



پروژه خطوط انتقال پساب از واحد فولادسازی به RO واحد کوثر
اسناد مناقصه تامین، اجرا، تست و راه اندازی



صفحه ۱ از ۱۵۸

پیوست ۱۸-۱-۳

شماره مناقصه: _____

پیوست هجده: اسناد و مدارک فنی

۱۸-۱ اسناد فنی پایه

۱۸-۱-۳ مشخصات فنی



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شرایط اجرایی و احداث

عملیات تامین، اجرا و تست لوله و اتصالات سه خط لوله بر اساس اطلاعات و نقشه های فنی پایه و با احتساب خطوط لوله ها، مخزن لازم جهت ذخیره آب ریجکت و پمپ لازم جهت انتقال ریجکت در سایت شرکت توسعه آهن و فولاد گل گهر و همچنین کلیه مصالح، ابزار آلات و سایر نیاز ها جهت انجام موضوع پیمان و همچنین عملیات اجرایی لوله کشی به شرح جدول و مراحل اجرایی و شرح کار به نحوه زیر اجراء می گردد. این خطوط لوله شامل ۱) یک خط آب تصفیه شده (Permeate) واحد اسمز معکوس تصفیه خانه جدید از محل انشعاب شماره ۳ (Junction 3) به مخزن آب مصرفی فولاد سازی، ۲) یک خط پساب برج خنک کن (Blowdown) ناحیه فولاد سازی به تصفیه خانه جدید ۳) یک خط پساب (Reject) واحد اسمز معکوس ناحیه فولاد سازی به مخزن آب خام واحد احیا کوثر به صورت تحت فشار می باشد. اطلاعات مربوط به این سه خط لوله در جدول ۱ آورده شده است. اطلاعات تکمیلی این خطوط لوله به همراه محاسبات در ضمیمه شماره ۱۸-۴ آورده شده اند. خاطر نشان می گردد، پیمانکار موظف است، قبل از شروع هرگونه عملیات اجرایی، از مسیر لوله گذاری ها، نقشه برداری نموده و با توجه به عمق دفن لوله ها، نقشه های پلان و پروفیل لوله گذاری را با مستندات موجود در سایت تطابق و رفع تداخل نماید.

جدول ۱- مشخصات خط لوله و سیستم پمپاژ در تعهد پیمانکار

ردیف	عنوان	مقدار طول حدودی (متر)	قطر (میلیمتر)**	دبی جریان (مترمکعب بر ساعت)	هد (متر)	مشخصات پمپها
۱	خط آب تصفیه شده (Permeate) واحد اسمز معکوس تصفیه خانه جدید از محل انشعاب شماره ۳ (Junction 3) به مخزن آب مصرفی فولاد سازی	۲۱۵۷	250-PN10	۱۴۰	۴۰	-
۲	خط پساب برج خنک کن (Blowdown) ناحیه فولاد سازی به تصفیه خانه جدید	۳۵۵۷	400-PN10	۳۷۰-۴۰۰	۲۶.۹	PU7 موجود و مطابق دیتاشیت پیوست
۳	خط پساب (Reject) واحد اسمز معکوس ناحیه فولاد سازی به مخزن آب خام واحد احیا کوثر	۲۲۵۷	315-PN10	۲۱۰	۲۱	PU6 مطابق دیتاشیت



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پیوست ۱۸-۱-۳

شماره مناقصه: _____

ردیف	عنوان	مقدار طول حدودی (متر)	قطر (میلیمتر)**	دبی جریان (مترمکعب بر ساعت)	هد (متر)	مشخصات پمپها
۴	خط پساب (Reject) از RO فولادسازی به تانک ذخیره آب ریجکت	۵۲	200-PN10	۲۱۰	مطابق مشخصات RO فولادسازی	

خطوط انتقال (ترانسفر لاینز) شامل:

(۱) انتقال آب تصفیه شده (Permeate) تولیدی در تصفیه خانه از محل انشعاب شماره ۳ (Junction 3) به سمت مخزن نگهداری آب پرمییت در SMP،

(۲) انتقال آب بلودان از SMP به سمت تصفیه خانه جدید

(۳) انتقال آب برای RO موجود در SMP به تانک آب خام در پلنت کوثر، می باشد.

آب ریجکت با دبی ۲۱۰ متر مکعب بر ساعت با هد حدودی ۲۱ متر به سمت مخزن آب خام واحد کوثر با استفاده از پمپ PU6 منتقل میگردد. لاین انتقال آب Reject از SMP به سمت مخزن آب خام کوثر TK-01 می باشد. با توجه به اینکه حجم آب خام کوثر ۱۱۵۰ متر مکعب بوده و با در نظر داشتن کل آب خوراک ورودی، زمان ماند حدودا ۲ ساعت می باشد. این زمان ماند برای متعادل سازی و اختلاط بین جریان ریجکت SMP با ورودی آب خام (خلیج فارس) جهت رقیق سازی خوراک RO کوثر کوتاه می باشد. بنابراین یک تانک ذخیره به ظرفیت ۸۰۰ مترمکعب بر ساعت برای ذخیره آب ریجکت در نظر گرفته شده است.

در زمانهایی که خروجی این تانک به سمت مخزن TK-01 پلنت کوثر باشد لازم است پمپ PU6 سیگنال امدادی دریافت را از پلنت RO کوثر دریافت نماید. در صورتی که این سیگنال دریافت نشد و لول سنج موجود در این مخزن به HH برسد، ضروری است با استفاده از شیر کنترلی، خروجی به سمت 900-WWT-TA01-01 wastewater basin موجود در پلنت SMP هدایت شود و پمپ PU6 از مدار خارج شود. لازم است مدرک فلسفه کنترل در این خصوص در نظر گرفته شود.

جهت انتقال بلودان به سمت تصفیه خانه جدید از ایستگاه پمپاژ موجود در سایت با دیتاشیت ارائه شده در پیوست شماره ۴-۱-۱۸ استفاده میگردد. این پمپ به صورت intermittent میزان ماکزیمم ۳۷۰ متر مکعب بر ساعت آب بلودان را به سمت تصفیه خانه جدید منتقل میکند. آب تصفیه شده با دبی ۱۴۰ مترمکعب بر ساعت از طریق خط لوله از تصفیه خانه جدید به مخزن آب مصرفی فولادسازی منتقل می گردد. تامین و اجرای اجرای این خطوط بر عهده پیمانکار است.

ضمنا انتقال آب ریجکت از RO فولادسازی به تانک 100-DRP-TA01-02 و ارتباط آن با خط بلودان موجود ورودی تانک 900-WWT-TA01-01 و شیرآلات مورد نیاز در مسیر مطابق نقشه های طراحی، بر عهده پیمانکار است.



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پیوست ۱۸-۱-۳

شماره مناقصه: _____

احداث ۳ خط انتقال آب و پساب :

۱- تامین و عملیات لوله گذاری با لوله پلی اتیلن

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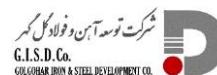
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۱-۱۳-

۱-۱۴-



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پیوست ۱۸-۱-۳

شماره مناقصه: _____

۱-۱۵

جدول ۲- درصد وزنی جهت تایید مراحل مختلف عملیات لوله گذاری برای لوله های پلی اتیلنی

شماره ردیف	قطر لوله (میلیمتر)	۳۱۵-۴۰۰	۲۰۰-۲۸۰	۱۱۰-۱۸۰	۵۰-۹۰	۱۶-۵۰
	شرح عملیات	درصد وزنی (W.F)				
۱	تمیز کردن مسیر لوله گذاری و انجام کارهای نقشه برداری لازم	۶.۵	۷.۵	۸	۸.۵	۸.۵
۲	بارگیری و حمل لوله ها و اتصالات	۱۴.۵	۱۳	۱۲	۱۱	۱۱
۳	حفر ترانشه	۲۰	۲۲	۲۴	۲۵	۲۵
۴	تسطیح و آماده کردن کف ترانشه	۶.۵	۷.۵	۹	۱۰.۵	۱۰.۵
۵	قرار دادن لوله ها و اتصالات درون ترانشه و نصب آنها	۱۶	۱۲	۹.۵	۷	۷
۶	خاکریزی اطراف و روی لوله درون ترانشه، با ماسه بادی	۸	۸.۵	۹	۹.۵	۹.۵
۷	آزمایش هیدرولیکی خط لوله و تایید آن	۱۰	۸.۵	۷.۵	۶.۵	۶.۵
۸	پخش و کوبیدن خاک سرندي، خاکریز نهایی و عملیات تکمیلی و تحویل نهایی	۱۸.۵	۲۰	۲۱	۲۲	۲۲
	جمع	۱۰۰	۱۰۰	۱۰۰	۱۰۰	۱۰۰

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صفحه ۶ از ۱۵۸	پیوست ۱۸-۱-۳	شماره مناقصه: _____

سیویل و سازه:

مدرک حاضر حاوی معیارهای کارهای سیویل و سازه‌ای، به همراه مشخصات خصوصی مربوط به سازه‌های پروژه «ترنسفرلین بازچرخانی پساب پروژه گل گهر» می‌باشد. اطلاعات مندرج به عنوان مبنای فنی برای تهیه اسناد مناقصه، برآورد هزینه، تامین مصالح و اجرای سازه‌های مرتبط در این پروژه مورد استفاده قرار خواهد گرفت. رعایت الزامات و دستورالعمل‌های ذکر شده در این سند الزامی است.

- تمام کارهای سیویل و سازه، از جمله مخازن و پیت‌ها، ساپورت‌ها و رک‌های نگهدارنده لوله‌ها و سینی کابل‌ها، کانال‌ها و ترنج‌ها، منهول، و هر تاسیسات مورد نیاز دیگر، در حوزه مسئولیت پیمانکار قرار دارند.
- پیمانکار موظف است دستورالعمل‌های کامل ساخت، حمل، نصب، نگهداری کلیه سازه‌های بتنی و فولادی را تهیه و برای تایید به دستگاه نظارت/ کارفرما ارائه نماید. این دستورالعمل‌ها باید شامل جزئیات فنی، مراحل اجرایی، تمهیدات ایمنی، تامین پایداری موقت در حین نصب سازه‌ها و کنترل کیفیت در تمامی مراحل و مطابق با استانداردهای ملی و بین‌المللی مرتبط باشند.
- پیمانکار موظف است تمامی اقلام لازم را به‌طور کامل شناسایی کرده و مشخصات فنی کامل و منطبق با الزامات برای هر یک ارائه دهد.
- تایید کلیه عملیات اجرایی سازه منوط به تاییدیه‌های مربوطه و نتایج مطلوب آزمایش‌های انجام گرفته با نظر دستگاه نظارت/ کارفرما از جمله مقاومت فشاری بتن، آزمایش‌های جوش، مصالح فولادی و پیچ‌ها، ضخامت رنگ و غیره می‌باشد. پیمانکار موظف است کلیه تسهیلات لازم را برای انجام آزمایش‌های مربوطه فراهم نماید.
- کلیه مصالح و لوازم مشروحه در مشخصات فنی باید قبل از اجرا و نصب به تایید دستگاه نظارت/ کارفرما برسد و بر اساس نقشه‌های اجرایی عمل شود. در صورت اختلاف بین مشخصات فنی و نقشه‌های اجرایی در کلیه موارد می‌بایستی بر طبق نظر دستگاه نظارت/ کارفرما عمل شود.

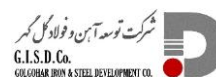
مشخصات فنی

خاکبرداری

عملیات خاکبرداری شامل برداشت خاک سطحی، خاکبرداری عمومی، و خاکبرداری محدود در بخش‌هایی که جنس خاک آن‌ها ممکن است خاک نرم، خاک سخت یا سنگ نرم/سخت باشد -چه در حضور آب و چه در شرایط خشک- می‌شود. این عملیات به صورت دستی یا مکانیکی با روش‌های انتخابی انجام خواهد شد. در حین کار باید دقت ویژه‌ای به عمل آید تا به لوله‌ها یا کابل‌های مدفون موجود آسیبی وارد نشود و حفاظت کافی برای آن‌ها فراهم شود.



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شماره مناقصه: _____

سازه‌های بتنی و فونداسیون‌ها

- تامین مصالح و اجرای ساختمان‌ها، فونداسیون‌ها و سایر سازه‌های بتنی مسلح (به جز مخازن ذخیره آب) باید مطابق با مبحث نهم مقررات ملی ساختمان ایران انجام شود.
- مخازن بتنی برای ذخیره‌سازی آب باید بر اساس ضوابط و معیارهای طرح و محاسبه مخازن آب زمینی (نشریه شماره ۱۲۳ سازمان مدیریت و برنامه‌ریزی ایران) اجرا شوند.
- بتن با مقاومت فشاری مشخصه ۲۸ روزه نمونه استوانه‌ای طبق ASTM C39 و بر اساس مقادیر ارائه شده در مبحث نهم مقررات ملی ساختمان استفاده می‌شود. مقدار سیمان مصرفی در بتن نباید کمتر از ۳۵۰ کیلوگرم در مترمکعب و نسبت آب به سیمان نباید بیش از ۴۰٪ باشد.
- حداقل ضخامت دیوار پیرامونی ۳۰۰ میلی‌متر و حداقل ارتفاع کف مخزن از زمین اطراف ۳۰۰ میلی‌متر باشد.
- برای بهسازی بستر خاک زیر فونداسیون با توجه به شرایط بستر و سطح آب زیرزمینی، بنا به تشخیص دستگاه نظارت/ کارفرما، در صورت نیاز، بسترسازی به عمق ۶۰ سانتیمتر شفته‌ریزی با خاک تهیه شده مناسب شن دار و ۱۵۰ کیلوگرم آهک شکفته در هر مترمکعب اجرا می‌گردد.
- قالب‌بندی فونداسیون باید به وسیله قالب فلزی به صورت استاندارد و مهارهای کافی طبق این‌نامه مربوطه صورت پذیرد. هر گونه مهار قالب به وسیله سیم و مفتول به آرماتورها ممنوع می‌باشد.
- برای ایجاد کاور میلگردها از اسپیسرهای پلاستیکی مورد تایید دستگاه نظارت/ کارفرما استفاده می‌شود.
- پیمانکار موظف است کلیه آزمایش‌های مورد نیاز بر روی مصالح مصرفی بتن را از طریق آزمایشگاه مورد تایید دستگاه نظارت/ کارفرما انجام دهد و پیش از اجرای عملیات بتن‌ریزی، نمونه مصالح مورد استفاده را به آزمایشگاه مورد وثوق دستگاه نظارت/ کارفرما ارائه نماید. همچنین ارائه طرح اختلاط بتن متناسب با زمان و محل اجرای بتن با تعداد کافی و دریافت تاییدیه مربوطه الزامی بوده و کلیه هزینه‌های انجام آزمایش‌ها و تهیه و تایید طرح اختلاط بر عهده پیمانکار است و هیچ‌گونه هزینه‌ای در این خصوص قابل پرداخت نخواهد بود.
- در هنگام اجرای بتن بایستی متناسب با حجم و توان بتن‌ریزی روزانه در محل‌های مناسب با هماهنگی دستگاه نظارت/ کارفرما، درزهای اجرایی لازم پیش‌بینی و به وسیله دو لایه رابیتس با مهار مناسب برای جلوگیری از پیش‌روی بتن اجرا شود.
- کلیه میلگردهای مصرفی در فونداسیون و سازه و سقف از نوع AIII می‌باشد.
- بتن مصرفی در فونداسیون و سازه و سقف از نوع C30 با مقاومت فشاری ۲۸ روزه استوانه‌ای برابر با 300kg/cm² می‌باشد.
- در صورتی که در حین عملیات اجرای فونداسیون بخشی از سطح به صورت لجن و یا از خاک‌های نامرغوب ملاحظه شود، پیمانکار موظف است آن بخش از سطح را تخلیه و با مصالح مرغوب از جمله لاشه‌چینی با ملات پر نموده و سپس اقدام به اجرای فونداسیون نماید.



