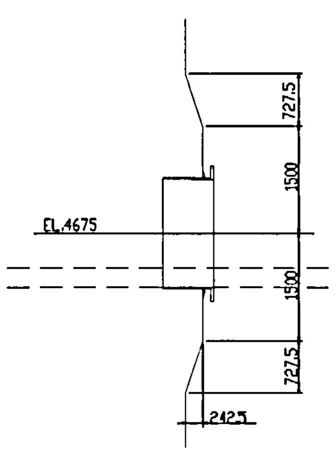

3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS
MHI PROPRIETARY CLASS B
PLAN RECORD
NOTES
◇ - DETAIL MEASURING POINTS (INSIDE AND CONCRETE SIDE)
KEY PLAN
EL.16400
EL.10750
FL.0
φ11400
φ10750(I.D.)
BASE LINER
14400
180°
90°
0°
360°
270°
337822
OUTSIDE DEVELOPED ELEVATION
A-A
B-B
VERTICAL LINER ANCHOR (CT32.3x36.5x1.6x2.3)
CIRCUMFERENTIAL LINER ANCHOR (3.2x37.5)
BACKING PLATE (3.2x40)
DETAIL "a"
DETAIL "b"
LINER ANCHOR DETAIL
NOTES
1. MATERIALS LINER PLATE (PL. 1.6) SGV410
LINER ANCHOR SS400
2. ALL WELD SHALL BE FILLET WELDS UNLESS OTHERWISE NOTED.
7-223072
STEEL STRUCTURE DEPARTMENT STRUCTURE DESIGNING SECTION
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
CYLINDER LINER ANCHOR DETAILS
#1 TIERS
SCALE 1/30,1/2
DRAWING NO.
M1-ZCD1002A
0
MHI KOBE SHIPYARD & MACHINERY WORKS

3rd ANGLE PROJECTION | ISO METRIC SCREW THREADS

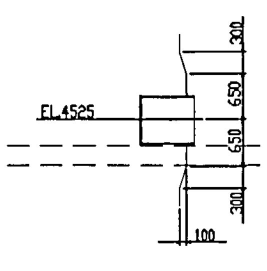
MHI PROPRIETARY CLASS B | PLAN RECORD



OUTSIDE DEVELOPED ELEVATION



B-B



A-A

NOTES

1. THIS DWG. INDICATES LINER PLATE BLOCK LAYOUT OF CYLINDER PORTION.
2. MARKS' IN ( ) INDICATE LINER PLATE BLOCK MARKS.
3. CIRCUMFERENTIAL DIMENSIONS SHOWN ON THIS DWG. ARE ARC LENGTHS OF OUTSIDE SURFACE OF LINER PLATE.
4. CLASSIFICATION OF WELD SEAMS ARE AS FOLLOWS;
   - FIELD WELD
   - SHOP WELD

7-223072

SET	SET	MARK	DESCRIPTION	MATERIAL	QUANTITY PER SET	MASS (kg)	REMARKS

STEEL STRUCTURE DEPARTMENT PRODUCTION SHOP

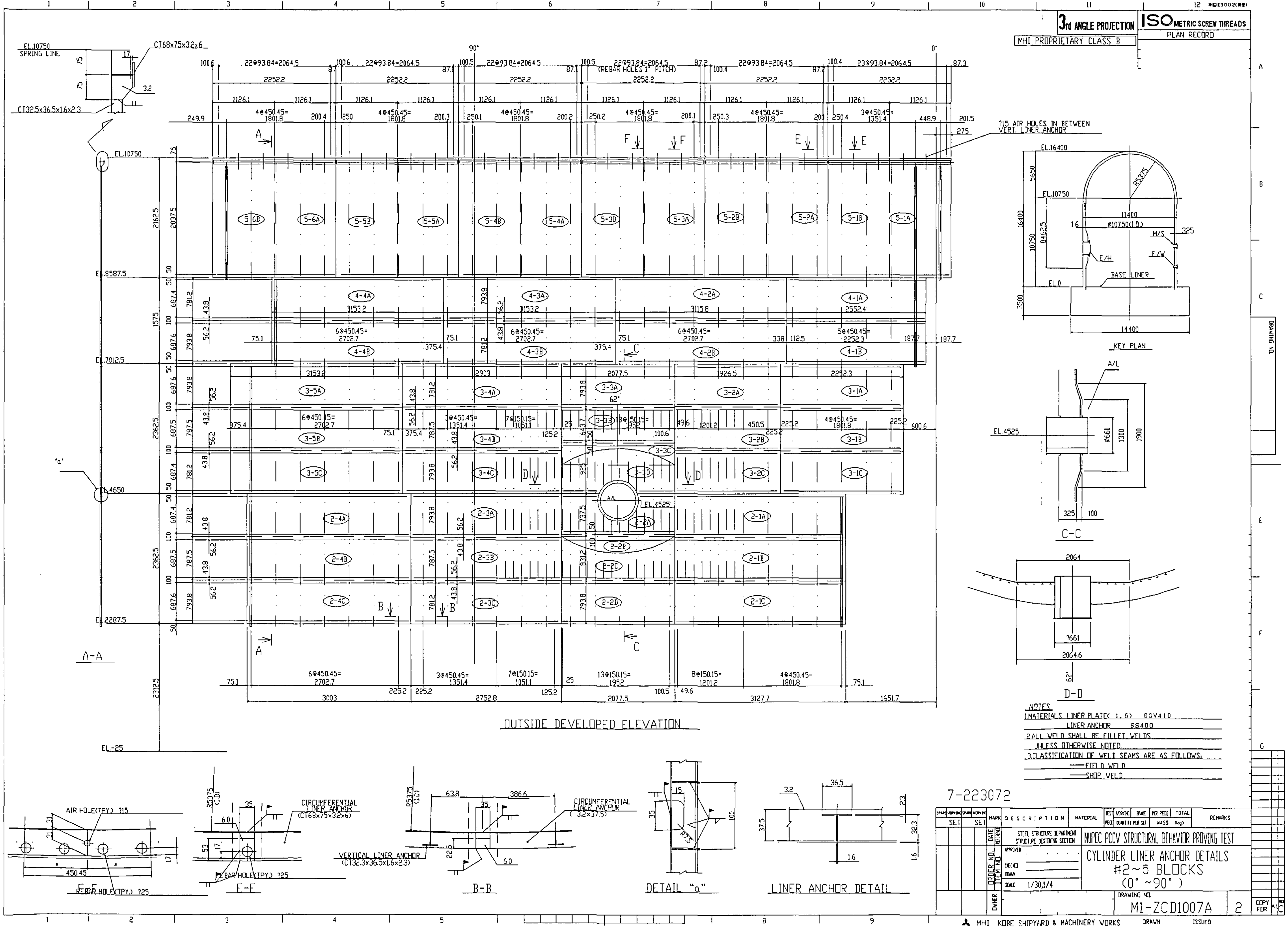
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST