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صفحه ۸ از ۱۵۸

پیوست ۱۸-۳

شماره مناقصه: _____

- پیمانکار در اجرای بتن‌ریزی ملزم به ساخت بتن با استقرار بچینگ در کارگاه یا تهیه بتن آماده از کارخانه مورد تایید دستگاه نظارت/ کارفرما می‌باشد و در هیچ حالتی ساخت بتن با خلأ، بتن‌یر یا دست مورد تایید نیست.
- رعایت کلیه موارد ایمنی در هنگام و پس از خاگرداری از جمله فنس کشی اطراف گود و اجرای نوار خطر و سایر علائم هشداردهنده و دیگر عملیات ساختمانی الزامیست.
- برای استفاده از میلگرد مصرفی در سازه لازم است پیش از اجرا آزمایش‌های مربوطه مطابق با مبحث نهم مقررات ملی ساختمان انجام شود و نتایج به تایید دستگاه نظارت/ کارفرما برسد.
- اب، سیمان، شن و ماسه مصرفی باید مطابق استانداردهای مربوطه مبحث نهم مقررات ملی ساختمان بوده و به تایید دستگاه نظارت/ کارفرما برسد و بتن ریخته‌شده بایستی مطابق مقررات ملی و روش مورد تایید نظارت عمل‌آوری شود.
- در محل دال‌ها، فونداسیون‌ها و دیوارهای بتنی هیچ‌گونه سوراخی ایجاد نشود مگر آن‌چه که در نقشه‌ها آمده است یا بنا به ضرورت تاسیساتی و با تایید کتبی دستگاه نظارت/ کارفرما باشد.
- قبل از شروع بتن‌ریزی سقف، محل داکت‌ها و کلیه جاسازی‌های لازم دقیقاً پیش‌بینی شود.
- در کلیه مراحل بتن‌ریزی می‌بایست بتن توسط وسایل مکانیکی لرزانده و ویبره شود.
- قطعات فولادی باید از معایبی که به مقاومت و یا شکل ظاهری آن لطمه می‌زند عاری باشند. استفاده از فولادهای مصرف‌شده مجاز نیست.

آب‌بندی مخازن و پیت‌ها

پیمانکار موظف است مخازن و پیت‌های آب‌بند تحویل دهد. مواد استفاده‌شده و روش اجرای پوشش کف و بدنه و آب‌بندی درزها باید بر اساس استاندارد بین‌المللی و تاییدیه دستگاه نظارت/ کارفرما انجام شود. برخی از نمونه‌ها برای نوار آب‌بندی و مواد پرکننده درزها در ادامه معرفی شده است.

نوار آب‌بند: P.V.C Polyvinyl Chloride, Polypropylene, Polyethylene Polyurethane

پرکننده درزها: Rosin Impregnated cork, Neoprene و Betonies Dehydrated Cork, Bituminous

سازه‌های فولادی

- تامین مصالح و اجرای سازه‌های فولادی باید بر اساس مبحث دهم مقررات ملی ساختمان ایران انجام شود.
- استفاده از اتصالات پرچی مجاز نیست. اتصالات پیچی و جوشی باید مطابق ایتمهای تاییدشده در ادامه باشد.
- حداقل ضخامت تمام مقاطع فولادی (به جز مقاطع نوردشده و ناودانی‌ها) نباید کمتر از ۶ میلی‌متر باشد.
- بولت‌های مهاري باید از میلگرد اجدار با حداقل قطر ۲۰ میلی‌متر ساخته شوند.
- ضخامت ورق گاست نباید کمتر از ۸ میلی‌متر باشد.
- در اتصالات نباید کمتر از دو پیچ استفاده شود.

	پروژه خطوط انتقال پساب از واحد فولادسازی به RO واحد کوثر اسناد مناقصه تامین، اجرا، تست و راه اندازی	
صفحه ۹ از ۱۵۸	پیوست ۱۸-۱-۳	شماره مناقصه: _____

- قطعات فولادی اعم از اجزای قاب، ستون‌ها و تیرهای اصلی باید حتی‌الامکان یکپارچه باشد و از وصله قطعات کوتاه خودداری شود، مگر آنکه محل وصله یا در نقشه‌های اجرایی یا با موافقت مهندس طراح باشد.
- رعایت کلیه مفاد مبحث دهم مقررات ملی ساختمان در خصوص مونتاژ، ساخت، جوشکاری، رنگ‌آمیزی، رواداری، اتصالات و غیره در خصوص اجرای سازه الزامی می‌باشد.
- برش، مونتاژ، جوشکاری و متصل کردن قطعات به یکدیگر باید در کارخانه سرپوشیده و مجهز ساخت اسکلت‌های فولادی مورد تایید دستگاه نظارت/ کارفرما انجام شود.
- کارخانه سازنده باید با عرضه شماره و عنوان مصالح، مشخصات فنی مربوطه طبق مدارک رسمی و همچنین گزارش آزمایش‌های مصالح، ثابت کند که مصالح مناسب مورد استفاده قرار گرفته است.
- هر گاه ناظر از مشخصات فولادهای وارد به کارخانه اطمینان نداشته باشد می‌تواند از هر ۱۰ تن نیمرخ فولادی مشابه به تعداد ۳ نمونه اتفاقی انتخاب و انجام آزمایش‌ها را مطابق استانداردهای ملی و یا ISO در مورد آنها تقاضا نماید.

آماده‌سازی سطح

آماده‌سازی سطح، پرایمینگ و رنگ‌آمیزی قطعات و صفحات فولادی مطابق استانداردها و براساس تایید دستگاه نظارت/ کارفرما انجام خواهد شد.

- تمامی قطعات فولادی با یک لایه پرایمر تحویل داده خواهند شد. بخش‌هایی که در بتن مدفون می‌شوند، رنگ‌آمیزی، روغن‌کاری یا گالوانیزه نخواهند شد، مگر اینکه این قطعات برای تامین مقاومت در برابر حریق توسط بتن پوشانده شوند که در این صورت پرایمر اعمال خواهد شد.
- در اتصالات کارگاهی که از پیچ‌های پرمقاومت استفاده می‌شود، سوراخ‌ها باید از پوسته‌های زنگ‌زدگی، الودگی و هرگونه مواد مضر دیگر کاملاً پاک شوند.
- سطوحی که قرار است رنگ شوند باید کاملاً عاری از زنگ‌زدگی، پوسته، لکه، روغن و هرگونه ماده مضر دیگر باشند.
- در صورت خوردگی در محل پروژه، در آماده‌سازی سطح و رنگ‌آمیزی باید تمهیدات ویژه‌ای در نظر گرفته شود.
- آماده‌سازی سطح باید مطابق با سطح $Sa-2 \frac{1}{2}$ استاندارد SIS 05 5900 انجام گیرد.

مصالح

- آرماتور: میلگرد اجدار فولاد پرمقاومت گرید II و III مطابق با استاندارد DIN 1045 با حداقل تنش تسلیم به ترتیب ۳۰۰۰ و ۴۰۰۰ کیلوگرم بر سانتی‌متر مربع یا معادل تاییدشده
- سیمان: پرتلند تیپ II سیمان پرتلند ضدسولفات تیپ V یا پوزولانی باید مطابق با استاندارد ASTM C150 یا معادل تاییدشده
- سنگدانه‌ها: سنگدانه‌های ریز و درشت برای بتن و ماسه برای ملات و گروت باید مطابق با استانداردها ASTM C33 یا AASHTO M80 و M6



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پیوست ۱۸-۱-۳

شماره مناقصه: _____

- فولاد: فولاد با گرید St37 یا St52 مطابق با استانداردهای DIN به شماره ۱۰۲۵، ۱۰۵۰ و ۱۷۱۰۰ با حداقل تنش تسلیم ۲۴۰۰ و ۳۶۰۰ کیلوگرم بر سانتی مترمربع یا معادل تایید شده

- پیچ، مهره و واشر: پیچ‌ها، مهره‌ها و واشرها باید مطابق با استانداردهای DIN در جدول زیر و گالوانیزه با توجه به شرایط محیطی

پیچ‌های معمولی	پیچ‌های پرمقاومت		آیتم
	HV 10.9	HV 8.8	
DIN 7990	DIN 6914	DIN 931	پیچ
DIN 555	DIN 6915	DIN 934	مهره
DIN 7989	DIN 6916	DIN 125	واشر گرد
DIN 434	DIN 6917	DIN 434	واشر مربعی برای اتصال ناودانی‌ها
DIN 435	DIN 6918	DIN 435	واشر مربعی برای اتصال مقاطع I

- الکترودهای جوشکاری

○ الکترودهای جوشکاری دستی باید مطابق با مشخصات AWS A5.1 تحت عنوان «الکترودهای پوشش‌دار فولاد نرم برای جوشکاری قوسی» یا معادل تایید شده باشد.

○ الکترودهای بدون پوشش و پودر فلاکس دانه‌ای مورد استفاده در فرایند جوشکاری قوس زیرپودری باید مطابق با رده‌بندی

AWS F60 و یا F70 طبق استاندارد AWS A5.17 با عنوان «الکترودهای فولادی نرم بدون پوشش و فلاکس برای

جوشکاری قوس زیرپودری» یا معادل تایید شده باشد.



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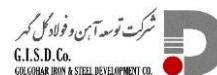
پیوست ۱۸-۱-۳

شماره مناقصه: -----

ELECTRICAL



پروژه خطوط انتقال پساب از واحد فولادسازی به RO واحد کوثر
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پیوست ۱۸-۱-۳

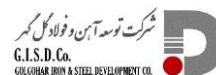
شماره مناقصه: _____

Technical Specification for Cable Tray, Ladder, Conduit & Accessories Bulk Material

00	ISSUED FOR APPROVAL	M.KHAVARI	F.NIKNAM	A.MONFARED	1405/02/08
Rev.	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED	APP DATE



پروژه خطوط انتقال پساب از واحد فولادسازی به RO واحد کوثر
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صفحه ۱۳ از ۱۵۸

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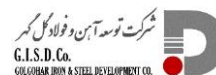
شماره مناقصه: _____

TABULATION REVISED PAGES

SHEET	Rev.00	Rev.01	Rev.02	Rev.03	SHEET	Rev.00	Rev.01	Rev.02	Rev.03
01	X				51				
02	X				52				
03	X				53				
04	X				54				
05	X				55				
06	X				56				
07	X				57				
08	X				58				
09	X				59				
10	X				60				
11	X				61				
12	X				62				
13	X				63				
14	X				64				
15	X				65				
16	X				66				
17	X				67				
18	X				68				
19	X				69				
20	X				70				
21	X				71				
22	X				72				
23	X				73				
24	X				74				
25	X				75				
26	X				76				
27	X				77				
28	X				78				
29	X				79				
30	X				80				
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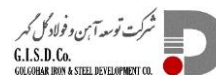
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صفحه ۱۷ از ۱۵۸

پیوست ۱۸-۳

شماره مناقصه: _____

GENERAL

1.1 SCOPE

This specification is prepared to cover the project Cable Trays & Ladders that located in the Project.

1.2 DOCUMENT PRIORITY

In case of conflict between documents, the order of precedence shall be:

- This Specification.
- Drawings and other technical documents.
- I.E.C. standards.
- Other standard and codes when I.E.C. publications have not yet been issued.

1.3 CONDITION OF OPERATION

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, and 365 days/year operation.

Site Conditions

1.4 Plant Location

The Site is located at Gol-E-Gohar Iron Ore Complex, situated in Sirjan, Province of Kerman in southern part of Islamic Republic of IRAN, approximately 285 km southwest of Kerman city and 335 km north of Bandar Abbas port, in a semi-desertic high plateau terrain, 1750 m above sea level, and flanked by mountains over 2500 m high trending northwest to southwest.

1.5 Meteorological

Ambient Temperature

Max. Temperature:	+40 deg. C (Recorded) +50 deg. C (Design)
Min. temperature:	-12 deg. C (Recorded) -10 deg. C (Design)
Average temperature:	+15.9 deg. C (Design)
Wet bulb design temperature (summer):	+25 deg C
Relative Humidity:	Max. 70%

Wind Velocity

According to National Iranian Code (6th revision):

Basic speed data:	130 Km/h
Basic pressure data:	0.845 KN/m ²
Correction factor:	
0 - 10 m:	2
10 - 20 m:	2.2
20 - 100 m:	2.4

Rainfall

Yearly 120 mm (average)
Monthly rainfall 260mm (Max)



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پیوست ۱۸-۱-۳

شماره مناقصه: _____

Barometric Pressure

820 milliards

Geological Conditions

This data is belongs to the existing palletizing plant location. For the engineering the contractor shall be study geotechnical conditions for the essential location according to the project plan.

Altitude: About 1,750 m above mean sea level

Soil bearing: approx. 20t/m²

Ground water level: approx. 60 m below ground level

Earthquake Load

Equipment in plant will be dimensioned including a safety calculation against earthquake according to the "Iranian Code for Seismic Resistant Design of Buildings

– Publication No. S253-2nd edition, autumn 1999" ("Iranian Regulations 2800") and "Minimum Design Loads for Building and Structures" (Iranian Regulations 519).

- Design base acceleration: 0.3·g

- Classification of Buildings: Group 2

- Soil classification: soil type III-b

1.6 Conditions of Operation

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, 365 days/year operation.

STANDARDS AND CODES

IEC 61537 Cable management - Cable tray systems and cable ladder systems

ISO 1461 Hot Dip Galvanized Coatings on Fabricated Iron and Steel Articles

In case of any conflicts among the above-mentioned referenced documents and this specification, the more stringent requirement shall govern.

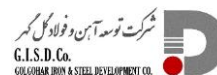
1.0. CABLE TRAYS DESCRIPTION

1.1. Features

Ladder type cable trays shall consist of two side channels to which rungs shall be fastened by continuous welding; spacing between rungs shall be <300 mm.



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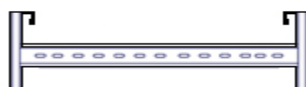
پیوست ۱۸-۳

شماره مناقصه: _____

Sharp edges and burrs capable of damaging cables shall be positively avoided.

Ladder type cable trays are applied only for Electrical.

To protected cables, for each side number of cable tray's inside edge shall be 3 (totally 6). (as following figure)



1.2. Ladder type cable trays

Available inside depth shall be not less than 85 mm. Widths shall be either 300 or 600mm (inside available clear space). The side channel size of cable trays shall be 100x25x25 mm. Rung channel size for cable trays shall be 35x15x15mm, fully welded to side channels. Thickness of rungs shall be same as side channels.

Perforated trough type cable trays (for Instrumentation) – Available inside depth shall not be less than 100mm for 400 & 600 mm wide trays. The same shall not be less than 50mm for 200 mm and 300 mm wide trays. The side channel for cable trays shall be 100X12X12 mm for 600 mm and 400 mm trays and 50x12x12 mm for 300 and 200 mm trays.

Widths shall be 100/200/300/400/500/600 mm (inside available clear space).

Depth of connecting splice plates shall be suitable for ladder or perforated type cable trays height.

Metal cable trays shall be assembled by means of continuous welding or bolting. Riveting and spot welding are not allowed. In any case, welding and punching shall be carried out before galvanizing.

Horizontal and vertical elbows shall be continuous (without angles).

MV cables, LV cables and control cables shall be placed on separated cable trays/ladders by considering MV cables placed on lowest level and control cables placed on upper trays/ladders.

The cable tray (Ladder type) side channels shall be fabricated with minimum 2mm thickness.

The cable tray (Perforated type) thickness shall be minimum 2mm.

The cable tray covers shall be minimum 1.5 mm thick

1.3. Material of Construction

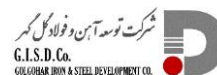
Ladder type cable trays shall be made from hot deep galvanized.

Perforated type cable trays for Instrumentation shall also be made from hot deep galvanized steel.

1.4. Finishing



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Finishing for the hot deep galvanized steel trays - Hot deep galvanizing shall be done after fabrication; for carbon steel having thickness / 2 mm, the minimum galvanizing thickness shall be 85 micron of Zinc coating.

1.5. Sizing

Cable trays shall be designed to support the loads specified in Inquiry. Anyway, in lack of other instructions, a mass of 200 N per linear meter and per 200 mm tray width shall be considered.

The maximum deflection of tray span shall be within 1/200 of the span.

Working load is intended as useful carrying capacity, in addition to the tray its own load.

Contribution of rungs to withstanding it is deemed negligible.

In addition to the working (static) load (due to cables), concentrated live load equal to 900 N (equivalent to a man weight) shall be considered, in whichever location respect to supports, without the tray being permanently deformed.

Cable tray system shall be able to withstand the required loads, with a safety factor / 1.5.

2.0. CABLE TRAYS ARRANGEMENT

2.1. General

Trays arrangement shall allow an easy laying and removal of cables.

2.2. Clearances

Vertical and Horizontal clearances between cable trays shall be ensured as per the requirements.

A side clearance of 600 mm at least is required for accessibility; if clearance on one side is less than the required one, cable tray shall be considered as not accessible on this side.

2.3. Supports

The maximum distance between brackets shall be considered 1.5 m.

2.4. Covers

Cable trays may be provided in outdoor areas on topmost layer of the trays, where cables are likely to be exposed to direct sunlight and mechanical damage is likely to occur during maintenance activities.

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The covers shall be arranged so as not to confine the heat generated by radiation from the cables.

Mounting of covers on cable trays shall be carried out by spacers, for cable ventilation reasons.

2.5. Fittings

Manufacturer shall supply, together with straight sections of cable trays, the following fittings:

- brackets and structural elements, horizontal and vertical elbows, reducers, tees, crosses, rigid connectors, expansion connectors, adjustable connectors, spacers;
- hardware as screws, nuts, washers;
- Accessories as conduit adapters, partitions, fasteners, slopes.