LINER PLATE BLOCK LAYOUT OF CYLINDER PORTION

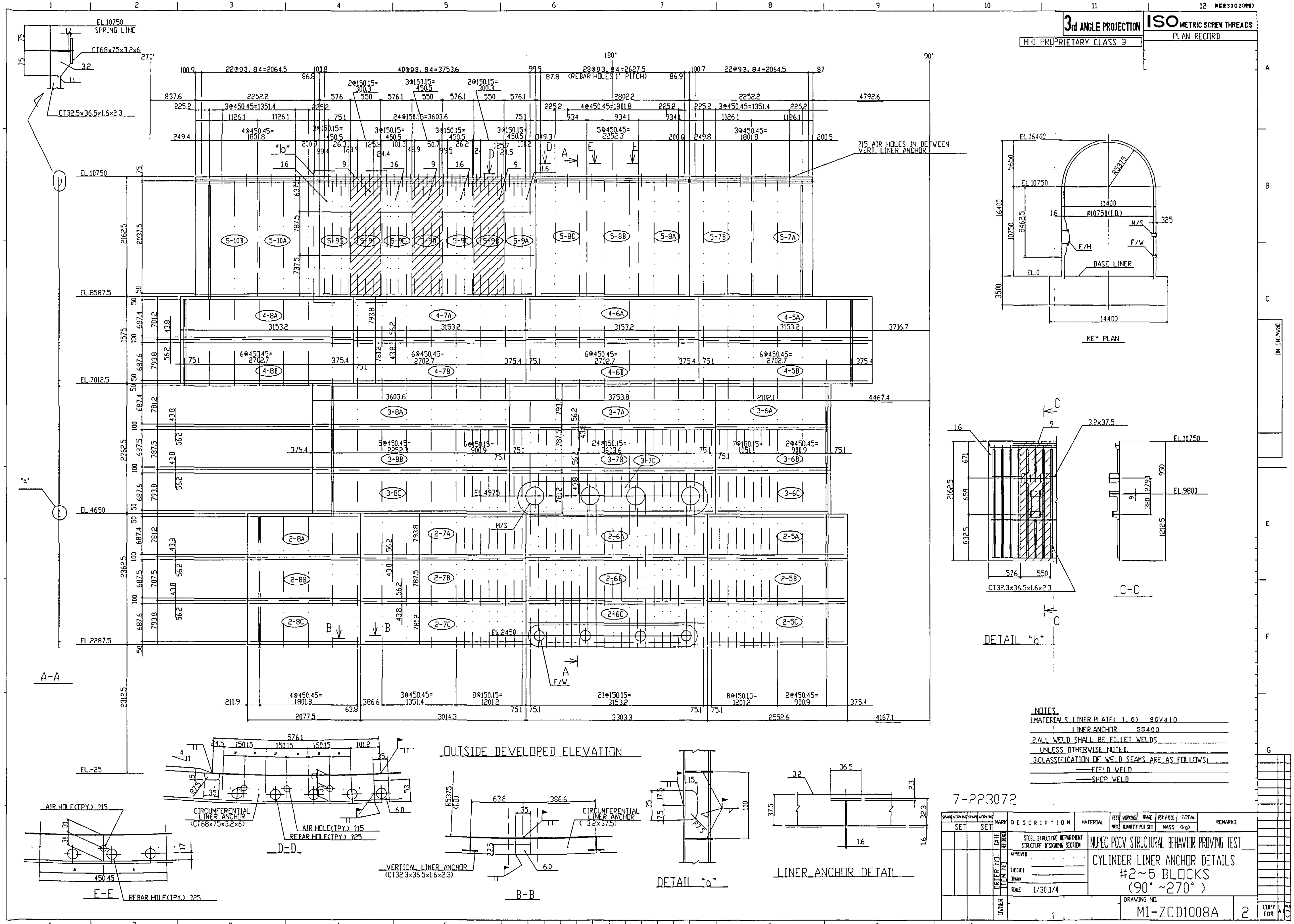
SCALE 1/50

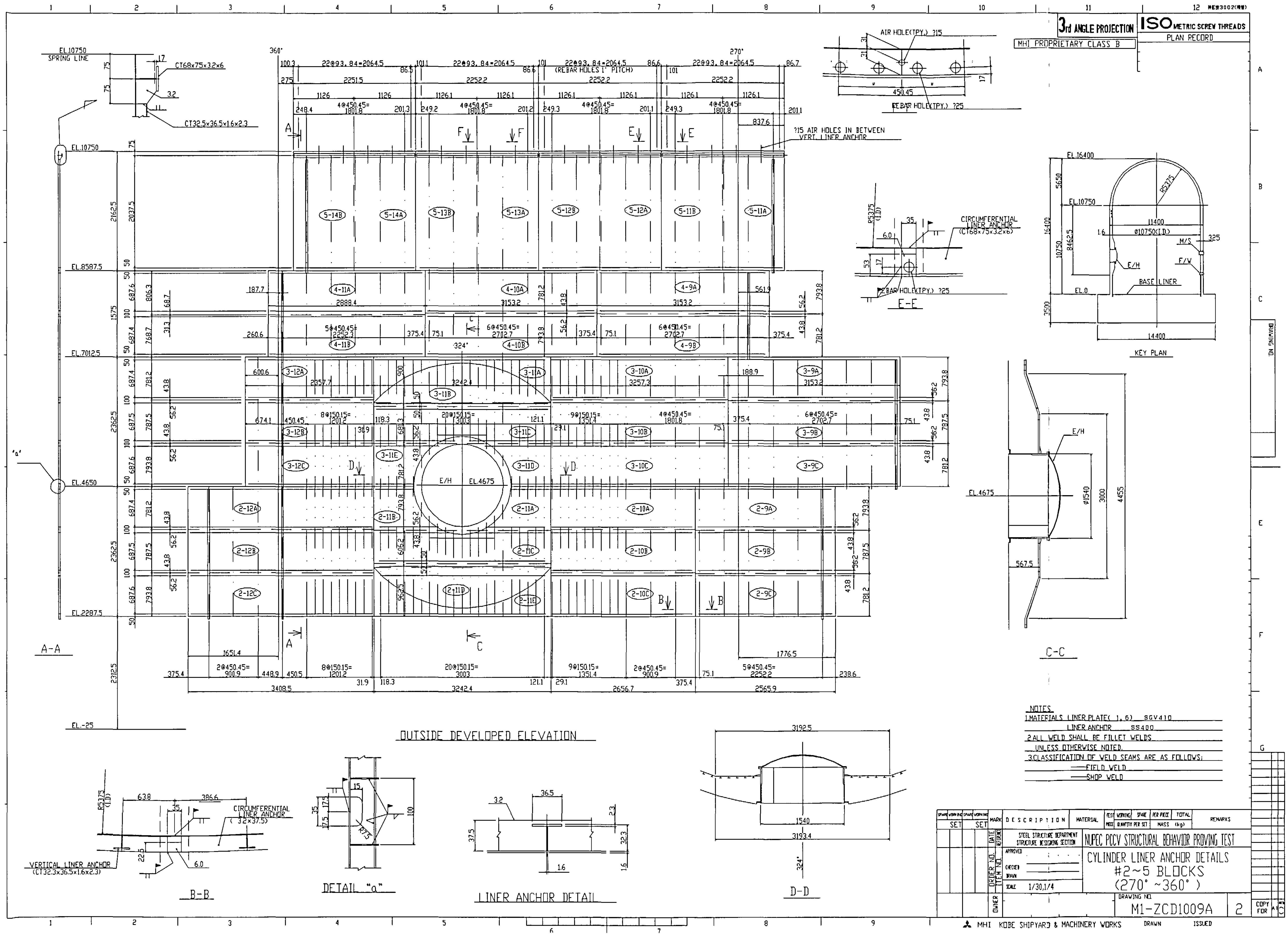
DRAWING NO. M1-ZCD1006A 0

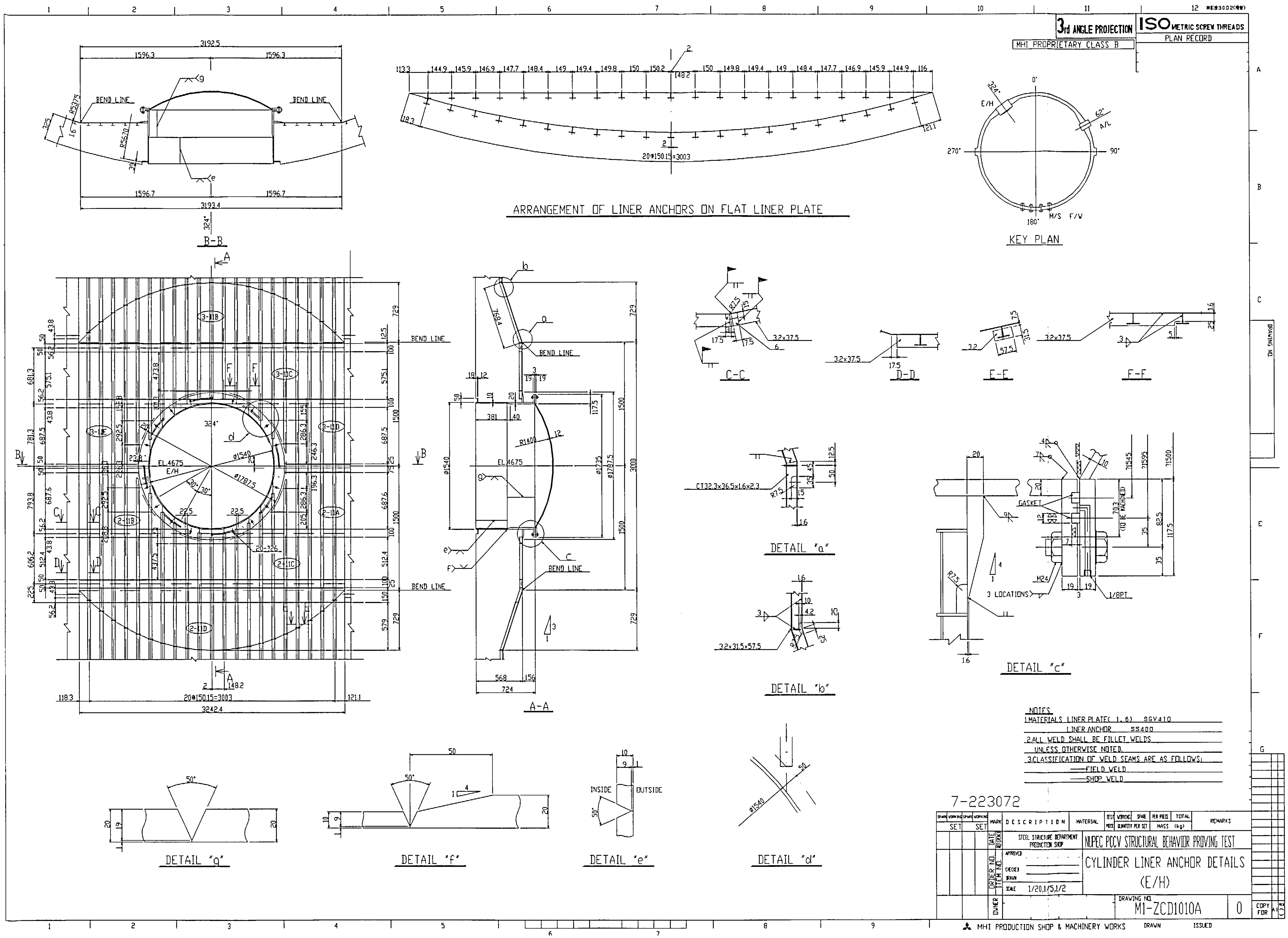
MHI PRODUCTION SHOP & MACHINERY WORKS



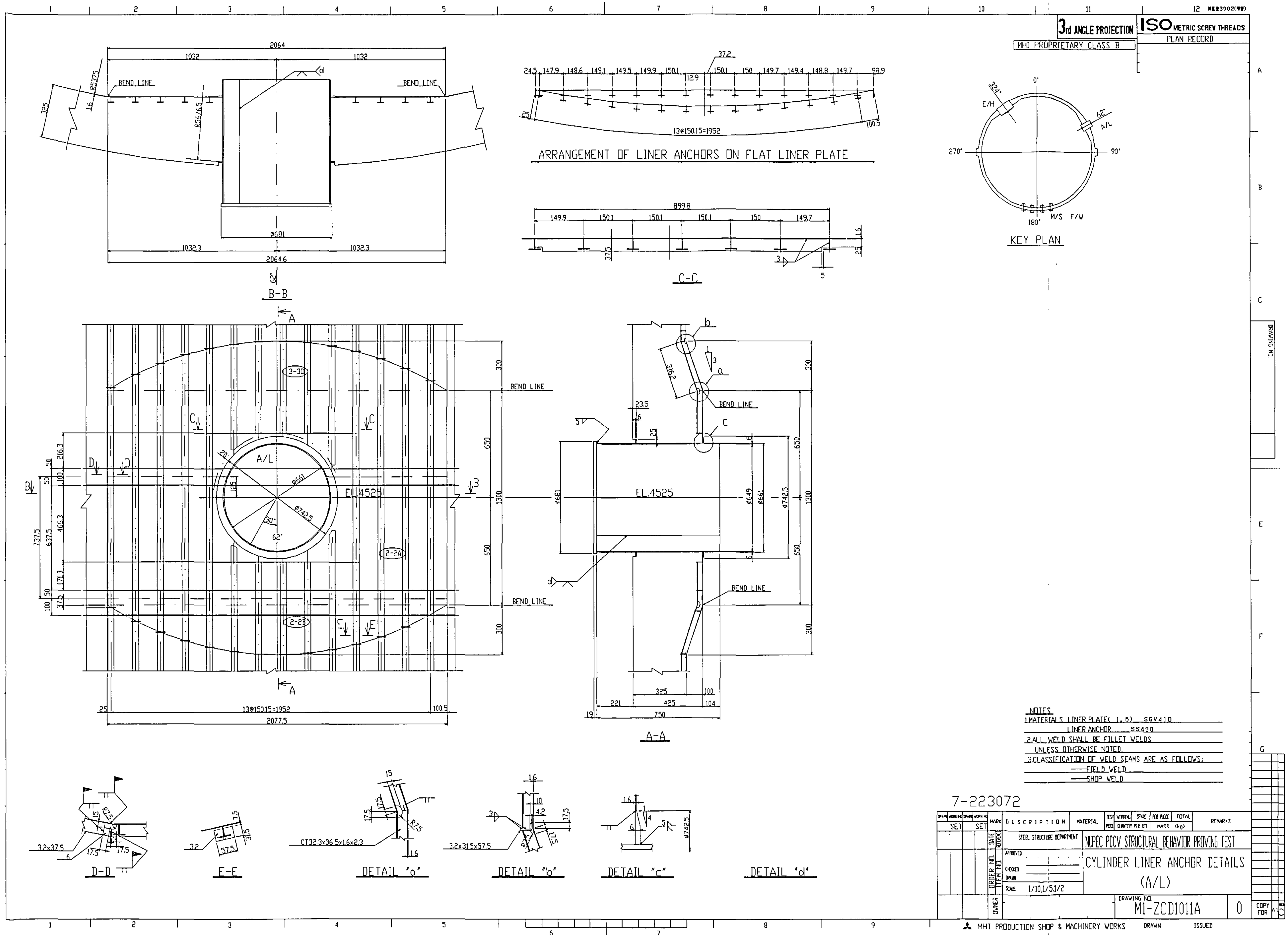
3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS
MHI PROPRIETARY CLASS B
PLAN RECORD
OUTSIDE DEVELOPED ELEVATION
A-A
EL.10750 SPRING LINE
CT68x75x3.2x6
CT32.5x36.5x1.6x2.3
(REBAR HOLES 1° PITCH)
?15 AIR HOLES IN BETWEEN VERT. LINER ANCHOR
EL.16400
EL.10750
1140C
ø10750(I.D.)
M/S
F/V
F/H
BASE LINER
EL.0
14400
KEY PLAN
A/L
EL.4525
C-C
D-D
E-E
B-B
F-F
DETAIL "a"
LINER ANCHOR DETAIL
AIR HOLE(TPY.) ?15
REBAR HOLE(TPY.) ?25
CIRCUMFERENTIAL LINER ANCHOR (CT68x75x3.2x6)
CIRCUMFERENTIAL LINER ANCHOR (3.2x37.5)
VERTICAL LINER ANCHOR (CT32.3x36.5x1.6x2.3)
NOTES
1.MATERIALS LINER PLATE(1.6) SGV410
LINER ANCHOR SS400
2.ALL WELD SHALL BE FILLET WELDS UNLESS OTHERWISE NOTED.
3.CLASSIFICATION OF WELD SEAMS ARE AS FOLLOWS;
FIELD WELD
SHOP WELD
7-223072
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
CYLINDER LINER ANCHOR DETAILS
#2~5 BLOCKS
(0° ~90°)
STEEL STRUCTURE DEPARTMENT STRUCTURE DESIGNING SECTION
SCALE 1/30,1/4
DRAWING NO. M1-ZCD1007A 2
MHI KOBE SHIPYARD & MACHINERY WORKS