Quantity shall be stated in Material requisition; in case of lack of quantity in Material requisition about hardware, quantity to be supplied shall be enough for a proper assembling, with a reasonable quantity overestimation.

3.0. DRAWINGS AND DOCUMENTATION

General Documentation requirements

Manufacturer shall supply documentation with complete information about:

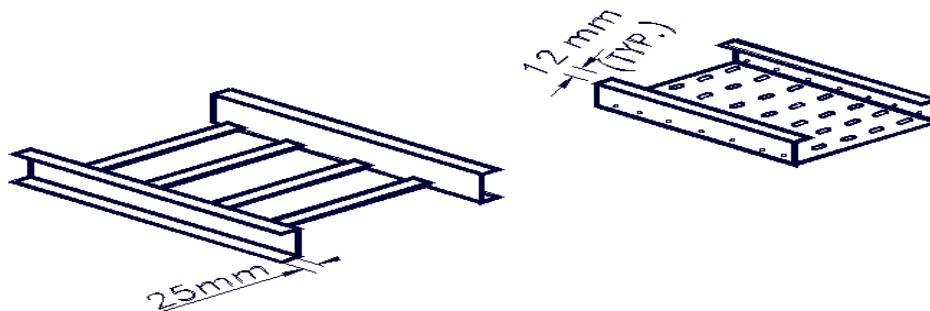
- Type of material;
- Type of finishing (in particular galvanizing);
- Mass of tray in kg per meter;
- Maximum overall dimensions,
- Basic solutions (standard span; allowed working load) with specification
- About consequent deflection values;
- Assembling instructions with illustrations.
- List of applicable type test certificates
- Test report of FAT

All documents shall show the relevant purchase order number, item and manufacturers references.

4. Types of Cable Trays & Accessories

4.1 Cable Tray Element

Cable Tray Straight Element



Length of Cable Tray :3000 mm Standard Length

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	STP10	STL10
200 mm	STP20	STL20
300 mm	STP30	STL30
400 mm	STP40	STL40
500 mm	STP50	STL50
600 mm	STP60	STL60
700 mm	STP70	STL70



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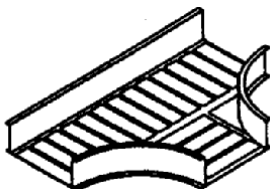


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شماره مناقصه: _____

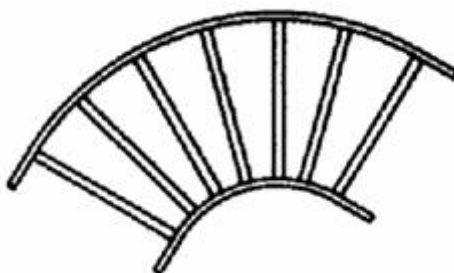
Cable Tray tee Element



Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type Radius (RAD): 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	TEP10	TEL10
200 mm	TEP20	TEL20
300 mm	TEP30	TEL30
400 mm	TEP40	TEL40
500 mm	TEP50	TEL50
600 mm	TEP60	TEL60
700 mm	TEP70	TEL70

Cable Tray horizontal 90° bend Element



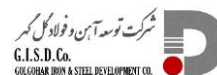
Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type.

Radius (RAD) : 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	HBP10	HBL10
200 mm	HBP20	HBL20
300 mm	HBP30	HBL30
400 mm	HBP40	HBL40
500 mm	HBP50	HBL50
600 mm	HBP60	HBL60
700 mm	HBP70	HBL70



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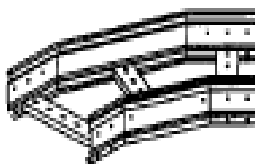


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شماره مناقصه: _____

Cable Tray horizontal 45° bend Element



Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type.

Radius (RAD): 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	HBP10(45)	HBL10(45)
200 mm	HBP20(45)	HBL20(45)
300 mm	HBP30(45)	HBL30(45)
400 mm	HBP40(45)	HBL40(45)
500 mm	HBP50(45)	HBL50(45)
600 mm	HBP60(45)	HBL60(45)
700 mm	HBP70(45)	HBL70(45)

Note: Cable tray horizontal 90 bend element can be similar to point 8.1.4



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شماره مناقصه: _____

Cable Tray internal vertical 90° bend Element



Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type
Radius (RAD): 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	VBP10(I)	VBL10(I)
200 mm	VBP20(I)	VBL20(I)
300 mm	VBP30(I)	VBL30(I)
400 mm	VBP40(I)	VBL40(I)
500 mm	VBP50(I)	VBL50(I)
600 mm	VBP60(I)	VBL60(I)
700 mm	VBP70(I)	VBL70(I)

Cable Tray external vertical 90° bend Element

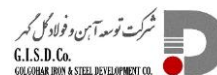


Working Depth : minimum 100 mm inside for perforated and 85 mm for ladder type
Radius (RAD) : 600mm

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	VBP10(E)	VBL10(E)
200 mm	VBP20(E)	VBL20(E)
300 mm	VBP30(E)	VBL30(E)
400 mm	VBP40(E)	VBL40(E)
500 mm	VBP50(E)	VBL50(E)
600 mm	VBP60(E)	VBL60(E)
700 mm	VBP70(E)	VBL70(E)



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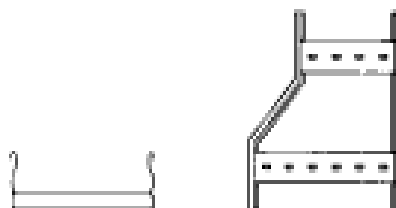


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شماره مناقصه: _____

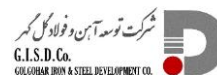
Cable Tray right reduction Element



WIDTH1 to WIDTH2	ITEM(Perforated type)	ITEM(Ladder type)
600mm-500 mm	RRP(60-50)	RRL(60-50)
600mm-400 mm	RRP(60-40)	RRL(60-40)
600mm-300 mm	RRP(60-30)	RRL(60-30)
600mm-200 mm	RRP(60-20)	RRL(60-20)
600mm-100 mm	RRP(60-10)	RRL(60-10)
500mm-400 mm	RRP(50-40)	RRL(50-40)
500mm-300 mm	RRP(50-30)	RRL(50-30)
500mm-200 mm	RRP(50-20)	RRL(50-20)
500mm-100 mm	RRP(50-10)	RRL(50-10)
400mm-300 mm	RRP(40-30)	RRL(40-30)
400mm-200 mm	RRP(40-20)	RRL(40-20)
400mm-100 mm	RRP(40-10)	RRL(40-10)
300mm-200 mm	RRP(30-20)	RRL(30-20)
300mm-100 mm	RRP(30-10)	RRL(30-10)
200mm-100 mm	RRP(20-10)	RRL(20-10)
Height of cable tray	100 mm	100 mm



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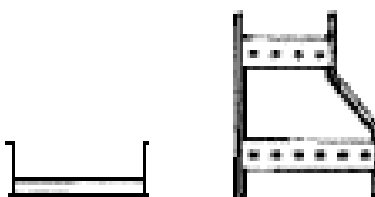


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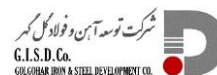
Cable Tray LEFT reduction Element



WIDTH1 to WIDTH2	ITEM(Perforated type)	ITEM(Ladder type)
600mm-500 mm	LRP(60-50)	LRL(60-50)
600mm-400 mm	LRP(60-40)	LRL(60-40)
600mm-300 mm	LRP(60-30)	LRL(60-30)
600mm-200 mm	LRP(60-20)	LRL(60-20)
600mm-100 mm	LRP(60-10)	LRL(60-10)
500mm-400 mm	LRP(50-40)	LRL(50-40)
500mm-300 mm	LRP(50-30)	LRL(50-30)
500mm-200 mm	LRP(50-20)	LRL(50-20)
500mm-100 mm	LRP(50-10)	LRL(50-10)
400mm-300 mm	LRP(40-30)	LRL(40-30)
400mm-200 mm	LRP(40-20)	LRL(40-20)
400mm-100 mm	LRP(40-10)	LRL(40-10)
300mm-200 mm	LRP(30-20)	LRL(30-20)
300mm-100 mm	LRP(30-10)	LRL(30-10)
200mm-100 mm	LRP(20-10)	LRL(20-10)
Height of cable tray	100 mm	100 mm



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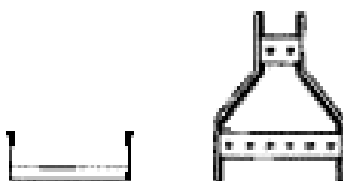


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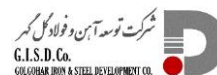
Cable Tray CENTRAL reduction Element



WIDTH1 to WIDTH2	ITEM(Perforated type)	ITEM(Ladder type)
600mm-500 mm	CRP(60-50)	CRL(60-50)
600mm-400 mm	CRP(60-40)	CRL(60-40)
600mm-300 mm	CRP(60-30)	CRL(60-30)
600mm-200 mm	CRP(60-20)	CRL(60-20)
600mm-100 mm	CRP(60-10)	CRL(60-10)
500mm-400 mm	CRP(50-40)	CRL(50-40)
500mm-300 mm	CRP(50-30)	CRL(50-30)
500mm-200 mm	CRP(50-20)	CRL(50-20)
500mm-100 mm	CRP(50-10)	CRL(50-10)
400mm-300 mm	CRP(40-30)	CRL(40-30)
400mm-200 mm	CRP(40-20)	CRL(40-20)
400mm-100 mm	CRP(40-10)	CRL(40-10)
300mm-200 mm	CRP(30-20)	CRL(30-20)
300mm-100 mm	CRP(30-10)	CRL(30-10)
200mm-100 mm	CRP(20-10)	CRL(20-10)
Height of cable tray	100 mm	100 mm



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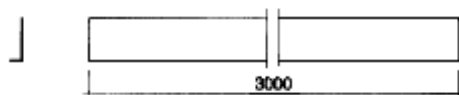


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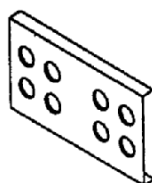
پیوست ۱۸-۱-۳

شماره مناقصه: _____

Separators (Dividers)



Separators (Dividers)	Ladder Type: SPL Perforated Type: SPP
1.1. Finishing	1.2. Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.3. Height	1.4. Suitable for cable tray height border 100 mm
1.5. Accessories	1.6. Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder



Normal Joint For Ladder / perforated Type Cable Trays	Ladder / perforated Type: NJ
1.7. Finishing	1.8. Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.9. Length	1.10. 200 mm
1.11. Height	1.12. Suitable for cable tray height
1.13. Accessories	1.14. Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder



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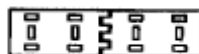


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شماره مناقصه: _____

Horizontal Hinged Splice Plate



Horizontal Hinged Splice Plate	Ladder Type: HHSL Perforated Type: HHSP
1.15. Finishing	1.16. Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.17. Length	1.18. 250 mm
1.19. Height	1.20. Suitable for cable tray height border 100 mm
1.21. Accessories	1.22. Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder

Vertical Hinged Splice Plate



Vertical Hinged Splice Plate	Ladder Type: VHSL Perforated Type: VHSP
1.23. Finishing	1.24. Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.25. Length	1.26. 270 mm
1.27. Height	1.28. Suitable for cable tray height border 100 mm
1.29. Accessories	1.30. Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder



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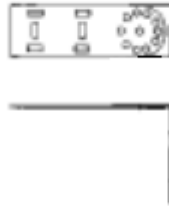


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پیوست ۱۸-۱-۳

شماره مناقصه: _____

Lateral Connection Joint



Lateral Connection Joint		Ladder Type: LCJL	
1.31.	Finishing	1.32.	Hot deep galvanizing after fabrication, galvanizing thickness shall be 57 micron (average) of zinc coating
1.33.	Length	1.34.	170 + 100 mm
1.35.	Height	1.36.	Suitable for cable tray height
1.37.	Accessories	1.38.	Stainless Steel Hardware with Bolts, nuts and washer used for fixing plate to ladder

4.2 Cable Trays Cover And Accessories

Cable Tray Straight Element Cover

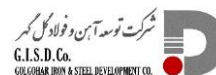


Length of each unit cover	1500 mm standard length
---------------------------	-------------------------

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CSTP10	CSTL10
200 mm	CSTP20	CSTL20
300 mm	CSTP30	CSTL30
400 mm	CSTP40	CSTL40



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شماره مناقصه: _____

500 mm	CSTP50	CSTL50
600 mm	CSTP60	CSTL60
700 mm	CSTP70	CSTL70

Cable Tray External Vertical 90° Bend Element Cover



Minimum Bending Radius	600 mm (minimum bending radius of the cable tray)	
WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CVBP10(E)	CVPL10(E)
200 mm	CVPP20(E)	CVPL20(E)
300 mm	CVPP30(E)	CVPL30(E)
400 mm	CVPP40(E)	CVPL40(E)
500 mm	CVPP50(E)	CVPL50(E)
600 mm	CVPP60(E)	CVPL60(E)
700 mm	CVPP70(E)	CVPL70(E)

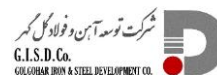
Cable Tray Internal Vertical 90° Bend Element Cover



Minimum Bending Radius	600 mm (minimum bending radius of the cable tray)	
WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CVBP10(I)	CVPL10(I)
200 mm	CVPP20(I)	CVPL20(I)
300 mm	CVPP30(I)	CVPL30(I)
400 mm	CVPP40(I)	CVPL40(I)
500 mm	CVPP50(I)	CVPL50(I)
600 mm	CVPP60(I)	CVPL60(I)
700 mm	CVPP70(I)	CVPL70(I)



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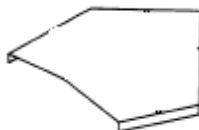


صفحه ۳۳ از ۱۵۸

پیوست ۱۸-۱-۳

شماره مناقصه: _____

Cable Tray Horizontal 45° Bend Element Cover



Minimum Bending Radius		600 mm (minimum bending radius of the cable tray)	
WIDTH	ITEM(Perforated type)	ITEM(Ladder type)	
100 mm	CHBP10(45)	CHPL10(45)	
200 mm	CHPP20(45)	CHPL20(45)	
300 mm	CHPP30(45)	CHPL30(45)	
400 mm	CHPP40(45)	CHPL40(45)	
500 mm	CHPP50(45)	CHPL50(45)	
600 mm	CHPP60(45)	CHPL60(45)	
700 mm	CHPP70(45)	CHPL70(45)	

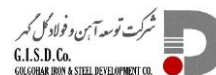
Cable Tray Horizontal 90° Bend Element Cover



Minimum Bending Radius	600 mm (minimum bending radius of the cable tray)	
Cable Tray Tee Element Cover		
WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CHBP10(90)	CHPL10(90)
200 mm	CHPP20(90)	CHPL20(90)
300 mm	CHPP30(90)	CHPL30(90)
400 mm	CHPP40(90)	CHPL40(90)
500 mm	CHPP50(90)	CHPL50(90)
600 mm	CHPP60(90)	CHPL60(90)
700 mm	CHPP 70(90)	CHPL70(90)



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صفحه ۳۴ از ۱۵۸

پیوست ۱۸-۳

شماره مناقصه: _____



Minimum Bending Radius

600 mm (minimum bending radius of the cable tray)

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CTEEP10	CTEEL10
200 mm	CTEEP20	CTEEL20
300 mm	CTEEP30	CTEEL30
400 mm	CTEEP40	CTEEL40
500 mm	CTEEP50	CTEEL50
600 mm	CTEEP60	CTEEL60
700 mm	CTEEP70	CTEEL70

Cable Tray Right Reduction Element Cover



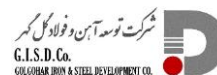
WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CRRP10	CRRL10
200 mm	CRRP20	CRRL20
300 mm	CRRP30	CRRL30
400 mm	CRRP40	CRRL40
500 mm	CRRP50	CRRL50
600 mm	CRRP60	CRRL60
700 mm	CRRP70	CRRL70

Cable Tray Left Reduction Element Cover





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صفحه ۳۵ از ۱۵۸

پیوست ۱۸-۱-۳

شماره مناقصه: [REDACTED]

WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CLR10	CLRL10
200 mm	CLRP20	CLRL20
300 mm	CLRP30	CLRL30
400 mm	CLRP40	CLRL40
500 mm	CLRP50	CLRL50
600 mm	CLRP60	CLRL60
700 mm	CLRP 70	CLRL70

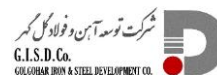
Cable Tray Central Reduction Element Cover



WIDTH	ITEM(Perforated type)	ITEM(Ladder type)
100 mm	CCR10	CCRL10
200 mm	CCRP20	CCRL20
300 mm	CCRP30	CCRL30
400 mm	CCRP40	CCRL40
500 mm	CCRP50	CCRL50
600 mm	CCRP60	CCRL60
700 mm	CCRP 70	CCRL70



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صفحه ۲۶ از ۱۵۸

پیوست ۱۸-۱-۳

شماره مناقصه: _____

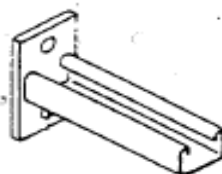
3.1. Cable Trays Accessories

Cover Fixing Clamp



Cover Fixing Clamp	Ladder /Perforated Type: SC
Finishing	Electroplated zinc galvanized
Accessories	Head bolts, Nut & Washer included

Horizontal Support



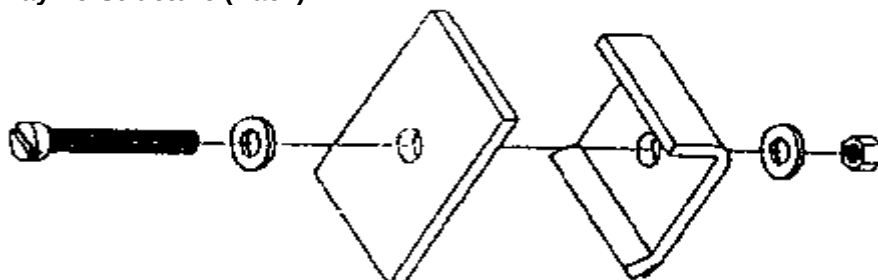
Horizontal Support	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing thickness shall be 85 micron(average) of zinc coating
Length	Suitable for 300mm/400mm/600 wide cable tray and cable ducts
Height	

Bolt Fixing To Support (Beam)



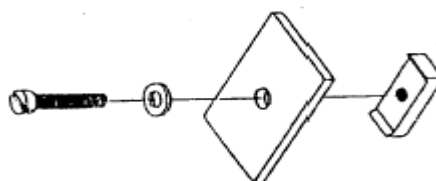
Bolt Fixing To support (Beam)	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing.
Accessories	Nut, plane washer and spring washer

Bolt Fixing Cable Tray To Structure (Rack)



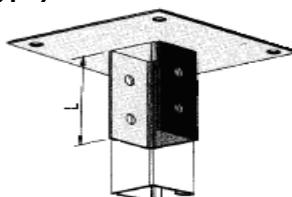
Bolt Fixing Cable Tray To Structure (Rack)	Type:
Material of Construction	Carbon Steel
Finishing	Hot deep galvanizing after fabrication, galvanizing.
Accessories	Double plate, head bolts, nut and washer included

Bolt Fixing Cable Tray To Brackets



Bolt Fixing Cable Tray To Brackets	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing.
Accessories	Head bolts & nut included

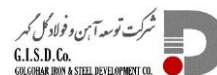
Ceiling Or Floor Fastening Plate (Simple Type)



Ceiling Or Floor Fastening Plate	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing thickness shall be 85 micron(average) of zinc coating
Dimension	Suitable for single channel
Base plate	Base plate with welded "U" Steel plate
Accessories	Stainless Steel Hardware with Channel nut screw, washers and bolts and expansion bolts for support fixing
Height	L = 100mm



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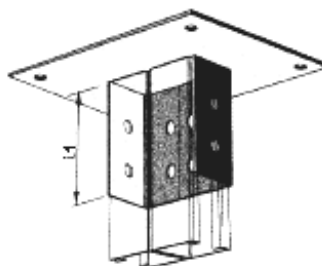


صفحه ۳۸ از ۱۵۸

پیوست ۱۸-۳

شماره مناقصه: _____

Ceiling Or Floor Fastening Plate (Double Type)

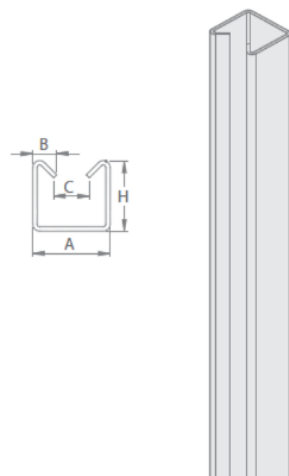


Ceiling Or Floor Fastening Plate (Double Type)	Type:
Finishing	Hot deep galvanizing after fabrication, galvanizing thickness shall be 85 micron(average) of zinc coating
Dimension	Suitable for double channel
Base plate	Base plate with welded "U" Steel plate
Accessories	Stainless Steel Hardware with Channel nut screw, washers and bolts and expansion bolts for support fixing
Height	L1 = 200mm

4.4 U Channel

Thickness: min. 2.5mm

A (mm)	B (mm)	C (mm)	H (mm)
45	12	21	41





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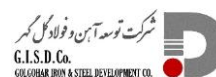
شماره مناقصه: [REDACTED]

Technical Specification For AC UPS

00	ISSUED FOR APPROVAL	M.KHAVARI	F.NIKNAM	A.MONFARED	1405/02/08
Rev.	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED	APP DATE



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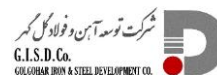
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TABULATION REVISED PAGES

SHEET	Rev.00	Rev.01	Rev.02	Rev.03	SHEET	Rev.00	Rev.01	Rev.02	Rev.03
01	X				51				
02	X				52				
03	X				53				
04	X				54				
05	X				55				
06	X				56				
07	X				57				
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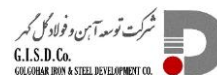
شماره مناقصه: _____

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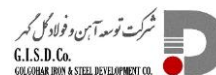
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شماره مناقصه: [REDACTED]

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شماره مناقصه: _____

1. GENERAL

1.1 SCOPE

This specification covers general technical requirements for design, equipment engineering, manufacture and shipment of complete AC Uninterruptable Power Supply (UPS).

1.2 DOCUMENT PRIORITY

In the event of any conflict between this specification, the requisition, codes and standards, the priority shall be given in the following order.

- Purchase order
- This specification
- Codes and standards

1.3 CONDITION OF OPERATION

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, and 365 days/year operation.

Site Conditions

1.4 Plant Location

The Site is located at Gol-E-Gohar Iron Ore Complex, situated in Sirjan, Province of Kerman in southern part of Islamic Republic of IRAN, approximately 285 km southwest of Kerman city and 335 km north of Bandar Abbas port, in a semi-desertic high plateau terrain, 1750 m above sea level, and flanked by mountains over 2500 m high trending northwest to southwest.

1.5 Meteorological

Ambient Temperature

Max. Temperature:	+40 deg. C (Recorded)
	+50 deg. C (Design)
Min. temperature:	-12 deg. C (Recorded)
	-10 deg. C (Design)
Average temperature:	+15.9 deg. C (Design)
Wet bulb design temperature (summer):	+25 deg C
Relative Humidity:	Max. 70%

Wind Velocity

According to National Iranian Code (6th revision):

Basic speed data:	130 Km/h
Basic pressure data:	0.845 KN/m ²
Correction factor:	
0 - 10 m:	2
10 - 20 m:	2.2
20 - 100 m:	2.4

Rainfall



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شماره مناقصه: _____

Yearly 120 mm (average)
Monthly rainfall 260mm (Max)

Barometric Pressure
820 milliards

Geological Conditions

This data is belongs to the existing palletizing plant location. For the engineering the contractor shall be study geotechnical conditions for the essential location according to the project plan.

Altitude: About 1,750 m above mean sea level

Soil bearing: approx. 20t/m²

Ground water level: approx. 60 m below ground level

Earthquake Load

Equipment in plant will be dimensioned including a safety calculation against earthquake according to the "Iranian Code for Seismic Resistant Design of Buildings

– Publication No. S253-2nd edition, autumn 1999" ("Iranian Regulations 2800") and "Minimum Design Loads for Building and Structures" (Iranian Regulations 519).

- Design base acceleration: 0.3·g

- Classification of Buildings: Group 2

- Soil classification: soil type III-b

2. STANDARDS AND CODES

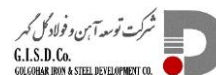
The UPS systems shall be designed, fabricated and tested in accordance with the latest revision of relevant international codes and standards including but not limited to the following wherever required. For undated references, the latest edition of the referenced document (including any supplements and amendments) applies. For dated references, the edition cited applies. The applicability of changes in the dated references that occur after the cited date shall be mutually agreed upon by CONTRACTOR/EMPLOYER and the VENDOR.

- IEC (International Electro-Technical Commission)

IEC 60309 (all parts)	Electrical installations of buildings
IEC 60529	Degrees of Protection Provided by Enclosures (IP code)
IEC 60801 Part2	Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment



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شماره مناقصه: _____

IEC 60076	Power Transformers
IEC 60146	Semiconductor Converters
IEC 60051	Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories
IEC 60289	Reactors
IEC 60445	Basic and safety principles for man-machine interface, marking and identification- identification of equipment terminals and conductor terminations
IEC 62040 (all parts)	Uninterruptable Power System (UPS)
IEC 60119	Recommendations for polycrystalline semiconductor rectifier stacks and equipment
IEC 60622	Sealed nickel cadmium prismatic rechargeable single cells

- ISO (International Organization For Standardization)

ISO 1000	SI Units and recommendation for use of their multiples and of certain other units
ISO 9001: 1994 or 9001:2000 (Including Design)	Quality management systems- Requirements
ISO 9002:1994	Quality systems- model for quality assurance in production, installation and servicing

3. Abbreviations

DCS	Distributed Control System
MCR	Main Control Room
UPS	Uninterruptible Power Supply
FAT	Factory Acceptance Test

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PMS Power Management System

PDP Power Distribution Panel

4. Document Preference

It shall be the VENDOR's responsibility to be, or to become, knowledgeable of the requirement of the referenced codes and standards.

The VENDOR shall notify the CONTRACTOR of any apparent conflict between this specification, the related data sheets, the codes and standards and any other specifications noted herein. Resolution and/ or interpretation shall be obtained from the CONTRACTOR in writing before proceeding with the design/ manufacture.

In case of conflict, the order of precedence shall be:

- Equipment Data sheets, if any
- This specification/ Inquiry document
- Above mentioned Standards and Codes
- VENDOR's Quality Plan

5. Deviation & Alternations

Deviations from this specification are only acceptable where the VENDOR has listed in his quotation the requirements he cannot, or does not wish to comply with, and which the CONTRACTOR/ EMPLOYER has accepted in writing before order is placed. In the absence of a list of deviations, it will be assumed that the VENDOR complies fully with this specification. Technical changes implemented prior to CONTRACTOR/ EMPLOYER approval are subject to rejection.

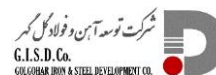
6. General Considerations

6.1 Unit of Measurement

International system of units (SI) shall be used as stated below or fraction of these units.



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شماره مناقصه: _____

Electric Current	A, mA, KA
Electric Power	W, KW
Electric Potential	V, KV
Electric Resistance	Ohm
Frequency	Hz
Inductance	H
Capacitance	F
Pressure	Bar, mBar, mmH ₂ O, mmHG
Temperature	°C
Weight	Kg, Ton

6.2 Power Supply

The input power to the UPS system will be 400 VAC, $\pm 5\%$, 3 Phase, 50 Hz $\pm 1\%$,

6.3 Environmental Data

The internal conditions for the rooms are temperature $+26 \pm 2^{\circ}\text{C}$ and relative humidity 45 to 50%. The shipping and storage conditions will be considered as -20°C to $+85^{\circ}\text{C}$ and humidity 0% to 100%. The UPS systems shall be able to continue the operation in case of HVAC failure condition. The maximum temperature in case of HVAC failure is $+50^{\circ}\text{C}$.

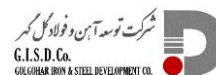
6.4 Hazardous Area Classification and Ingress Protection Degree (IP)

The UPS systems are installed in safe area. The UPS systems shall be protected against ingress of solids and water in accordance with IEC 60529. Protection degree for the UPS systems shall generally be IP 42 for indoor installation.

6.5 Tagging



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پیوست ۱۸-۱-۳

شماره مناقصه: _____

The VENDOR shall tag UPS systems in his supply with a stainless steel 316 corrosion resistance tag stamped with the specified tag number. The tag shall be permanently fastened but not glued, to the equipment, by the supplier, without any distortion on Instrument's IP.

Characters shall be 5 mm height minimum.

The tag numbering system & serial numbers which will be used by the VENDOR, shall be approved by CONTRACTOR/ EMPLOYER. Following information shall be on the tag name plates as a minimum:

- Manufacturer's name
- Model Number
- Serial Number
- UPS Tag No.
- Nominal input voltage, Current and Frequency
- Nominal output voltage, Current and Frequency
- Rated capacity of the unit
- IP Degree
- Date of Manufacture (Month, Year)

7. Technical Specification:

7.1 General requirements

In general, all material, components and accessories must be suitable for saliferous and dusty environment with high concentrations of wind-borne sand as commonly encountered in onshore installations in the Middle East. The possibility of condensation, as experienced during large temperature fluctuations in a humid atmosphere, shall be considered.

7.2 Operating Principle

- UPS unit shall consist of a rectifier/charger, an inverter, batteries, a static transfer switch, a maintenance bypass switch, a bypass transformer.

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صفحه ۴۹ از ۱۵۸	پیوست ۱۸-۱-۳	شماره مناقصه: _____

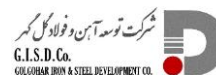
- During normal operation a source of alternating current will supply energy to the UPS unit. A rectifier converts incoming AC power to the DC which supplied the inverter and charges the battery. The inverter changes the DC to AC power, which supplied electrical energy to the critical loads through the static transfer switch.
- The output of the rectifier shall continuously supply the power requirements of the load, through the inverter, while simultaneously maintaining the battery in the float charge mode.
- In the event of an interruption or depression in the AC mains voltage, the battery shall supply the power requirements of the load via the inverter.
- Upon restoration of the AC mains voltage, the rectifier shall supply the power requirements of the load via the inverter, while simultaneously recharging the battery.
- The UPS unit shall be equipped with a static transfer switch and a bypass transformer. The output voltage and frequency of the inverter shall be kept synchronized with the bypass supply.
- In the event of rectifier/inverter failure or the load current becoming excessive, either transiently or continuously, the unit enters bypass mode where the load is temporarily supplied via the bypass line from primary or stand-by power.
- In case when the inverter voltage and frequency deviates from the specified tolerances, the static switch initiates uninterrupted transfer of the load to the bypass supply.
- Upon restoration of the inverter output voltage and frequency, the load shall be transferred back to the inverter which resumes synchronous operation with the bypass supply.
- A make before break switch shall also be provided, for manual transfer of the load to the bypass power supply, in order to isolate the rectifier, inverter and static transfer switch for maintenance purposes.

7.3 UPS System Configuration

- One UPS system is used for the plant as the following:
The UPS system shall be redundant (duplicate) unit type (for rectifier and inverter).
- The redundant (duplicate) unit UPS shall energize a single Power Distribution Panel (PDP). The PDP panel is supplied by others.



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- The duplicate unit configuration shall be rated for 100% of the rated capacity.

8. Electrical Characteristic

The UPS shall meet the following electrical requirements:

Input voltage:

230 VAC, $\pm 10\%$, 1 Phase, 50 Hz $+3\%$ -5% , without null

Output voltage:

Voltage: 230 VAC, $< 3\%$, 1 phase, 50 Hz $\pm 0.1\%$ (at customer terminals)

Power: 2KVA

Total harmonic distortion:

Less than 3%

Back-up time:

30 min., continuous load

Bypass transformer:

Type: Isolating, Stabilizer

230 VAC, $\pm 5\%$, 3 Phase, 50 Hz $\pm 1\%$, without null

Output: 230 VAC

Mounting: Free standing cabinet to be aligned with UPS

8.1 UPS Cabinet

- The UPS components shall be installed in suitable free standing floor mounted cabinets.
- The cabinets shall be constructed with multiple cable clamp facilities, completed with dust seal.
- The cabinets shall be bottom entries and shall be provided with adequate switch lighting and switch socket outlet facility.
- The cabinets shall be equipped with ventilation fans. The ventilation sizing circulation fan shall be based on maximum design temperature $+50\text{ }^{\circ}\text{C}$ for the



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case of HVAC failure condition.