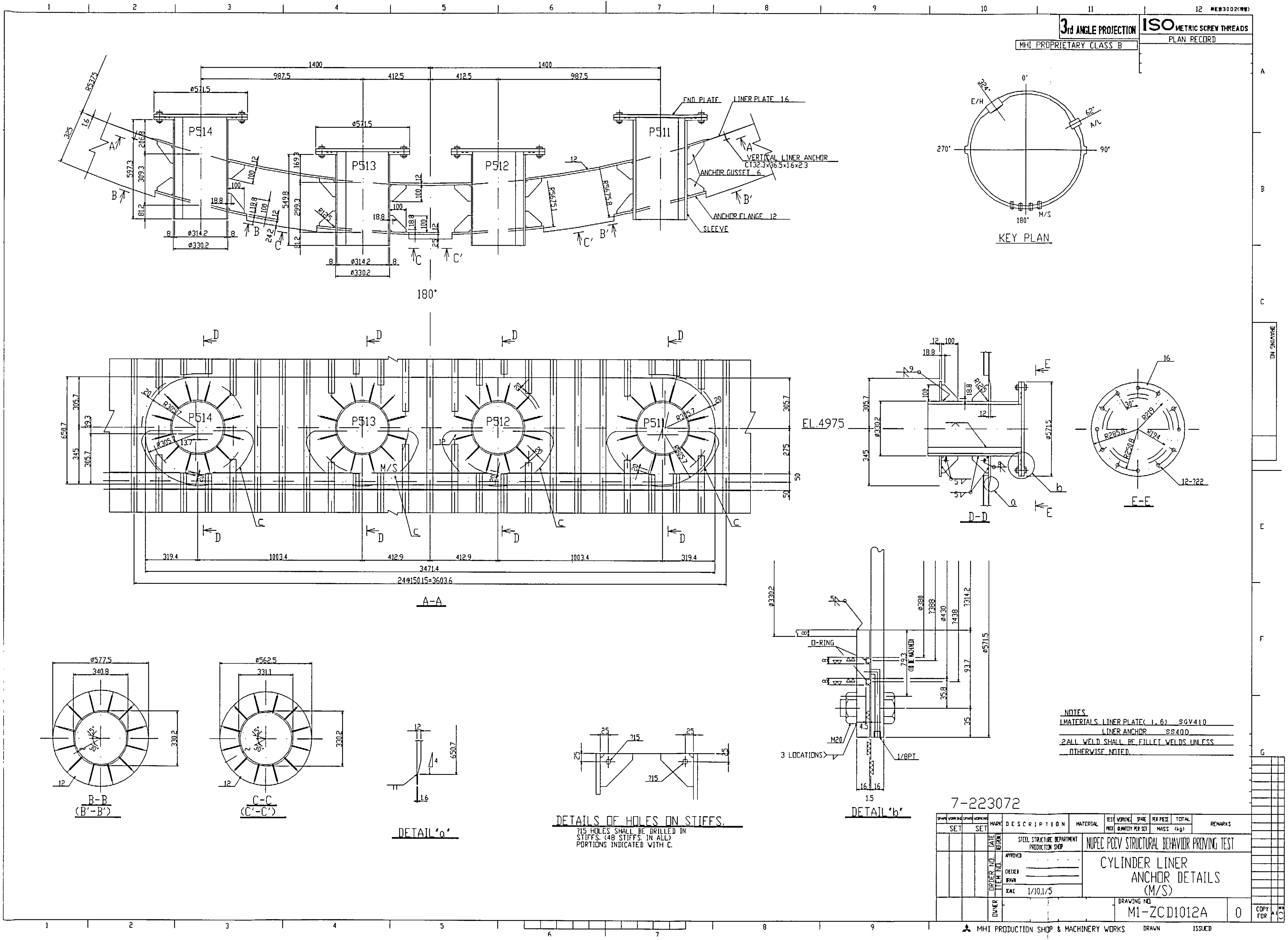

3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS
MHI PROPRIETARY CLASS B
PLAN RECORD
OUTSIDE DEVELOPED ELEVATION
KEY PLAN
DETAIL "b"
C-C
A-A
D-D
E-E
B-B
DETAIL "a"
LINER ANCHOR DETAIL
NOTES
1.MATERIALS LINER PLATE(1.6) SGV410
LINER ANCHOR SS400
2.ALL WELD SHALL BE FILLET WELDS
UNLESS OTHERWISE NOTED.
3.CLASSIFICATION OF WELD SEAMS ARE AS FOLLOWS;
FIELD WELD
SHOP WELD
7-223072
STEEL STRUCTURE DEPARTMENT STRUCTURE DESIGNING SECTION
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
CYLINDER LINER ANCHOR DETAILS
#2~5 BLOCKS
(90°~270°)
DRAWING NO.
M1-ZCD1008A
2
SCALE 1/30,1/4
MHI KOBE SHIPYARD & MACHINERY WORKS

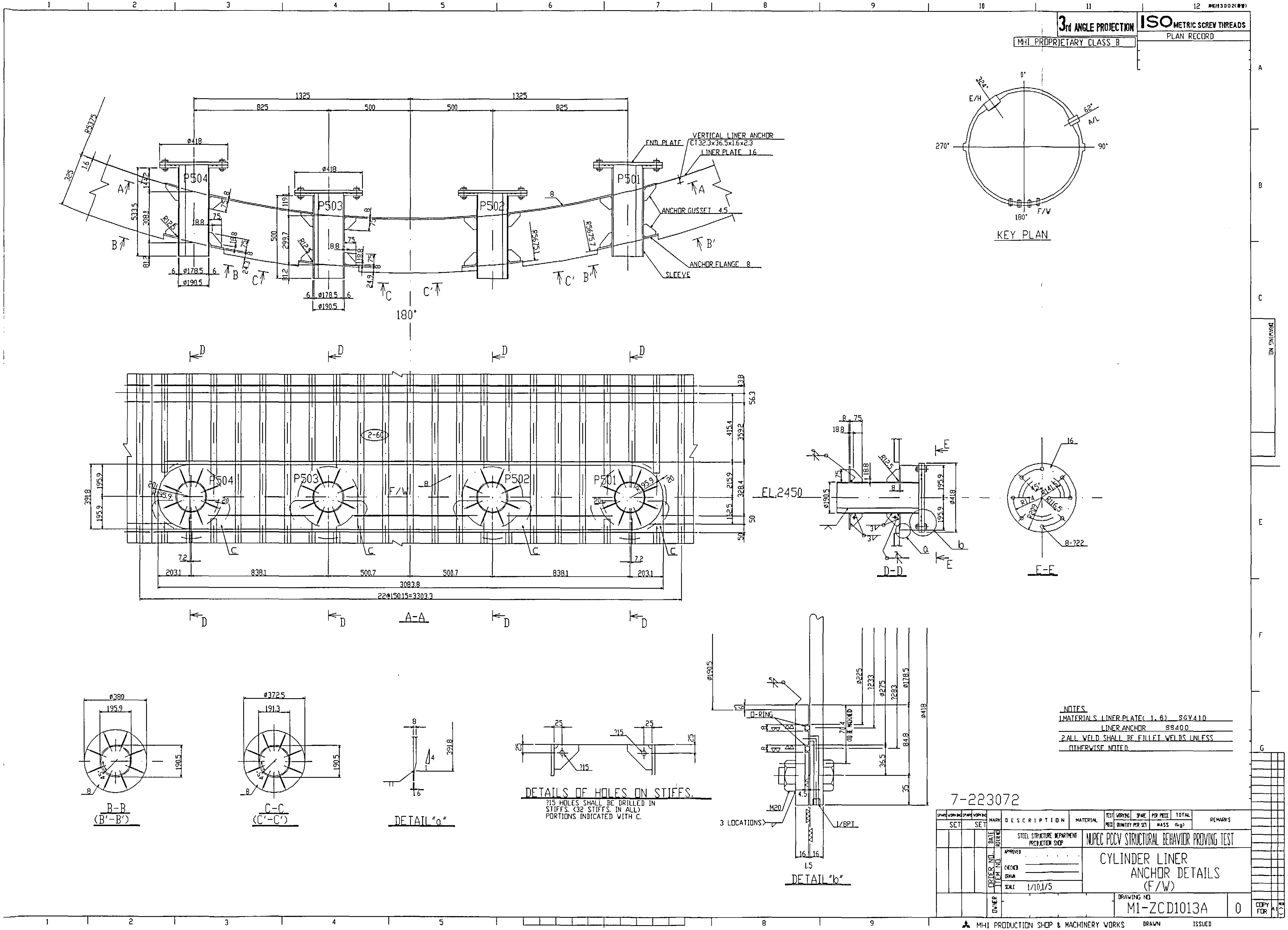

3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS
PLAN RECORD
MHI PROPRIETARY CLASS B
OUTSIDE DEVELOPED ELEVATION
A-A
B-B
C-C
D-D
E-E
DETAIL "a"
LINER ANCHOR DETAIL
KEY PLAN
EL.10750
SPRING LINE
CT68×75×3.2×6
CT32.5×36.5×1.6×2.3
EL.8587.5
EL.7012.5
EL.4650
EL.2287.5
EL.-25
EL.16400
EL.0
EL.4675
BASE LINER
CIRCUMFERENTIAL LINER ANCHOR
VERTICAL LINER ANCHOR
AIR HOLE(TPY.)
REBAR HOLE(TPY.)
NOTES
1.MATERIALS LINER PLATE(1. 6) SGV410
LINER ANCHOR SS400
2.ALL WELD SHALL BE FILLET WELDS
UNLESS OTHERWISE NOTED.
3.CLASSIFICATION OF WELD SEAMS ARE AS FOLLOWS:
FIELD WELD
SHOP WELD
DESCRIPTION
MATERIAL
REMARKS
STEEL STRUCTURE DEPARTMENT STRUCTURE DESIGNING SECTION
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
CYLINDER LINER ANCHOR DETAILS
#2~5 BLOCKS
(270° ~360°)
SCALE 1/30,1/4
DRAWING NO.
M1-ZCD1009A
2
MHI KOBE SHIPYARD & MACHINERY WORKS

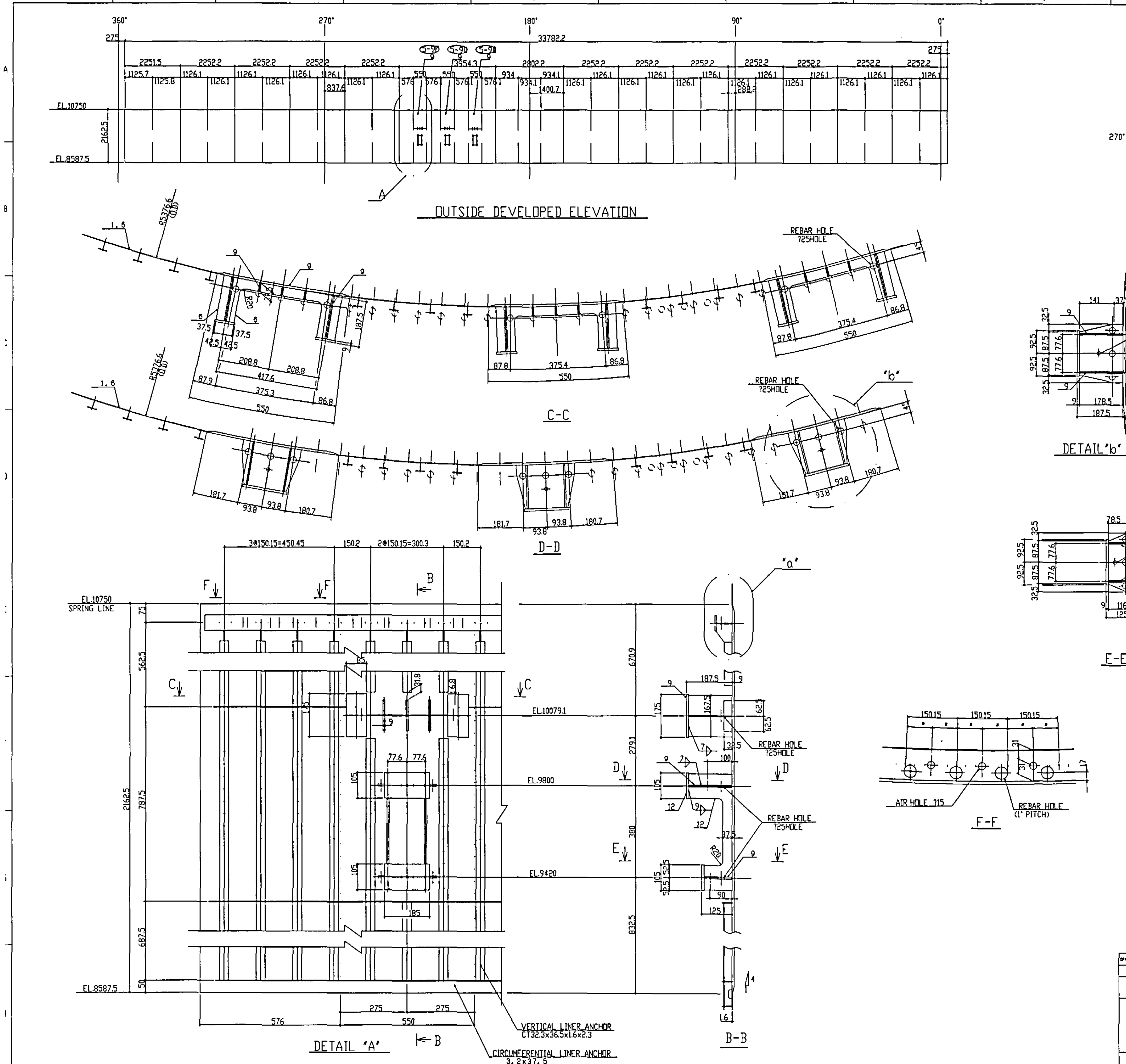


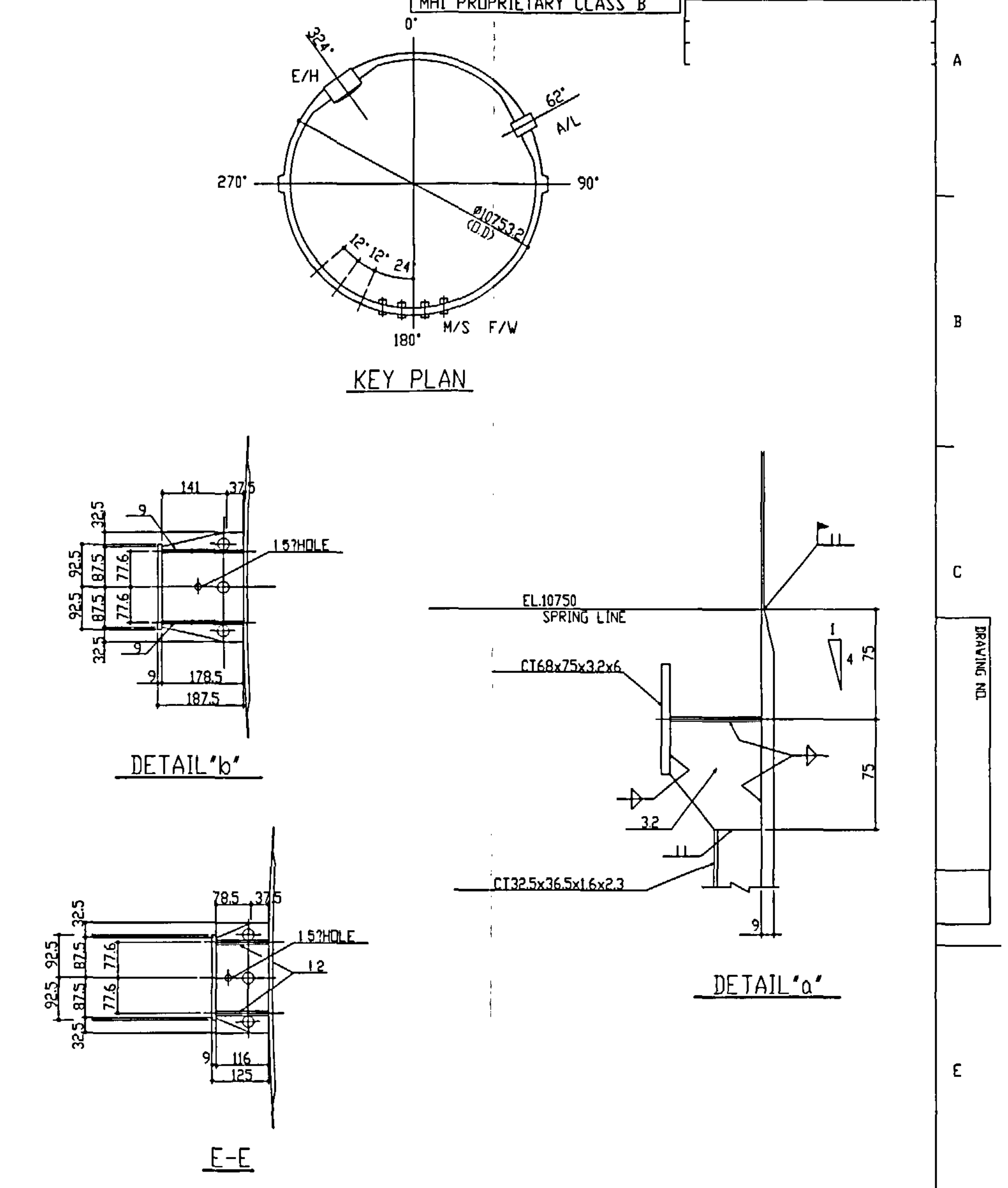
3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS
MHI PROPRIETARY CLASS B
PLAN RECORD
B-B
ARRANGEMENT OF LINER ANCHORS ON FLAT LINER PLATE
KEY PLAN
A-A
C-C
D-D
E-E
F-F
DETAIL "a"
DETAIL "b"
DETAIL "c"
DETAIL "g"
DETAIL "f"
DETAIL "e"
DETAIL "d"
BEND LINE
NOTES
1.MATERIALS LINER PLATE(1.6) SGV410
LINER ANCHOR SS400
2.ALL WELD SHALL BE FILLET WELDS
UNLESS OTHERWISE NOTED.
3.CLASSIFICATION OF WELD SEAMS ARE AS FOLLOWS;
FIELD WELD
SHOP WELD
7-223072
STEEL STRUCTURE DEPARTMENT PRODUCTION SHOP
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
CYLINDER LINER ANCHOR DETAILS
(E/H)
SCALE 1/20,1/5,1/2
DRAWING NO. M1-ZCD1010A
0
MHI PRODUCTION SHOP & MACHINERY WORKS


3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS
MHI PROPRIETARY CLASS B
PLAN RECORD
ARRANGEMENT OF LINER ANCHORS ON FLAT LINER PLATE
13@150.15=1952
KEY PLAN
E/H
A/L
M/S F/W
BEND LINE
B-B
C-C
A-A
A/L
EL.4525
D-D
E-E
DETAIL "a"
DETAIL "b"
DETAIL "c"
DETAIL "d"
NOTES
1.MATERIALS LINER PLATE(1, 6) SGV410
LINER ANCHOR SS400
2.ALL WELD SHALL BE FILLET WELDS
UNLESS OTHERWISE NOTED.
3.CLASSIFICATION OF WELD SEAMS ARE AS FOLLOWS;
FIELD WELD
SHOP WELD
7-223072
MARK
DESCRIPTION
MATERIAL
REMARKS
STEEL STRUCTURE DEPARTMENT
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
CYLINDER LINER ANCHOR DETAILS
(A/L)
APPROVED
CHECKED
DRAWN
SCALE 1/10,1/5,1/2
DRAWING NO.
M1-ZCD1011A
0
MHI PRODUCTION SHOP & MACHINERY WORKS