Specification of the cabinets shall be as follows:

- Manufacturer:
- Dimensions: 800x2000 mm (DxH), width as required but not less than 800 mm
- Painted sheet steel according to RAL 7035
- Modular structure
- Internal door pocket for drawings
- IP 42 for indoor installation
- All doors shall be lockable by means of a common key.
- All wires shall be installed in cable duct
- Facilities on top for lifting with crane
- The cabinet design shall allow full and easy access to all components, connections and terminations. The cabinets shall be fully equipped/ wired (Frames and racks, terminal strips and rail, wire markers and ferrules, ...).
- Gland plates shall be provided within the enclosures for cable entrance.
- The components inside the cabinet shall be positioned in an optimum location for operation and servicing purposes.
- All wires shall be identified at each end according to equipment manufacturer's standard numbering system, using cable markers. Conductors shall be identified at each termination by the same tag as the terminal by wire sleeves made of oil resistance material. Conductor shall run from terminal to terminal without splices.
- Terminal strips shall be mounted and wired so that the internal and external wiring do not cross over the terminals.
- The wirings shall be run in suitable wire ways. The wires shall be of extra flexible, standard copper, PVC insulated, 75 °C type.
- Terminals shall be permanently marked with tags shown on corresponding drawings. Signal wiring shall be screened within the cabinets where necessary to avoid pick up of electrical noise.
- For input and output signal wiring, screens shall be electronically continuous and the screen shall be connected to the appropriate cabinet instrument earth bar, if



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required.

- Internal signal and power wiring shall meet BS 6231 and be flame retardant to BS 4066 Part 1 (IEC 60332 Part 1) or equivalent. Internal communication wiring shall meet BS 4808 Part 2, or equivalent, if used.

- i. Transformer and reactors used in the construction of the UPS shall be dry type air cooled and shall comply with IEC 60076, IEC 60289 and IEC 60146 standards.

The noise level measured at one meter from the UPS units shall not exceed 70 dBA at any load.

- ii. The radio frequency interference shall be minimized and shall not exceed the value defined in relevant IEC recommendations.
- iii. Separate molded case automatic circuit breakers shall be provided for the input AC supply to the rectifier, the bypass circuit supply and batteries. A molded case automatic circuit breaker shall also be provided on the output of the UPS system.
- iv. One LCD electronic display module shall be mounted on the cabinet's front door to indicate the following data:

- AC input voltage
- DC input circuit
- Battery charge and discharge currents
- Output voltage
- Output current
- Output frequency

Indicating lights shall be provided to show at least the following operating statue:

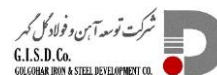
- AC input supply available
- Rectifier on
- Inverter on
- Load on inverter
- Load on bypass
- Inverter- bypass synchronized

Alarms shall be provided for failures which affect the overall integrity of the UPS system. At least the following local alarms with indicating lights shall be provided:

- AC input supply failure



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شماره مناقصه: _____

- Rectifier failure
- DC voltage low/ high
- DC earth fault
- Battery discharging
- Battery disconnected
- Inverter failure
- Inverter overload
- Inverter over temperature
- AC output voltage low/ high
- Output frequency low/ high
- Ventilation failure and/ or high temperature
- A graphic display shows operating modes of the UPS system (Inverter mode/ Bypass mode/ Manual (maintenance) mode) shall be provided on the UPS front door.

8.2 Rectifier/ Charger Construction

- The rectifier/ charger shall be a constant voltage self-regulating static type and shall include a sort start feature to gradually accept load when feeding discharge batteries.
- The rectifier shall be designed to continuously supply power to the inverter system and simultaneously supply DC power shall not be used to energize any load other than the inverter.
- The rectifier shall include provisions to automatically initiate high rate charging, here called equalize charging of batteries, upon restoration of AC power after an outage. The charging of batteries shall automatically reset to float charge, when the battery voltage reaches the nominal voltage.
- Means shall be provided to perform equalize charging of batteries manually. In such case, when the battery voltage reaches the nominal voltage, the charging mode shall reset automatically to float charge.
- The rectifier charging performance shall be in accordance with the requirements of the selected batteries, as specified by the battery supplier.
- The rectifier shall be sized to recharge the discharged batteries within 8 hours



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for Nickel- cadmium batteries, while supplying the full load of the inverter. The sizing of the rectifier shall be based on standard duty class 1 of IEC 60146.

8.3 Battery

- The battery shall be sealed-acid type.
-
- The UPS systems shall be equipped with suitable numbers of battery cells based on relevant output voltage and current of the UPS.
- The battery cells shall be sized to supply the load for a period of 30 min. with charger in off condition.
- All the necessary accessories for batteries including jointing cables between cells and a set of standard maintenance and testing tools shall be provided.
-
- The batteries shall be installed in a separate cabinet. For small UPS units the batteries together with other components can be installed in one enclosure.
- Suitable sized two poles load break switch or circuit breaker shall be provided to connect the battery to the rectifier/ inverter.
- The battery cabinet shall be naturally ventilated in order to prevent the accumulation of flammable gases, if any. Where batteries are installed in the same enclosure as the other components, forced air ventilation shall be provided.

8.4 Inverter Construction

- The inverter shall control the output voltage and frequency to maintain synchronism with the bypass power supply up to the steady state limits.
- The inverter steady state output voltage regulation shall be $\pm 1\%$ when operating independently and shall not exceed $\pm 5\%$ when synchronized with bypass supply. In the event of instantaneous load changes of 100% rated output, the voltage variation shall not exceed

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- $\pm 10\%$ and shall be restored to within the steady state limits in 0.1 second.
- For variation beyond state limits, the inverter shall revert to unsynchronized operation with internal control for voltage and frequency. The inverter shall automatically resume synchronous operation with the bypass supply when the voltage and the frequency of the bypass power supply returns within the specified tolerances.
- The inverter shall be equipped with automatic current limiting feature which prevents the output from exceeding the maximum safe rating of the inverter.
- The wave form of the output voltage shall be sinusoidal with total harmonic distortion not exceeding 5% for linear or non-linear loads.
- Means shall be provided to adjust the nominal output voltage of the inverter manually between 90% to 110% of the nominal output voltage.
- The inverter shall be capable of delivering sufficient short circuit current during the time required for the static transfer switch to transfer the short-circuited load to the bypass circuit. If the short circuit is not cleared by the downstream protective devices, the circuit breaker or switch fuse feeding the bypass circuit shall clear the fault.
- The inverter shall be capable to accept loads with crest factor of 3 to 1 without de-rating of the output. Crest factor is the ratio of the peak value of the current or voltage waveform to their RMS value.

9. Documentation

- Documentation of the UPS systems shall be provided in accordance with but not limited to the general requirements mentioned in this section.
- Vendor drawings shall be prepared by computer aided drafting (ACAD) system. Minimum four hard copies on papers and two soft copies on compact diskettes of all system drawings which shall be handed over to the CONTRACTOR/ EMPLOYER.
- All documents and drawings shall be in English language.
- The data sheet mentioned in “Annexes” section, shall be completed and submitted with the bid proposal by VENDOR.
- Following documents and drawings shall be prepared and submitted by VENDOR:

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- Recommended spare parts lists with their pertinent manufacturer's stock number for commissioning period and two years of operation
- General arrangement drawings
- Single line diagrams
- Main and control circuit schematic diagrams
- Test reports and performance curves
- Cable and conduit entrance locations
- Electrical and signal wiring diagram
- Layout drawing for the cabinets indicating the location of all inside equipment
- Dimensional drawing for cabinets
- Bill of Material
- Manufacturer standard catalogues and drawings for quoted instrument including system manual, instruction, operating and maintenance manuals.
- Procedure for periodic tests by maintenance personnel
- Installation procedure
- Maintenance and troubleshooting procedure
- List and descriptions of all system error messages
- Termination schedule Electrical and Control Circuit diagram
- The conclusion document of the FAT signed by VENDOR, CONTRACTOR and EMPLOYER.
- Preventive maintenance and calibration routine schedules
- All other certificates including material certificate, ingress protection certificate, area classification certificate, ISO certificate and etc of the UPS system



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10. UPS quotation summary sheet

Following table shall be filled by vendor:

1	Name of project or plant	Golgohar Steel Project
2	Quantity	1 set
3	Tags	AC-UPS-Transfer line
4	Installation Location	Pump station
5	Maximum room temperature	50 C
6	Minimum room temperature	0 C
7	Required numbers of units (redundant (duplicate) or single unit)	Redundant (duplicate)
8	Rated capacity of each unit (kVA)	2 kVA
9	Nominal input voltage, number of phases and voltage variation	230 VAC $\pm 5\%$, 1 Phase,
10	Nominal input frequency and frequency variation	50 Hz $\pm 1\%$
11	Nominal DC voltage for the UPS	
12	DC voltage residual ripple	
13	DC voltage variation	
14	UPS output voltage and voltage variation	
15	UPS output numbers of phases	
16	UPS output frequency and frequency variation	
17	UPS output earthing system	
18	Output harmonic content	
19	Type of bypass isolating transformer	
20	Bypass transformer KVA rating	
21	UPS enclosure IP	
22	Mounting method, floor or wall mounted	
23	Cable entry from top or bottom	
24	Type of batteries	sealed -acid type
25	Battery standby time	30 min.
26	Battery internal resistance	
27	Capacity of UPS battery bank (Amp-Hr) at ... OC	
28	No. of cells in each UPS unit	
29	Battery housed in cabinet or rack	
30	Battery internal resistance	
31	Type of battery racks (Wooden or steel)	
32	Rectifier ampere rating (A)	
33	Inverter rating (KVA)	
34	Inverter overload capacity for one minute (KVA)	
35	Accessories	VENDOR attach list
36	Deviation from this specification if any	VENDOR attach list



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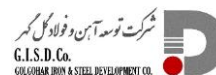
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Technical Specification For Earthing and Lightning

00	ISSUED FOR APPROVAL	M.KHAVARI	F.NIKNAM	A.MONFARED	1405/02/08
Rev.	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED	APP DATE



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TABULATION REVISED PAGES

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01	X				51				
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03	X				53				
04	X				54				
05	X				55				
06	X				56				
07	X				57				
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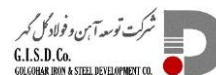
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1. GENERAL

1.1 SCOPE

This specification provides minimum requirements for the design of primary earthing and lightning system, and all accessories required for proper operation and describes the material that is proposed to use for the connection and installation of all cables to devices for earthing in soil for Golgozar Co.

DOCUMENT PRIORITY

In the event of any conflict between this specification, the requisition, codes and standards, the priority shall be given in the following order.

- Purchase order
- This specification
- Codes and standards

1.2 CONDITION OF OPERATION

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, and 365 days/year operation.

Site Conditions

1.3 Plant Location

The Site is located at Gol-E-Gohar Iron Ore Complex, situated in Sirjan, Province of Kerman in southern part of Islamic Republic of IRAN, approximately 285 km southwest of Kerman city and 335 km north of Bandar Abbas port, in a semi-desertic high plateau terrain, 1750 m above sea level, and flanked by mountains over 2500 m high trending northwest to southwest.

1.4 Meteorological

Ambient Temperature

Max. Temperature:	+40 deg. C (Recorded) +50 deg. C (Design)
Min. temperature:	-12 deg. C (Recorded) -10 deg. C (Design)
Average temperature:	+15.9 deg. C (Design)
Wet bulb design temperature (summer):	+25 deg C
Relative Humidity:	Max. 70%

Wind Velocity

According to National Iranian Code (6th revision):

Basic speed data:	130 Km/h
Basic pressure data:	0.845 KN/m ²
Correction factor:	
0 - 10 m:	2
10 - 20 m:	2.2
20 - 100 m:	2.4



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Rainfall

Yearly 120 mm (average)

Monthly rainfall 260mm (Max)

Barometric Pressure

820 milliards

Geological Conditions

This data belongs to the existing palletizing plant location. For the engineering the contractor shall be study geotechnical conditions for the essential location according to the project plan.

Altitude: About 1,750 m above mean sea level

Soil bearing: approx. 20t/m²

Ground water level: approx. 60 m below ground level

Earthquake Load

Equipment in plant will be dimensioned including a safety calculation against earthquake according to the "Iranian Code for Seismic Resistant Design of Buildings

- Publication No. S253-2nd edition, autumn 1999" ("Iranian Regulations 2800") and "Minimum Design Loads for Building and Structures" (Iranian Regulations 519).

- Design base acceleration: 0.3-g

- Classification of Buildings: Group 2

- Soil classification: soil type III-b

2. STANDARDS AND CODES

The equipment covered by this Specification, including all components and auxiliaries, shall be designed, manufactured and tested in accordance with the latest IEC Standards wherever they may apply, and in particular:

- IEC 60621-1 to 4- Electrical installation for outdoor sites under heavy conditions

- IEC 62305 Protection against lightning

- IEC 61557-5 - Resistance of earth

- IEEE 142-2007 – Recommended Practice for Grounding of Industrial and Commercial Power Systems

- IEEE80-2013

- NFPA 780

- BS 7430: 2011+A1: 2015 Code of practice for protective earthing of electrical installations.

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- UL 467 Grounding and Bonding Equipment
- IEC 60364-5-54:2011 Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements and protective conductors
- IEC 62561 Lightning protection system components
- IEC 60228 Conductors of insulated cables
- IEEE 837 Qualifying Permanent Connections Used in Substation Grounding
- BS EN 13601 Copper and copper alloys. Copper rod, bar and wire for general electrical purposes
- BS EN 13602 Copper and copper alloys. Drawn, round copper wire for the manufacture of electrical conductors
- BS EN 1982 Copper and copper alloys. Ingots and castings
- All Codes and Standards referred to here and elsewhere herein, shall mean the latest edition of said Code or Standard, including all amendments, annexes, etc.
- Any deviations or conflicts shall require prior approval from purchaser.

3. Document priority

Conflicting Requirements:

In the event of conflict, actual or implied, among documents relating to an enquiry or order, following order of precedence shall govern, unless agreed in writing by CLIENT.

a) This technical specification and Data Sheet.

b) Codes and standards referred to in the above documents, generally, the most stringent requirement.

The Vendor shall notify the CLIENT of any apparent conflict between this specification, the Codes and Standards and any other specification noted herein. Resolution and/or interpretation of precedence shall be obtained from the CLIENT in writing before proceeding with the design / manufacture.

All correspondence, Drawings and submittals shall be in English.

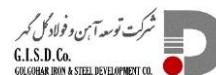
In case of conflict between documents, the priority shall be the stringent condition mentioned in the following documents:

This Specification,

Drawings and other documents,



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I.E.C. standards,

Other standard and codes when I.E.C. publications have not yet been issued.

4. Site Conditions

Plant Location:

The detail information about project area classification has mentioned in the meteorology document. Any deviation from the below ambient climatic conditions shall be clearly mentioned in the vendor/contractor proposal.

Plant location The Site is located in West Azerbaijan province of Iran, 25 Km far from Urmia city. The elevation of the Project area is approximately 1500 M above sea level.

Meteorological Condition:

Temperature

Max. ambient air temperature

Recorded 40°C

Design 40°C

Min. ambient air temperature

Recorded -16°C

Design -16°C

Rainfall

Annual rainfall Max. 580 mm

Ave. monthly rainfall 136 mm

Other

Max relative humidity (%) 63%

Geological Conditions:

Buildings, equipment foundations & structures shall be designed to resist earthquake forces in accordance with "Iranian Code of Practice for Seismic Resistant Design of Buildings (Standard No.2800)" latest edition & based on soil investigation report.

Design base acceleration

A=0.25g

5. Voltage Levels

o Low voltage

400 V, 3 phase



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- o Voltage tolerances $\pm 5\%$
- o Motors space heaters ($\geq 200\text{kW}$) AC 690 or 400 V, 3 phase
- o Motors space heaters ($< 200\text{kW}$) AC 230 V, 1 phase
- o Small consumers 230 VAC
- o Heaters, Lighting, socket system, repair boxes 400 / 230 V AC
- o Protection relay supply, Control system, Spring Loading, Motor (Supply Signaling, Circuit Breaker, MV Cubicle, Incoming and Bus tie of MCC, PC 110 VDC
- o Outgoing Feeders of PCC 230 VAC

6. EARTHING TECHNICAL SPECIFICATION

a. Earthing Design Summary

The earthing network is composed of primary and secondary earthing system. Primary system will be composed of different type of earth electrodes such as horizontal buried bare copper earth conductor forming earth grid or earth mesh and some driven earth rod. Heavy metal structure, Tank, building steel structure.... will be connected to primary earthing.

Structural concrete building, shall be equipped with earthing system.

The general earthing resistance will be less than 2 ohms at any point in the plants.

Step and touch voltage and ground potential rise (G.P.R) concept also shall be considered according to IEEE80-2013. In such area earth grid may be changed to earth mesh. Transformer neutral shall be connected to primary earthing by earth rod conductor effectively. Secondary system will be composed of at least two riser branches from primary system up to ground level (in proper location and related to number of equipment) and earthing bus bar and finally copper wire connected to equipment.

The earthing system shall be so designed that sections can be isolated and earthing measurements taken for such sections after the completion of installation.

b. Earthing characteristics.

Primary earthing:

Earthing mesh:

The earthing conductor for the plants earthing network will be sized to carry maximum line to ground (L-G) fault currents for a time of 1 second and will be stranded copper annealed conductors with a

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minimum of 7 strands. The primary earthing conductor size will be 95 mm² minimum. Depth of buried conductors is among 50~100 cm below ground level.