3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS
MHI PROPRIETARY CLASS B
PLAN RECORD
P514
P513
P512
P511
END PLATE
LINER PLATE 1.6
VERTICAL LINER ANCHOR
CT32.3x36.5x1.6x2.3
ANCHOR GUSSET 6
ANCHOR FLANGE 12
SLEEVE
180°
KEY PLAN
E/H
A/L
M/S
EL.4975
A-A
D-D
E-E
B-B
(B'-B')
C-C
(C'-C')
DETAIL 'a'
DETAIL 'b'
O-RING
3 LOCATIONS
M20
1/8PT
DETAILS OF HOLES ON STIFFS.
?15 HOLES SHALL BE DRILLED IN STIFFS. (48 STIFFS. IN ALL) PORTIONS INDICATED WITH C.
NOTES
1.MATERIALS LINER PLATE(1.6) SGV410
LINER ANCHOR SS400
2.ALL WELD SHALL BE FILLET WELDS UNLESS OTHERWISE NOTED.
7-223072
DESCRIPTION
MATERIAL
MASS (kg)
REMARKS
STEEL STRUCTURE DEPARTMENT PRODUCTION SHOP
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
CYLINDER LINER
ANCHOR DETAILS
(M/S)
SCALE 1/10,1/5
DRAWING NO.
M1-ZCD1012A
0
MHI PRODUCTION SHOP & MACHINERY WORKS


3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS
MHI PROPRIETARY CLASS B
PLAN RECORD
KEY PLAN
E/H
A/L
F/W
0°
90°
180°
270°
END PLATE
VERTICAL LINER ANCHOR
CT32.3x36.5x1.6x2.3
LINER PLATE 1.6
ANCHOR GUSSET 4.5
ANCHOR FLANGE 8
SLEEVE
P501
P502
P503
P504
EL.2450
A-A
D-D
E-E
B-B
(B'-B')
C-C
(C'-C')
DETAIL "a"
DETAIL "b"
DETAILS OF HOLES ON STIFFS.
215 HOLES SHALL BE DRILLED IN
STIFFS. (32 STIFFS. IN ALL)
PORTIONS INDICATED WITH C.
O-RING
M20
3 LOCATIONS
NOTES
1.MATERIALS LINER PLATE(1.6) SGV410
LINER ANCHOR SS400
2.ALL WELD SHALL BE FILLET WELDS UNLESS
OTHERWISE NOTED.
7-223072
DESCRIPTION
MATERIAL
TOTAL MASS (kg)
REMARKS
STEEL STRUCTURE DEPARTMENT PRODUCTION SHOP
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
CYLINDER LINER
ANCHOR DETAILS
(F/W)
APPROVED
CHECKED
DRAWN
SCALE 1/10,1/5
DRAWING NO.
M1-ZCD1013A
0
MHI PRODUCTION SHOP & MACHINERY WORKS
DRAWN
ISSUED





3rd ANGLE PROJECTION | ISO METRIC SCREW THREADS

MHI PROPRIETARY CLASS B

PLAN RECORD

NOTES

1. THIS DRAWING INDICATES ARRANGMENT AND DETAILS OF POLAR CRANE BRACKET.
2. MATERIALS SHALL BE SS400.
3. WELDS SHALL BE FILLET WELDS AS SHOWN BELLOW UNLESS OTHERWISE NOTED.

PLATE THICKESS	12mm	9mm	6mm
LEG SIZE	9mm	7mm	5mm

4. CLASSIFICATION OF WELD SEAMS ARE AS FOLLOWS;
   - FIELD WELD
   - SHOP WELD

STEEL STRUCTURE DEPARTMENT PRODUCTION SHOP

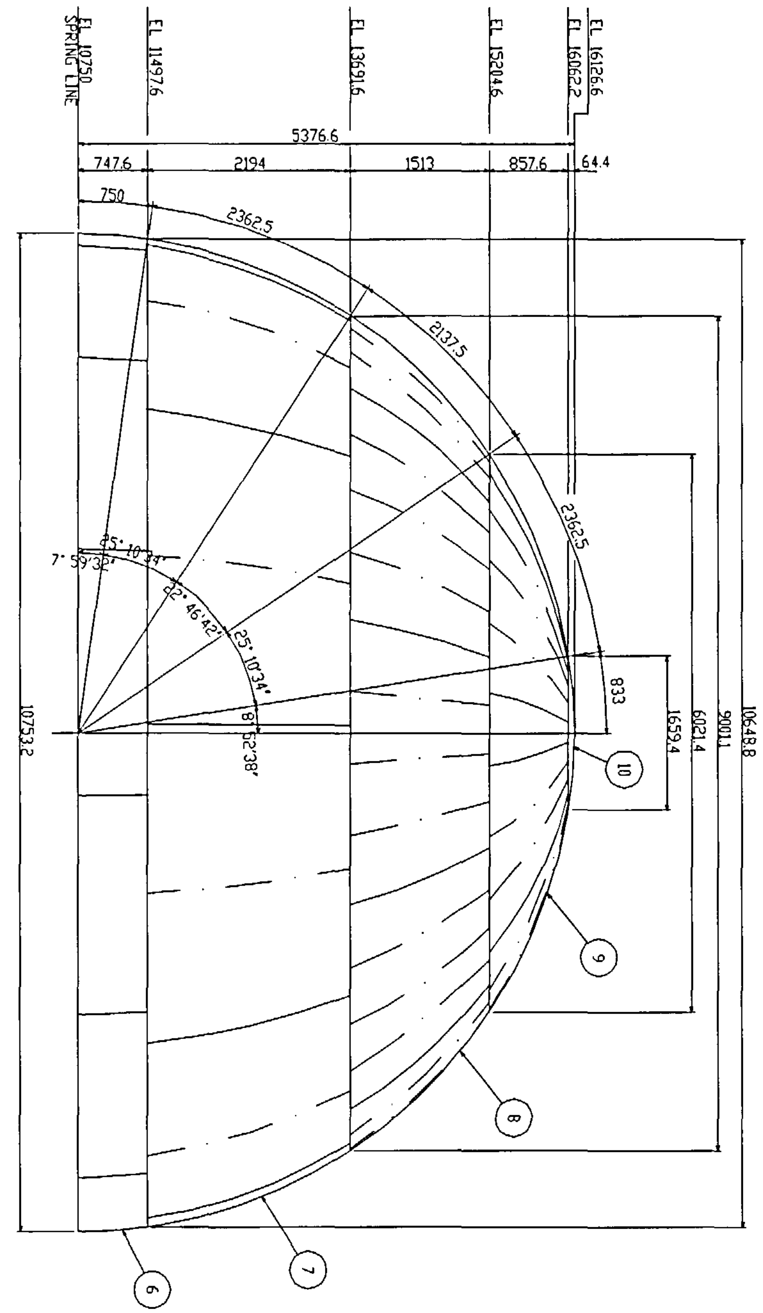
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST

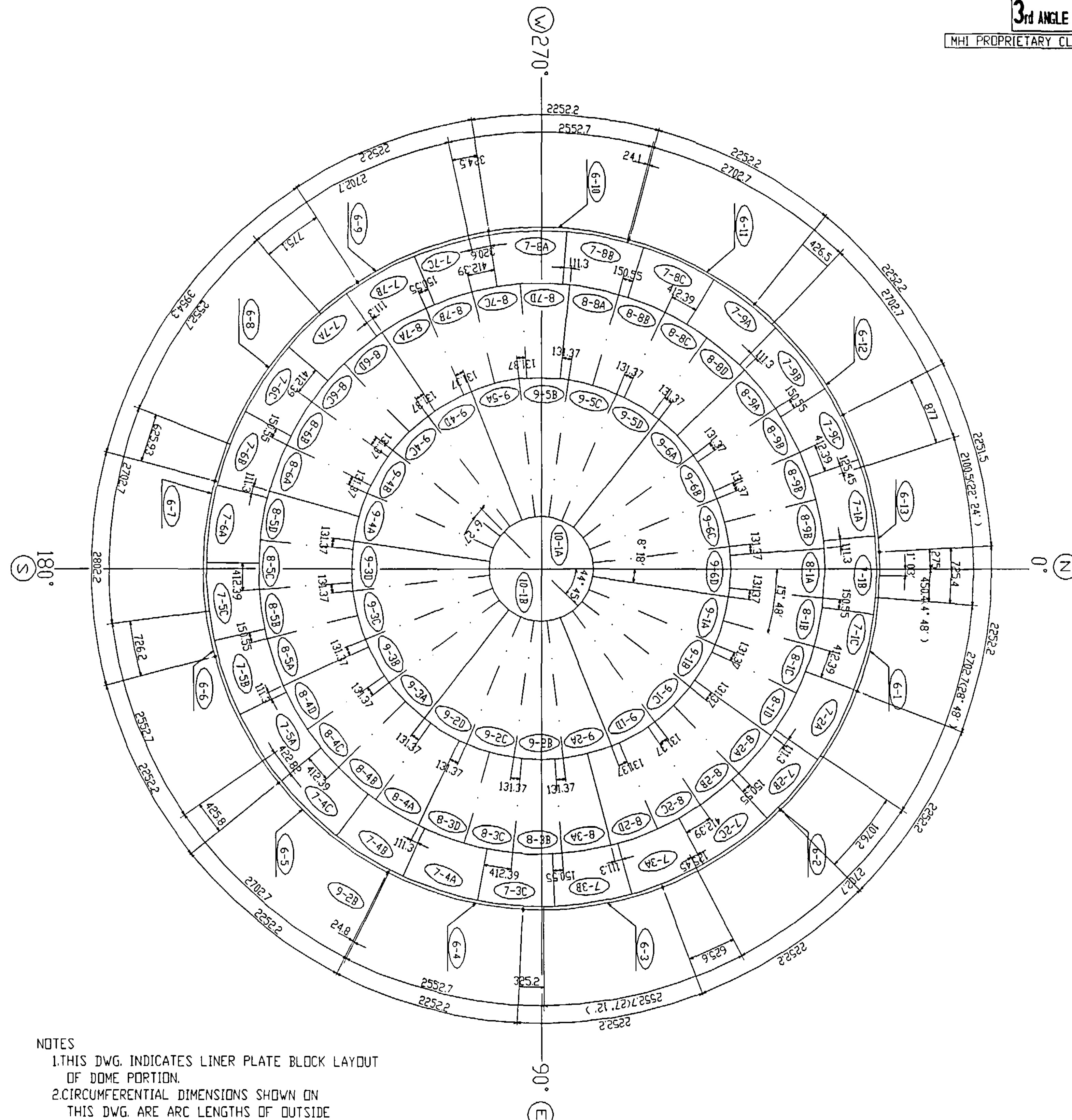
CYLINDER LINER ANCHOR DETAILS
POLA CRANE BRACKET DETAILS

SCALE 1/8

DRAWING NO. M1-ZCD1014A 0

MHI PRODUCTION SHOP & MACHINERY WORKS





NOTES

1.THIS DWG. INDICATES LINER PLATE BLOCK LAYOUT OF DOME PORTION.

2.CIRCUMFERENTIAL DIMENSIONS SHOWN ON THIS DWG. ARE ARC LENGTHS OF OUTSIDE SURFACE OF LINER PLATE.

3.MARKS' IN Ⓐ AND ⓍⓍ INDICATE TIER NUMBERS AND LINER PLATE BLOCK MARKS.

4.WELDS SHALL BE BUTT WELDS AS SHOWN BELLOW UNLESS OTHERWISE NOTED.

5.MATERIALS LINER PLATE (1.6) SGV410

6.CLASSIFICATION OF WELD SEAMS ARE AS FOLLOWS;

——— FIELD WELD

— — SHOP WELD

TIER NO.	LINER PLATE BLOCK MARKS	CIRCUMFERENTIAL DIMENSION		MERIDIONAL DIMENSION	QUANTITY	
		UPPER	LOWER			
⑥	6-1,6-2,6-5,6-7, 6-9,6-11,6-12	2676.45	2702.7	750	7	13
	6-3,6-4,6-6,6-8, 6-10	2527.76	2552.7		5	
	6-13	2080.12	2100.53		1	
⑦	7-1A~7-9C	1047.4	1239.04	2362.5	27	
⑧	8-1A~8-9B	525.47	785.5	2137.5	36	
⑨	9-1A~9-6B	217.22	788.2	2362.5	24	
⑩	10-1A,10-1B	——	2606.58	833	2	

SPARE	WORKING	SPARE	WORKING	MARK	DESCRIPTION	MATERIAL	TEST PIECE	WORKING / SPARE QUANTITY PER SET	PER PIECE / TOTAL MASS (kg)	REMARKS
	SET		SET							