Earthing rod:

The earthing rods shall be copper sleeved steel with a minimum of 16 mm diameter and 3-meter length. The primary earthing rods spacing will be 3 meters minimum.

Secondary earthing:

Where earthing conductor would be exposed the green/yellow PVC insulated earthing conductors suitable for a power frequency voltage to earth of 250 v (or conductor inside the plastic conduits shall be used).

All equipment frames and metal parts of indoor/outdoor apparatuses including main pipes, vessels crane tracks, Cable supports, etc. shall be earthed. It is sufficient to connect collective pipelines, main supporting system and tracks at interval of 20 meters.

The cross-section of earthing conductor shall be such as to safely carry the appropriate fault current for the necessary length of time.

Sensitive equipment using integrated circuits shall have their own earth system composed of insulated earthing rods connected to an independent ground mesh.

Equipment and structures shall be connected not less than 300mm above finished grade using bolted connectors. Connections to major outdoor equipment shall be looped to the main grid. Each structure column shall be grounded where required by placing earthing conductor on inside surface of structure legs on girder chord angles and supported neatly by bolt type connectors.

Metallic conduits shall be bonded at all mechanical joints and connected at intervals to main earth grid.

The marshaling plates will be connected to the main grid by two stranded copper wire with green/yellow PVC insulation, cross section 95 mm².

Insulated earthing conductor shall be used for connecting power transformer neutral point to the ground grid.

All secondary earthing system that will not run in the pipe or cable tray, must be shielded wire.

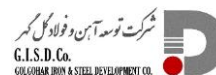
The grounding connection between equipment metallic parts and the buried conductor described at point 3 will be made as follows:

Marshaling plates

2 x 1 x 70 mm² Y/G copper / PVC



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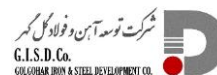
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LV motors 23 kW to 55kW	1 x 35 mm ² Y/G copper / PVC
LV motors over 55 kW	2 x 1 x 70 mm ² Y/G copper / PVC
LV control station	1x 16 mm ² Y/G copper / PVC
Tanks	1x70mm ² or 2x1x 35 mm ² stranded bare copper conductor
Steel structures	1 x 70 mm ² stranded bare copper conductor
Pipe rack	1 x70 mm ² stranded bare copper conductor
Process pipe	1x 16 mm ² Y/G Copper / PVC
Ladder & stairways	1 x 35 mm ² Y/G copper / PVC
Lighting, outlet	phase cross section according table A
Conveyor	1 x ۷۰ mm ² stranded bare copper conductor
- Metal fence	bare copper 16 mm ² wire
- Pipe (at extremity and every 20M)	bare copper 16 mm ² wire
- Metallic frame, doors, louvers, stairs	bare copper 16 mm ² wire
- Ladder, minor and secondary steel	
- Structures, metallic conduit	bare copper 16 mm ² wire
- Each cable ladder route must be earthed by a minimum of 35 mm ² earth cable and at a maximum of 15 m intervals.	
- Secondary earthing system will be connected to equipment, for the transformer and MV panel and power center, earth conductor shall be 120mm ² from two points.	

Phase Conductor Section S (mm ²)	Minimum Section of Earth Conductor Sp (mm ²)
$S \leq 16$	$Sp = S$
$16 < S < 35$	16
$S \geq 35$	$Sp = S/2$



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c. Earthing System Installation

- The steel structure of the plants will be made of steel columns which will be used also against atmospheric discharges by joining all elements via electrically welded connections.
- A number of lightning rods may be installed on concrete structure.
- Earthing ring around the building should be considered.
- Grounding conductor shall be connected to equipment by bolted connectors. Connector shall be copper or tinned copper were fitted to aluminum. Minimum contact area of the conductor to the connector shall be 10 cm².
- Earth conductors in the switchgear and relay room and plant area shall be run in cable tray where possible. Earth conductor shall be laid and clamped in the top power cable tray of each major cable tray run and other trays in the tier shall be bonded to this cable tray at every third section of cable tray, subsidiary tray runs shall be bonded between sections

d. Earthing Material

Copper Strip	Length X Width X Thickness (mm)
 This Copper Strip has to be holed according to requirements	(...) x 30 x 3

Stranded Copper Conductor, PVC Insulation (yellow/green), NYAF	Cross Section (mm ²)
	16
	25



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	50
	95
	120
	150
	240
	300

Earth Bar	Length X Width X Thickness (mm)
Earth Bar Type "B"	300 X 50 X 6
Earthing Rod	Length X Diameter (mm)
Earthing Rod	1500 X 16

7. LIGHTNING TECHNICAL SPECIFICATION

a. Lightning design summary

Lightning protection system shall be connected to general earthing system as directly as possible and with the shortest possible lines.

Insulated cable or copper earth has supported on insulators shall be used for connecting lightning arresters to lightning arrester counters. It is not allowed to use the supporting metal structures or the machine enclosure conductors, but a 95 square millimeter shall be used as a minimum cross-section copper conductor and connected to the earthing system.

-It is necessary, that earth conductor, connect to triple rods are then connected to earth network.

The connection shall be placed in an easily accessible point and insulated from the ground. In some locations, test joint shall be used.

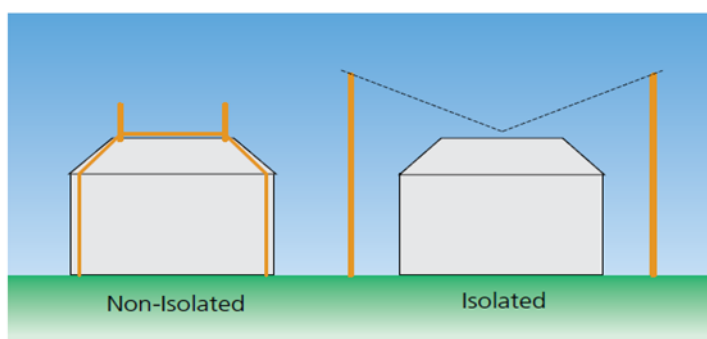
Besides following the shortest possible route, the earthing conductor must not be placed inside steel or other magnetic material pipe, but must be suitably protected at least up to 3 meters from ground level.

Lightning protection systems typically follow two approaches:

- Non-isolated system – where potentially damaging voltage differentials are limited by bonding the lightning protection system to the structure

• Isolated system – where the lightning protection system is isolated from the structure by a specified separation distance. This distance should be sufficient that energy is contained on the lightning protection system and does not spark to the structure.

Isolated systems are well suited to structures with combustible materials such as thatched roofs, or telecommunication sites that want to avoid lightning currents being conducted on masts and antenna bodies.



Permitted air-terminations are:

- Rods (including masts and free-standing masts)
- Meshed conductors (on building surface or elevated)
- Catenary wires
- Natural components

The standard considers the three methods to be equivalent, while Rod air terminations of height in the region of 0.5 m are preferable to shorter rods or conductors on the building surface. The rolling sphere method, mesh method and protection angle method are used to determine the required positioning of the lightning protection air-terminations. Meshed conductors used as air-terminations should not be confused with the mesh method. Any of these methods can be used to determine placement of the air-terminations.

	Non isolated	Isolated
Air-terminations		
Meshed conductors		Only practical for specific circumstances
Catenary wires		

b. Buildings Constructed of Non-Conductor Materials

These structures, if not surrounded by other higher nearby buildings, must be equipped with a lightning protection system on their highest points.

To protect high non-metallic buildings/ structures from lightning, Franklin lightning rods shall be used, but for ordinary non- metallic building/ structures Faraday cage method.

Connections to the earthing system shall be made by means of copper conductors with area cross section according to BS6651.

The aerial terminals shall be at least equivalent in weight and thickness to a 6 mm copper with walls 0.8 mm thick.

The lightning top point must be more than 25 cm above the top of the structure to be protected, but the rod length must not exceed 1.5 meters.

At least two earth conductors shall be placed, usually at the building corners, symmetrically with respect to the building itself, they must have a low impedance and must be installed without narrow curves or acute angles.

Connections to the earthing system shall be made as prescribed for dischargers.



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When a building has metal structure, this can be used as an earthing down conductor, (only for lightning protection purpose).

c. Building with Metal Structures and Walls

It is unnecessary to install protection against lightning since these buildings are sufficiently self-protected.

d. Stack Lightning Protection and Grounding

The stack lightning protection shall be in accordance with the recommendations of the latest edition of NFPA-780 "Lightning protection codes".

A smoke or vent Stack shall be classified as heavy duty if the cross-sectional area of the flue is greater than 500 in² (0.3 m²) and the height is greater than 75 ft. (23m).

Heavy-duty metal stacks having a metal thickness of 4.8 mm or greater shall not require air terminals or down conductors. They shall be grounded by means of at least two ground terminals located on opposite sides of the stack. If the stack is an adjunct of a building or located within the side flash distance, It shall be interconnected to the lightning protection on the building, If the stack is located within the perimeter of a protected building, two connections shall be made between the stack conductors and the nearest main building lightning conductors at or about the roof level.

Conductors for the lightning protection system and the down leads for the stack grounding shall be stranded, hard drawn copper.

Stack ground rods shall be at least 3 meters long, 16 mm diameter steel copper clad rods. All ground rods shall be bonded together and the cable bonding all ground rods shall be installed around the perimeter of the stack base and shall be buried to a nominal depth of 1/2 to 3/4 meter below grade.

e. Lightning system calculation

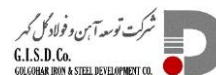
A risk assessment is generally undertaken to determine the level of risk for a specific structure, in order to make a comparison with a pre-determined value of "acceptable risk". Protection measures, at an appropriate lightning protection level (LPL), are then implemented to reduce the risk to or below the acceptable risk. The lightning protection level determines the spacing of the mesh, radius of rolling sphere, protective angle, etc.

The main outcome from this risk assessment is to determine if lightning protection is required and if so, to select the appropriate lightning class. The lightning class determines the minimum lightning protection level (LPL) that is used within the lightning protection design.

According IEC Standard, the rolling sphere method, mesh method and protection angle method are used to determine the required positioning of the lightning protection air-terminations. While the mesh method



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requires the use of surface mounted meshed conductors (a grid) to protect flat surfaces, the rolling sphere and protection angle method can also be used to determine protection provided by elevated meshed conductors to protect a variety of compound surfaces. The rolling sphere method generally provides the most optimized design and the vertical air-terminal is far more effective at capturing lightning flashes than mesh conductors installed upon, or just above structure surface. While there are limits on the application of the protection angle and mesh methods, generally the standard considers the three methods as equivalent. The rolling sphere method is recommended as the most universal method, while the mesh method is more suitable for the protection of flat surfaces. The protection angle method can only be used with limited vertical distances. Different design methods can be applied to different regions of a single lightning protection system, provided the zones afforded by each method overlap to protect the entire structure.

The number of dangerous events per year is primarily based upon the structure dimensions, length and type of service and the ground flash density. The physical dimensions of the structure and service are used to calculate the effective lightning capture area, and the ground flash density is used to determine the probable number of events per year. The probability of damage is obtained from the given tables in the standard, with some simple calculations being required.

It is important to understand the sources of damage, types of damage and types of losses as the procedure to assess the risk evaluates various combinations considering structure, contents, services and environment with the source and type of damage.

The risk analysis follows the general process of:

Identifying the structure to be protected and its environment.

Evaluating each loss type and associated risk (R1 to R3)

Comparing R1 to R3 to the appropriate tolerable risk RT to determine if protection is needed

Evaluating protection options so $R1 \text{ to } R3 \leq RT$

Lightning protection is required such that R1, R2 & R3 are all equal or lower than the respective tolerable risk (RT).

The risk of each loss is then compared to a tolerable risk:

If the calculated risk is equal or less than the respective tolerable risk (RT), then lightning protection is not required

If the calculated risk is higher than the tolerable risk then protection is required. Protective measures should be evaluated to reduce the calculated risk to be equal or less than the tolerable risk.

Critical values of required efficiency E, of the LPS, as a function of the direct lightning frequency Nd to the structure. And accepted lightning frequency of flashes Nc are show in figures.



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It is necessary to calculate the level of lightning protection systems in accordance with IEC 61024-1-1 standard formula should be used.

$$Ec=1-Nc/Nd$$

Only if $Nd \leq Nc$, Protection is not needed.

Lightning protection zones (LPZ) are used to define the electromagnetic environment. The zones may not necessarily be physical boundaries (e.g., structure walls). The zones are areas characterized according to threat of direct or indirect lightning flashes and full or partial electromagnetic field. LPZ 0 (Zero) is considered the "lowest" zone, LPZ 1, 2, 3, being respectively "higher".

Lightning Protection zone (LPZ)	Exposure threats		
	Lightning flash	Lightning current or induced current	Electromagnetic field
LPZ 0A	YES	Full	Full
LPZ 0B	NO	Partial	Full
LPZ 1	NO	Limited	Partial
LPZ 2	NO	Reduced Below LPZ 1	Reduced Below LPZ 1

8. TEST & INSPECTION

All equipment shall be subject to inspection and witness testing by client or his representatives in accordance with the relevant standards. Minimum requirements, for all facilities (before backfilling) shall comprise:

- Measurements of earthing resistance of each earth rod.
- Check continuity of equipotential loop, protection conductors and generally all earthing & bonding conductors.

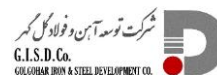
After backfilling:

- Measurement of earthing resistance of the grid

Should any conductor need to be embedded in concrete, contractor shall notify employers representative in writing as soon as installation is completed and at least 24 hours before embedding in concrete so employer s representative may inspect quality of work.



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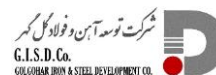
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Technical Specification For Lighting System and Socket

00	ISSUED FOR APPROVAL	M.KHAVARI	F.NIKNAM	A.MONFARED	1405/02/08
Rev.	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED	APP DATE



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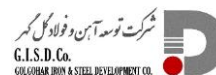
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TABULATION REVISED PAGES

SHEET	Rev.00	Rev.01	Rev.02	Rev.03	SHEET	Rev.00	Rev.01	Rev.02	Rev.03
01	X				51				
02	X				52				
03	X				53				
04	X				54				
05	X				55				
06	X				56				
07	X				57				
08	X				58				
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1. GENERAL

1.1 SCOPE

This specification covers minimum design requirement characteristics which suppliers should observe for the luminaries and lighting fixtures and small power outlets.

1.2 DOCUMENT PRIORITY

In case of conflict between documents, the order of precedence shall be:

- This Specification,
- Drawings and other technical documents.
- I.E.C. standards.
- Other standard and codes when I.E.C. publications have not yet been issued.

1.3 CONDITION OF OPERATION

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, and 365 days/year operation.

Site Conditions

1.4 Plant Location

The Site is located at Gol-E-Gohar Iron Ore Complex, situated in Sirjan, Province of Kerman in southern part of Islamic Republic of IRAN, approximately 285 km southwest of Kerman city and 335 km north of Bandar Abbas port, in a semi-desertic high plateau terrain, 1750 m above sea level, and flanked by mountains over 2500 m high trending northwest to southwest.

1.5 Meteorological

Ambient Temperature:

Max. Temperature:	+40 deg. C (Recorded) +50 deg. C (Design)
Min. temperature:	-12 deg. C (Recorded) -10 deg. C (Design)
Average temperature:	+15.9 deg. C (Design)
Wet bulb design temperature (summer):	+25 deg C
Relative Humidity:	Max. 70%

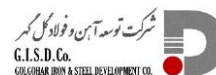
1.6 Wind Velocity

According to National Iranian Code (6th revision):

Basic speed data:	130 Km/h
Basic pressure data:	0.845 KN/m ²
Correction factor:	
0 - 10 m:	2
10 - 20 m:	2.2
20 - 100 m:	2.4



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Rainfall

Yearly 120 mm (average)
Monthly rainfall 260mm (Max)

Barometric Pressure

820 milliards

Geological Conditions

This data is belongs to the existing palletizing plant location. For the engineering the contractor shall be study geotechnical conditions for the essential location according to the project plan.

Altitude: About 1,750 m above mean sea level

Soil bearing: approx. 20t/m²

Ground water level: approx. 60 m below ground level

Earthquake Load

Equipment in plant will be dimensioned including a safety calculation against earthquake according to the "Iranian Code for Seismic Resistant Design of Buildings

– Publication No. S253-2nd edition, autumn 1999" ("Iranian Regulations 2800") and "Minimum Design Loads for Building and Structures" (Iranian Regulations 519).

- Design base acceleration: 0.3.g

- Classification of Buildings: Group 2

- Soil classification: soil type III-b

1.7 Conditions of Operation

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, 365 days/year operation.

2. STANDARDS AND CODES

The design of the electrical system for buildings and the electrical components shall comply with the latest edition of the following standards and codes:

IEC 60309	Receptacles for industrial purpose
IEC 60529	Classification of degree of protection provided by enclosures
IEC 60598	Luminaires
IEC 60884	Plugs and socket-outlets for household and similar purposes
IEC 60906	IEC system of plugs and socket-outlets for household and similar purposes



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IEC 60906-1

Plugs and socket-outlets 16 A 250 V AC

In the case of conflicts, interference or discrepancies between the listed codes, standards and specifications the company will decide on the procedure to be utilized.

3. LIGHTING CALCULATION CRITERIA

The problem of the Architect / Lighting Designer at the functional level is to determine how many lights and where to place them to get the correct level of illumination for a given activity.

The lux (symbol: lx) is the SI unit of illuminance and luminous emittance, measuring luminous flux per unit area. It is used in photometry as a measure of the intensity, as perceived by the human eye, of light that hits or passes through a surface. It is analogous to the radiometric unit watts per square metre, but with the power at each wavelength weighted according to the luminosity function, a standardized model of human visual brightness perception.

One lux is equal to one lumen per square meter. In other words:

- LUX = Level of Illumination. OR LUX (lx) = Lumens / Sq.M.
- Lux level = total light output (lumens) / area (square meters)
- Total Light Output = lumens per fixture * number of fixtures
- Number of Fixtures = (Lux level * area) / lumens per fixtures

Every Lamp has certain Lumens. It will be mentioned in the manufacturer data for light fitting to get the lumens per fixture.

3.1 UTILIZATION FACTOR: (UF)

This may be due different reasons viz., Room Reflectance's, Dimensions etc. the utilization factor (UF) is a Direct ratio. This is the proportion of the downward luminous flux that reaches the work area directly without reflection. It depends on the shape of the room. The Direct ratio has a low value with a tall narrow room (small RI) and a high value for a wide room (large RI).

The light distribution from the luminaries. Luminaries that emit light through a larger solid angle will generally have a smaller direct ratio than luminaries that emit light in a narrower beam. There exist data sheets of UF for rooms of different shapes and luminaries of a common type. Catalogues of luminaries often provide data sheets of UF for rooms. Normally we take 0.8 as the Utilization Factor.

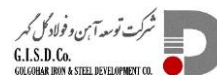
3.2 MAINTENANCE FACTOR (MF)

It is also known as LLF OR Light Loss Factor. This may be due different reasons viz., Time, Temperature, Cleanliness etc., the maintenance factor gives an estimate of how lighting conditions will deteriorate through use. Some factors are:

- Dust and dirt inside luminaries surfaces.
- Aging of light bulbs emitting less light.



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- Cleaning of room surfaces, e.g. ceiling. Normally the Maintenance Factor will be taken as below table

Location	MF
Industrial areas:	0.6
Non-industrial areas (outdoor):	0.7
Non-industrial areas (indoor):	0.8

3.3 ELECTRICAL FORMULAS:

Demand for Power (kW) = System Input Wattage (W) ÷ 1,000

Energy Consumption (kWh) = System Input Wattage (kW) x Hours of Operation/Year

Hours of Operation / Year = Operating Hours / Day x Operating Days / Week x Operating Weeks / Year

Lighting System Efficacy (Lumens per Watt or LPW) = System Lumen Output ÷ Input Wattage Unit

Power Density (W/ Sq.M.) = Total System Input

3.4 REQUIRED ILLUMINATION LEVELS

The required illumination levels, measured at the working plane or 1 m above the floor level in a horizontal plane, are shown in the table below. These values shall be used as a basis for the design of new installations.

Electrical rooms, transformer rooms	250lux
Battery rooms, diesel generator rooms (if any)	200lux
Control rooms, pulpits, computer rooms	400-500lux
Tunnels, basements, cellars	50-100lux

Control of the illumination level should be possible by switching-off rows/groups of luminaries.

5. EMERGENCY & SAFETY LIGHTINGS



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شماره مناقصه: _____

An emergency lighting system shall be provided and shall be by external emergency supply during power failure, for min 30 % of total lighting in building and area except for control room substation and laboratory to be min.50 %. In addition, safety lighting fixtures shall be provided for critical escape points to assure safe personnel exit from substation, control room and strategic points of process area. Safety Lights shall be LED type with built-in battery. Charger / inverter and automatic switching system.

Emergency lighting and Safety lighting shall be installed in the substation & control room, other building and other places according to process & Operation requirement.

The location and arrangement of the emergency fixtures shall be suitable to prevent the dangerous of a power failure.

Emergency lighting level shall reach at least 30% of the normal illumination level and other places according to process & Operation requirement. For emergency socket shall be considered for process & Operation requirement.

20% of emergency lighting fixtures will be provided as safety lighting with battery backup. These lighting fixtures will be equipped with internal emergency source (built-in battery), suitable to maintain the lighting for at least 30 minutes.

6. LIGHTING FIXTURES

For Outdoor lighting system, Water proof industrial type LED lighting fixture shall be designed. The outdoor lighting will be designed with astronomical type.

The plant lighting shall be designed in such a way that in daytime the lighting outdoors should be switched on by means of a switch overriding the appropriate photoelectric relay contact. Moreover, the lighting distribution board shall be provided with an override switch for maintenance purposes.

For electrical rooms which the lights are operated continuously, switching is done using the panel board circuit breakers or wall mounted push button may also be used.

General requirements of overall lighting fixtures are as follows:

Wiring shall be designed for maximum voltage drop of 2 percent.

LED fittings for indoor application shall have through wiring and completely equipped and wired. Connection to gear tray shall be by plug-in connector.

Wiring inside light fittings shall have a minimum cross section of 0.75mm². A cross section of at least 1.5mm² shall be used for through wiring.

The term "luminaries" shall mean a lighting fixture complete with lamp, related control gears (capacitor, igniters, chocks, etc.) and other accessories.

Capacitors of 0.5 micro farads and above shall be provided with a means of prompt discharge on disconnection of the supply.

Induction and high reactance transformers are to be installed as close as practicable to the associated discharge lamp.



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The electrical insulation grade of all light and ordinary power materials shall be min. 500V, DC, 1min. after the application of the voltage.

All LED tubes shall be 47W, 1150mm in length, 38mm in diameter or 24W, 600mm in length and have bi-pin lamp contacts, unless otherwise stated. LED tubes shall be of day light type.

The degree of protection of enclosure for indoor application shall be min. IP20 and for weatherproof version shall be min. IP54, if not otherwise specified.

Luminaries shall be fitted with an earthing screw.

All metallic parts of luminaries shall be electrically connected together.

Luminaries shall have cable entries compatible with their specified class of enclosure.

Enclosures shall be of metal or flame retardant insulating materials.

The materials chosen for the luminaries shall be able to withstand without damage or aging or alteration in their structural or physical properties for the severe local climatic condition.

Minimum types of enclosure against foreign bodies and water shall be in accordance with IEC 60529 "Degree of protection provided by enclosure (IP code) 2nd Edition".

Lighting and ordinary power materials shall be designed and constructed for either recess, flush or surface mountings as required.

Cable glands shall be provided for all cable entries of luminaries. For enclosures with degree of protection up to IP23, glands shall be of thermoplastic type for indoors only. Non magnetic, compression type cable glands shall be provided, from corrosion-proof metal material, complete with PVC shroud (for outdoor type).

All cable entries shall be threaded and plugged. Threads shall be in accordance with ISO metric.

All equipment with conductive (metal) body shall be provided with internal earthing terminal.

In steel structure buildings such as workshop, the lighting fixtures shall be with 140W, or 200W, 230V LED lamps, complete with ballast, aluminum reflector and grounding terminal. Degree of protection shall be IP54.

All lighting fixtures and their conduits shall be suitable for the area classification in which they are to be installed.

The Variety of luminaries shall be kept to a minimum.

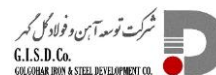
LED lighting fixtures with 24/47W LED lamps may be used in houses toilets and similar places in different buildings.

A suitable lighting fixture shall be provided above the entrance door of each building. The switch for this lamp shall be installed by the side of the door.

Lighting fixture for public services, laundry and kitchen shall have LED lamp and their degree of protection shall be IP42.



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Control gear shall be suitable for operation at 230V, 50Hz, power factor compensated to at least 0.9. The ballast shall be of a type specially adapted for the particular make of lamp selected. The lamp shall be able to start with at least plus or minus ten percent of the voltage value and continue in normal operation with dips attaining 20 percent for four seconds.

Each luminaries shall be permanently marked with the maximum permissible wattage of the lamp to be fitted.

Each luminaries optical or unit shall be protected by a heat and high impact resistant glass protector and shall be dust and watertight and suitable for area of installation. The protector shall be smooth to reduce a minimum dirt accumulation with a coefficient of transmission of the order of 88 percent or better.

Lighting Fixture shall be equipped with chain holder.

7. LIGHTING DISTRIBUTION

The lighting circuits from distribution board to local main junction boxes will be 3-phase with 5- wires (3-phase + neutral + earth).

The lighting circuits from main junction boxes to lighting fixtures shall be single-phase with 3- wires (1-phase + neutral + earth).

The load distribution of lighting circuits shall be balanced over the 3 phases, as much as possible. Lighting installations shall be designed to avoid stroboscopic effects. The lighting fixtures in hazardous area shall be designed according to the related hazardous area classification drawings, if any.

8. FLOOD LIGHT

The degree of protection for outdoor installation flood light in this plant is considered as IP54.

Floodlights should be wide beam with symmetrical pattern of light.

Floodlights should be suitable for 140 & 200Watt LED lamps.

Floodlights should be equipped with built-in ignition & control gear.

Floodlights should have wiring with heat resistance flex with silicon insulation and exterior connection box. Ignition unit shall be incorporated in the junction box.

The housing for flood lights shall be stainless steel and anodized aluminum reflector

The painting finish of all parts of the floodlight shall be powder coated and stove enameled white to 70-80 μm .

Other characteristics of the floodlights shall be in accordance with section 4 of this specification as required.

In areas such as football yard the floodlights shall be mounted on tower with 30m height or less which made of steel pipe.

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9. STREET LIGHTING

Street lighting luminaries for 140W or 200W LED lamp equipped on 9m height (at least) Lighting Poles.

Body of pressed aluminum sheet, which is chromated electrostatically and stove enameled.

Reflector of anodized 99.9% pure aluminum and bowl of clear glass.

Suitable for pole mounting, on 42-60mm diameter steel pipe angled at 5° to horizontal.

Degree of protection by enclosure at least IP54.

Luminaries shall have a suitable terminal block to allow connection of the internal wiring and incoming supply cable into which standard cross-linked polyethylene cable could be connected.

Lighting poles shall be made of hot dip galvanized steel pipe and suitable to accommodate the LED discharge lamps with accessories & flood lights fitting, type of poles indicated in lighting detail installations drawings.

Bulkhead lighting fitting equipped with bracket shall be suitable for outdoor installation.

The height of pole for street lighting shall be 8m for 140W lamp and 10m for 200W.

Lighting poles shall be equipped with cutout fuse with use of armored cables, three phase, neutral & ground wire and suitable for circular conductor up to 25mm².

Lighting poles shall be supplied with either two-sealed neoprene grommets or a glanded brass bonding plate for Cu/XLPE/SWA/PVC cables, complete with earthing terminal.

10. TYPE OF INDOOR LUMINAIRES

10.1 LED LUMINAIRES

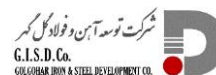
Surface luminaires with white louvers – 47W LED – IP42. Sheet steel, stove-enameled, with heat-resistant wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Recess luminaires with white louvers – 37W LED – IP42. Sheet steel, white, stove-enameled, with surrounding rim. 6mm high, and knockouts at each end for wiring inside the luminaires, heat resistant, single conductor cables should be used. With heat resisting wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Surface luminaires with white louvers – 47W LED – IP42. Sheet steel, stove-enameled, with heat-resistant wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².



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Recess luminaries with white louvers – 37W LED – IP42. Sheet steel, white, stove-enameled, with surrounding rim. 6mm high, and knockouts at each end for wiring inside the luminaries, heat resistant, single conductor cables should be used. With heat resisting wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Surface luminaries with Plexiglas opal diffusers – 47W LED - IP42. Trapezium – shaped front and side sections in sheet steel, joined together flush by corner pieces die-cast in zinc alloy, stove-enameled, white with knock-outs at each end for through-wiring with heat-resistant wiring ready for connection and complete with low-less inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Recess luminaries with Plexiglas opal diffusers – 37W LED - IP42. Sheet steel, white, stove enameled. With knockouts at each end for through wiring inside the luminaries. Using heat resistant, single conductor cables. Wires shall be sealed and mechanically protected by grommet or by gland. With heat resisting wiring, ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Surface luminaires with white louvers – 47W LED – IP54. Sheet steel, stove-enameled, with heat-resistant wiring ready for connection and complete with low-loss inductive ballast. With 4-pole terminal block and earth connection for wire up to 2.5mm².

Wall luminaries with Plexiglas diffusers – 10W LED – IP54 for mounting above the mirror. Sheet steel, white, stove-enameled. With heat-resistant wiring ready for connection and complete with conventional inductive ballast with 2-pole terminal block and earth connection for wire up to 2.5mm².

10.2 INDUSTRIAL LUMINAIRES

High-bay reflector units, with 140W LED lamp and IP54. Deep-drawn top member of sheet steel with aluminum colored, heat-resistant enamel finish.

Cable entry through suspension opening. Applicable for workshop. Suitable for mounting height over 6m.

Plastics or cast-metal bulkhead units.

With basket guard and globe. Housing of brown or gray molded plastics, with two compression type glands applicable for outdoors and equipment rooms.

10.3 SAFETY LIGHTING UNITS

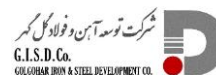
Safety lighting and exit signs are complete with self-contained batteries and fully automatic in operation. It shall operate on 230V AC single phase 50Hz system and upon failure of the normal power system LED lamp shall be battery backed up.

The unit shall be capable of operating in the emergency mode for a minimum 30 minutes at not less than 87.5% of normal battery voltage.

The unit shall operate on failure of the normal power supply.



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The units shall be equipped with the fully automatic charger to maintain the battery fully charged all the times with a test switch to indicate operating status of the unit & batteries.

Units can be provided With 2 LED lamps 8 watt, plastics or cast-metal bulkhead units.

11. LAMPS

11.1 LED LAMPS

ALL LAMPS ARE LED TYPE.

Type	:	LED						
Wattage	:	24	37	47	140	200		Watt
Flux intensity	:	2400	4500	4500	18000	2400		Lumen
Average Life	:	2000	2000	2000	2000			Hours

11.2 EXIT SIGN LAMPS

Type	:	LED
Wattage	:	2 x 8 W
Battery	:	Ni-Cd

12. LIGHTING SWITCHES

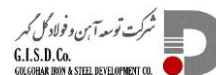
- All lighting switches shall be designed and constructed for minimum 10A at 230V AC.
- Lighting switches shall be suitable for supply of discharge and LED lamps at the rated current and at the site conditions.
- For outdoor and industrial areas the switches shall be weather-proof, IP54 with body of corrosion-proof, cast metal and threaded conduit entry, these switches shall be suitable for surface mounting. Earth terminals shall be provided.
- For indoor areas, the switches shall be of molded insulating material, with threaded conduit entry. The switches shall be suitable for surface or flush mounting (with box) as specified in list of equipment and materials.
- In all buildings the lighting switches shall be mounted in height of 1200mm and from 300mm of wall edge.

13. ASTRONOMICAL RELAY CLOCK (TIMER) FOR OUTDOOR LIGHTING

- Programmable for different zones.



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- Calculate Dusk/Dawn for each day with an offset (before or after dusk/dawn)
- Battery Back-up for 5 years
- Up to 15 Amp load
- At least 2 relay outputs

14. POWER OUTLETS

14.1 General

Socket outlets should be provided the facilities required for operation, maintenance and inspection during normal operation and plant overhaul in all areas. Full temporary facilities must be made available.

Socket voltage levels shall be:

- 230 VAC for general purposes such as portable equipment
- 400 VAC for welding

Socket outlets and their associated plugs operating at different voltage levels shall not be interchangeable.

14.2 230 VAC Sockets

230 VAC socket outlets shall be minimum 16A, 3 wire, 3 pole and single phase interlocked type. In general, the third pole of each receptacle shall be solidly and permanently connected to the plant earthing system.

In general, no more than six 230 VAC sockets shall be supplied by one circuit.

The minimum size of conductor for small power socket branch circuit shall be 4 mm².

230 VAC outlets shall be fed from a normal lighting distribution board, and comprising earth leakage circuit breakers.

The number of outlets shall be calculated on the basis that the plant areas can be reached with a 15 meters extension cord.

14.3 Power Socket Boxes

Some Power Socket Box (with two 16A, 230VAC, 50Hz, 1Ph+N+E and one 32A, 400VAC, 50Hz, 3Ph+N+E Socket outlets) with IP54 shall be considered for maintenance purpose of conveyors, fed by Local Lighting panel. Circuits from Local Lighting panel to Power Socket Box shall be three-phase, with 5wires (3-phase +Neutral+ earth).