STEEL STRUCTURE DEPARTMENT PRODUCTION SHOP

NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST

APPROVED

CHECKED

DRAWN

SCALE 1/40

LINER PLATE BLOCK LAYOUT OF DOME PORTION

DATE | REFERENCE | ORDER NO. | ITEM NO. | OWNER

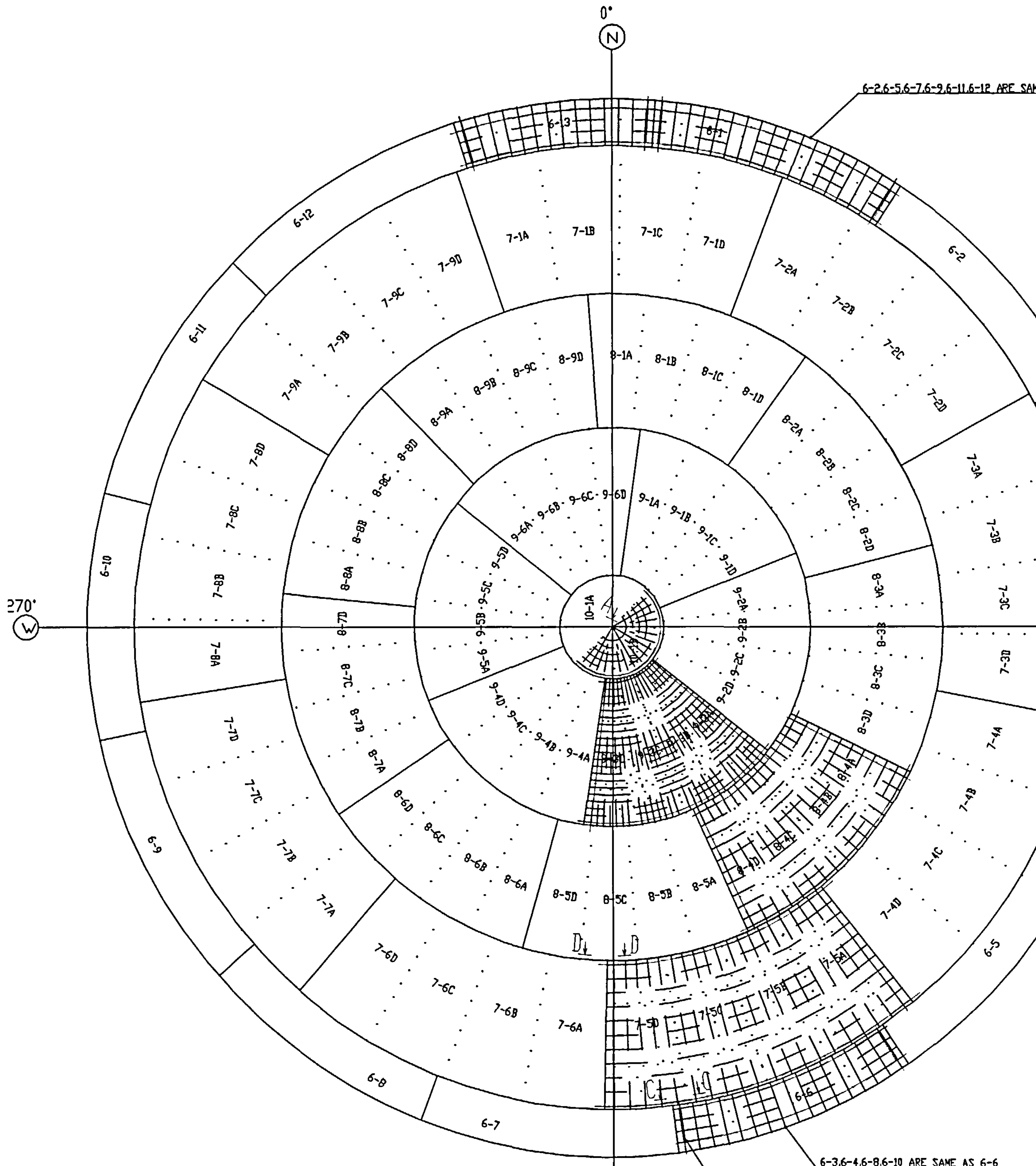
DRAWING NO. M1-ZCD1015A | 0

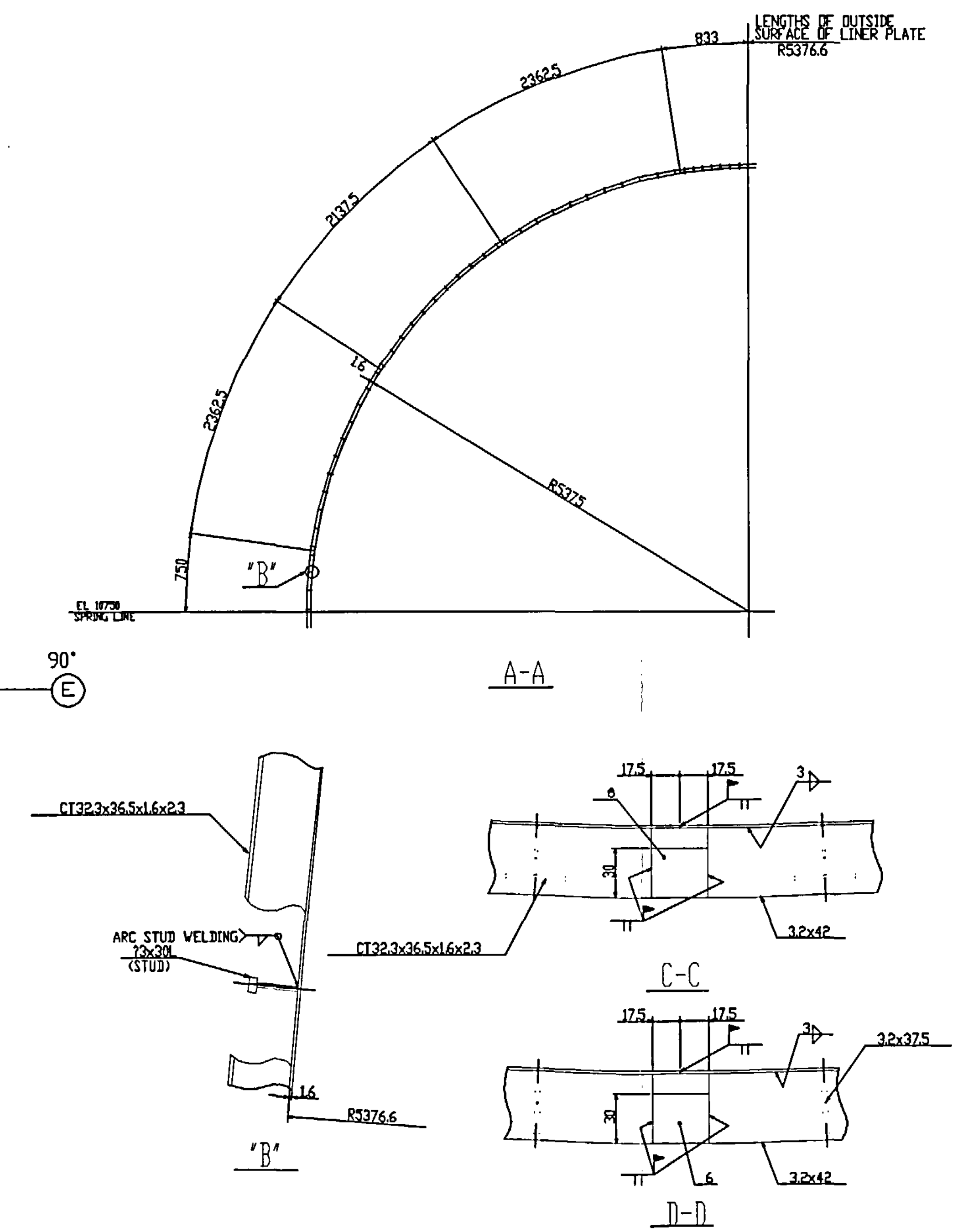
COPY FOR A1

MHI PRODUCTION SHOP & MACHINERY WORKS | DRAWN | ISSUED

3rd ANGLE PROJECTION | ISO METRIC SCREW THREADS

MHI PROPRIETARY CLASS B | PLAN RECORD





NOTES
1. WELDS SHALL BE BUTT WELDS AS SHOWN BELLOW UNLESS OTHERWISE NOTED.
2. MATERIALS LINER PLATE(1.6) SGV410
   LINER ANCHOR AND STUD SS400
3. THIS DWG. ARE OUTSIDE SURFACE OF LINER PLATE.
4. CLASSIFICATION OF WELD SEAMS ARE AS FOLLOWS;
   ——FIELD WELD
   — —SHOP WELD

⑥ TIERS	398
⑦ TIERS	1458
⑧ TIERS	1134
⑨ TIERS	1860
⑩ TIERS	146
TOTAL	4996

MARK	DESCRIPTION	MATERIAL	TEST PIECE	QUANTITY PER SET	SPARE	PER PIECE MASS (kg)	TOTAL	REMARKS

STEEL STRUCTURE DEPARTMENT PRODUCTION SHOP

NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST

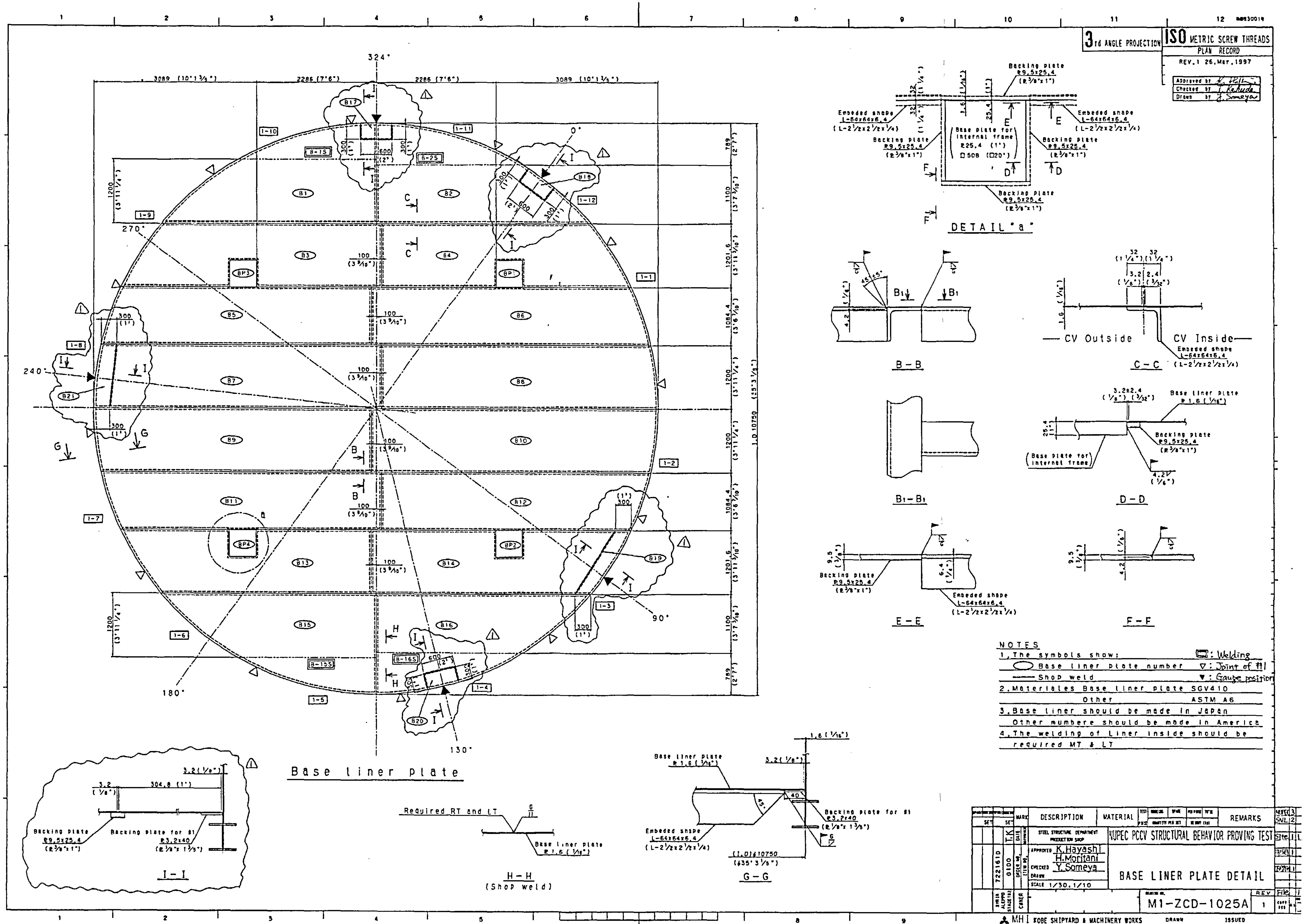
STUD LAYOUT OF DOME PORTION

APPROVED / CHECKED / DRAWN

SCALE 1/40,1/2

DRAWING NO. M1-ZCD1016A 0

MHI PRODUCTION SHOP & MACHINERY WORKS DRAWN ISSUED


3rd ANGLE PROJECTION
ISO METRIC SCREW THREADS
PLAN RECORD
REV.1 26.Mar.1997
Base liner plate
DETAIL "a"
B-B
B1-B1
C-C
D-D
E-E
F-F
CV Outside
CV Inside
I-I
H-H
(Shop weld)
G-G
Required RT and LT
Backing plate
Embeded shape L-64x64x6.4 (L-2½x2½x¼)
Base liner plate ℓ1.6 (1/16")
NOTES
1. The symbols show:
Base liner plate number
Shop weld
Welding
Joint of fill
Gauge position
2. Materiales Base liner plate SGV410
Other ASTM A6
3. Base liner should be made in Japan
Other numbers should be made in America
4. The welding of Liner inside should be required MT & LT
NUPEC PCCV STRUCTURAL BEHAVIOR PROVING TEST
BASE LINER PLATE DETAIL
APPROVED K.Hayashi
H.Moritani
CHECKED Y.Someya
SCALE 1/30, 1/10
M1-ZCD-1025A
MHI KOBE SHIPYARD & MACHINERY WORKS