The maximum distance to access to nearest socket box shall be 30m, so the distance between two adjacent socket boxes, shall be maximum 60m.

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15. JUNCTION BOXES

Unless otherwise specified, the junction boxes shall be of metallic construction, hot dipped galvanized, stainless steel or aluminum die-cast, with an ingress protection IP 55 for outdoor and IP 42 for indoor at least. They shall be adequately sized to accommodate the incoming cables.

Separate clamp type terminals shall be provided for each conductor. Bunching of conductors under the terminal is not acceptable.

All unused entries shall be fitted with approved stopping plugs.

Junction boxes shall be provided with label detailing function and circuit reference. Junction boxes shall be provided with internal and external brass each terminal (min M8, max M10).

16. PACKING

The lighting fixtures, flood lights & accessories shall be packed ready for service with all wiring terminals links, label, foundation bolt (if applicable) and earth connector and all other necessary devices assembled and tested.

17. MANUFACTURER'S RESPONSIBILITY AND GUARANTEES

The supplier is to take full responsibility for the complete equipment. All components shall be guaranteed for first class material and workmanship throughout and shall be guaranteed to perform satisfactorily in accordance with service conditions as specified.

Any exception or deviations shall be listed separately for company approval.

18. VENDOR DOCUMENTS

The supplier shall provide following technical documents such as:

- Overall dimension, weight and installation instructions for all types of lighting equipment.
- Related brochures and catalogue.



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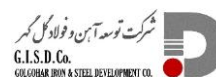
Technical Specification for Lighting Distribution Panel

00	ISSUED FOR APPROVAL	M.KHAVARI	F.NIKNAM	A.MONFARED	1405/02/08
Rev.	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED	APP DATE

TABULATION REVISED PAGES



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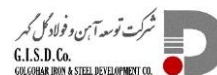
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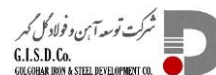
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1. GENERAL

1.1 SCOPE

This This specification has been prepared to provide minimum requirement for design, fabrication and supply of lighting centers, lighting distribution panels & power socket boxes of Golgohar Steel Project.

In case of discrepancy between documents and this specification, the stringent shall be applied.

No deviation from this specification is allowed unless specificity agreed among OWNER and VENDOR.

1.2 DOCUMENT PRIORITY

In the event of any conflict between this specification, the requisition, codes and standards, the priority shall be given in the following order.

- Purchase order
- This specification
- Codes and standards

1.3 CONDITION OF OPERATION

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, and 365 days/year operation.

Site Conditions

1.4 Plant Location

The Site is located at Gol-E-Gohar Iron Ore Complex, situated in Sirjan, Province of Kerman in southern part of Islamic Republic of IRAN, approximately 285 km southwest of Kerman city and 335 km north of Bandar Abbas port, in a semi-desertic high plateau terrain, 1750 m above sea level, and flanked by mountains over 2500 m high trending northwest to southwest.

1.5 Meteorological

Ambient Temperature

Max. Temperature:	+40 deg. C (Recorded)
	+50 deg. C (Design)
Min. temperature:	-12 deg. C (Recorded)
	-10 deg. C (Design)
Average temperature:	+15.9 deg. C (Design)
Wet bulb design temperature (summer):	+25 deg C
Relative Humidity:	Max. 70%

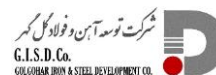
Wind Velocity

According to National Iranian Code (6th revision):

Basic speed data:	130 Km/h
Basic pressure data:	0.845 KN/m ²
Correction factor:	
0 - 10 m:	2
10 - 20 m:	2.2



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20 - 100 m: 2.4

Rainfall

Yearly 120 mm (average)

Monthly rainfall 260mm (Max)

Barometric Pressure

820 milliards

Geological Conditions

This data is belongs to the existing palletizing plant location. For the engineering the contractor shall be study geotechnical conditions for the essential location according to the project plan.

Altitude: About 1,750 m above mean sea level

Soil bearing: approx. 20t/m²

Ground water level: approx. 60 m below ground level

Earthquake Load

Equipment in plant will be dimensioned including a safety calculation against earthquake according to the "Iranian Code for Seismic Resistant Design of Buildings

– Publication No. S253-2nd edition, autumn 1999" ("Iranian Regulations 2800") and "Minimum Design Loads for Building and Structures" (Iranian Regulations 519).

- Design base acceleration: 0.3·g

- Classification of Buildings: Group 2

- Soil classification: soil type III-b

2. STANDARDS AND CODES

The panels shall be constructed wired and tested in accordance with all applicable sections of the latest below listed standards and codes.

For equipment manufactured in Europe

IEC International Electro technical Commission.

IEC 60144 Degrees of Protection of Enclosures for Low Voltage Switchgear and Control Gear.

IEC 60439 Low Voltage Switchgear and Control Gear Assemblies.

IEC 60529 Classification of Degree of Protection Provided by Enclosures.

For equipment manufactured in the USA

NEMA National Electrical Manufacturer's Association.

NEC National Electrical codes.

The panels may conform with the national standards of the country of manufacturer, provided these standards are based on IEC recommendations. Vendor shall state in the quotation the standard to which the panel conforms. If these are the national standards, then vendor shall state in the quotation the deviation, if any, from the relevant IEC recommendations.

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3. TECHNICAL REQUIREMENTS

The panel and individual equipment and components shall be suitable for the expected short time currents. The values of the short circuit and earth fault currents and duration, shall be as what will be indicated on the single line diagram. If not otherwise indicated, the duration times of the currents mentioned above shall not be less than 1 S.

Space heater and lighting shall be considered for all panels.

When no information is given regarding earth fault currents, the value shall be assumed as being equal to the phase to phase fault current. The circuits downstream of the circuit breakers shall be suitable for the relevant tripping characteristics (current/time)

The panel and the individual components shall be sized assuming that:

- a) All the equipment, including the spare equipment, is rated as indicated on the single line diagram.
- b) The bus bars are at their rated current.
- c) The site conditions are taken into account with the ambient temperature at its maximum value.

The distribution boards shall be of the free standing or rack or wall mounted and fixed type. It shall be metal enclosed type.

The panels shall be able to withstand the mechanical, electrical and thermal stresses and the corrosive phenomena.

The panels and the covers forming the enclosure shall be fastened with screws.

The opening of doors and the removal of covers mechanically fastened, shall only be possible by means of groove keys or tools.

The types of keys and tools mentioned above shall be reduced to a minimum consistent with the safety requirements.

Panels shall be operated from the front.

It shall be possible for specialized and authorized personnel to carry out the following operations, with the switchboard alive:

- a) Visual inspection of equipment.
- b) Operation of disconnecting switches.
- c) Replacement of circuit breakers, etc.
- d) Connection of incoming cables.

To permit these operations, barriers shall be provided between adjacent circuits that might accidentally be touched.

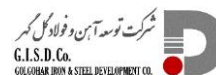
Equipment and components located within the enclosure shall not be mounted directly on the walls of enclosure.

Equipment subject to adjustment or replacement, i.e. circuit breakers, etc., shall be positioned so that they are easily accessible from the front of the panel.

All equipment inside panels shall have suitable nameplates.



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شماره مناقصه: _____

The panel shall have a minimum thickness of 2 mm with reinforcements where panels may be weakened due to large punchings being removed. An exception may be made for internal sheets as they are not part of the load bearing structure and of to external frame, i.e. partitions. These sheets may have a thickness of 1.5 mm.

The doors shall be hinged. Equipment mounted on hinged doors shall be connected with extra flexible conductors.

Panels shall be completely closed with sheets to prevent insects and dust from entering. The entry of cables to the panel can be from the bottom or top as will be specified in the requisition.

On three-phase systems with a neutral, the neutral bus bar shall extend for the whole length of the phase bus bars and shall be half the size of main phase bus bars.

On three-phase systems with neutral, fed by three-pole circuit breakers, the neutral bar shall have a bolted link near the outgoing terminals.

The bus bars shall be PVC sleeved. All joints and tappings of bus bars shall be shrouded.

Unless otherwise indicated, the bus bars shall be of electrical grade copper.

The bus bar supports may be insulated, molded or layered insulating supports; they shall be of non hygroscopic and dust deposits or condensation.

The bus bar supports shall take into consideration thermal expansion and vibration, if any.

The bus bars and power insulation conductors shall be marked L₁-L₂-L₃-N₁ PE or in colors.

Circuit breakers shall be manually actuated and be provided with a visual indicator mechanically actuated, showing the following positions:

- a) Open.
- b) Closed.

Actuating of circuit breaker shall be possible after opening of front door or cover.

Tripping characteristic shall be as what will be indicated on the one line diagrams.

Contactors, e.g. for lighting control, shall be of the compact air break. Other contactors may be taken into consideration on an individual basis.

Contactor drop out voltage shall be between 45% to 65% of rated voltage and maximum contact pressure shall be with 80% of rated voltage.

Signal lamps, if applicable, shall be of the LED type.

On-load switches shall be air break, sized for opening on-load and closing under short circuit conditions, operable from the front panel where an indicator shall show the position (closed/open).

A minimum of 20% spare circuit breakers or minimum one per each size shall be provided and completely wired to terminal blocks.

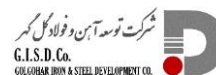
Unless specifically indicated in the single line diagram, the protection of installations against indirect contact shall be made by an earthing system with protective circuits.

According to the following diagram (IEC Standard) the earthing system is TN-CS system.

So, the panels bus No., are as follows:



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شماره مناقصه: _____

Lighting Center	3Ph+N+PE
Lighting Distribution Panel	3Ph+N+PE
Power Socket Box	3Ph+N+PE

The interconnecting cables are as follows:

Lighting Center to Lighting Distribution Panel and Power Socket Box	3Ph+N+PE, 4-wire cable
Lighting Distribution Panel and Power Socket Box to lightings and sockets	1Ph+N+PE, 3-wire cable, 3Ph+N+PE, 5-wire cable.

For this reason, a protective bar (PE) shall be installed in all panels including those with special insulation.

In double insulated panels, this bar shall connect the armoring of cables of outgoing circuits to the earthing system of the incoming circuits.

The protective bar (PE) shall cover the whole length of the panel and provided with connecting bolts at the two ends and anywhere that the connection of a cable is provided.

This shall be of copper and with a cross section suitable for the short circuit current duration time provided.

In panels the protective bar (PE) shall be installed inside, in the most suitable position to connect the cable armoring.

In panels, with vertical equipment, a vertical protective bar shall be provided for connection of cables and equipment.

In panels, except when double insulated the non current carrying parts of each section or box shall be individually connected to the PE bar with a 10 mm² copper.

Conductor shall be calculated on the basis of the prospective current of earth failure.

The continuity of all metallic parts through equipotential bonding or structure joint shall be guaranteed.

PE bar inside metal enclosed panels shall be connected to one external earthing terminal. This earthing terminal shall be suitable as minimum:

- Lug on 16 mm² single, stranded conductor (for lighting panels).
- Lug on 35 mm² single, stranded conductor (for power socket boxes).

Bolted connections shall be made using bolts, nuts and washer of stainless steel or approved equivalent.

Cable gland shall be suitable for to type of cable as what will be specified in the requisition. Glands shall be located on the bottom of panel.



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شماره مناقصه: _____

All wiring shall be continuous from outgoing circuit breakers to terminals without splicing. Wires shall be stranded copper conductor PVC insulated with minimum cross section of 2.5 mm² for control, 4 mm² for power, and 6 mm² for current transformers. Wires shall be protected against mechanical damages.

The conductor ends shall be fitted with crimped type lugs and numbered ferrules.

The ferrules shall be arranged so that the numbers are easily read.

Outgoing conductors shall be connected to terminals located in the bottom part of the panel.

Links shall be used to jumper adjacent terminals together where required, avoiding the use of wire links as much as possible.

The terminals shall be suitable for the type and the material of conductors being connected.

For conductors less than 10 mm², clip-on type terminals are acceptable. For conductors of 10 mm² and above, bolted terminals shall be used.

The insulating material of terminals shall be melamine or other high density plastic. The molding mass shall be filled with mineral or inorganic compounds.

Terminal blocks shall be tagged with the phase number and neutral. They shall be mounted such that to give easy access and sufficient space for execution of cable terminations, their fastening and to enable ferrule number and labels to be read without difficulty. Barriers shall be provided between terminals belonging to different branch circuits. branch circuit number shall be provided between the barriers.

Non detachable nameplate (s) of black-white-black shall be installed on top of panel. These nameplates shall at least contain the following information:

- a) Panel tag number.
- b) Manufacturer's name and type.
- c) Supply voltage.
- d) Degree of protection.

4. ADDITIONAL REQUIREMENTS FOR PANELS LOCATED OUTDOORS

Panels shall be industrial type and have minimum protection class as per IEC 144 as follows:

- a) Indoor: IP 42
- b) Outdoor: IP 55

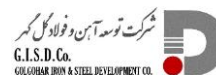
Ventilation or drainage openings, if any, shall be at least IP 3X.

Unused holes shall be plugged off instead of installed cable glands.

An ample sized rain canopy shall be mounted over the panel.



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شماره مناقصه: _____

5. MATERIAL

5.1 General

The material applied for the various parts shall be in accordance with the parameters as what will be specified in requisition.

Unless the coil of the contactor shall be suitable for operation on 230 V, 1 PH, AC supply and shall work satisfactorily between +10% and -15% of the rated voltage.

The contactor drop off voltage shall be between 15% to 65% of the rated coil voltage.

5.2 Thermal overload relay

Thermal overload relays shall be three element, positive acting, ambient temperature compensated type with adjustable setting range.

Thermal overload relays shall be manually reset type with the reset push-button brought out on the front of the panel. The reset push-button shall be capable of being operated without opening the compartment door.

Thermal overload relays shall be provided with minimum 2 NO + 2 NC contacts with a rating of 5 A at 230 V, 1 PH, 50 Hz, AC and 1.3 A at 110 V DC (Inductive load).

5.3 Moulded case circuit breakers (MCCBs)

MCCBs shall be provided with spring assisted quick make/break manually operated trip free mechanism. Wherever specified, MCCB shall be suitable for remote tripping operation and the tripping device shall be suitable for the specified control supply voltage.

MCCBs shall be provided with tripping device with inverse time characteristics for overload protection and instantaneous characteristics for short circuit protection.

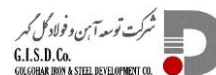
MCCB operating handle "ON" and "OFF" positions shall be displayed and the operating handle shall be mounted on the door of the compartment housing MCCB.

MCCB shall be provided with minimum 2 NO + 2 NC auxiliary contacts rated for 5 A at 230 V, 1 PH, 50 Hz, AC or 1.3 A at 110 V DC (Inductive load).

If specified in the requisition, the MCCBs shall be provided with solenoid closing mechanism to make them suitable for remote closing operation. The closing solenoid shall be suitable for specified control supply voltage.



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شماره مناقصه: _____

5.4 Measuring instruments

All measuring instruments shall be of 96x96 mm square pattern, flush mounting type.

All AC ammeters and voltmeters shall be of moving Iron type for AC and permanent magnet type for DC. Accuracy class shall be 1.5.

5.5 Control switches

All control switches shall be rotary, back connected type, having cam operated contact mechanism. The selector switch shall also have 4 positions for reading 3 phase currents and fourth position for OFF. The voltmeter selector switch shall also have 4 positions. Three shall be used to measure phase to phase voltage and fourth shall be OFF position.

Remote/trip/off selector switch for the motor feeders shall be lockable in OFF position.

5.6 Push-buttons

Push-button colors shall be as follows:

Stop/open/emergency	:	Red
Start/close	:	Green
Reset/test	:	Black

5.7 Indicating Lamps

The indicating lamps shall be low wattage and long life type with following lens colors:

On	:	Green
Stop	:	Red
Trouble	:	Yellow, amber

Failure of an indicating light shall not cause circuit breaker miss-operation so suitable protection shall be foreseen for this propose.

6. SHOP TESTS

Testing shall take place in manufacturer's shop.

The following inspection/tests are required as a minimum:

- Insulation test.
- Functional test.
- Check of equipment against requisition specifications, vendor prints.

The equipment shall be tested in the presence of the purchaser or his nominated representatives and the acceptance of the equipment will depend on the successful completion of such inspection and tests.

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To permit the purchaser or his nominated representatives to be present for inspection and tests, vendor shall give adequate notice of his intention to carry out tests, or of equipment being available for inspection.

This notice shall not be less than two week before start date of inspection. In the case of tests for long duration, the actual date of commencement shall be the subject of agreement between vendor and purchaser.

Vendor is deemed to be responsible for all subcontracted equipment and component parts.

7. PAINTING

The equipment shall be painted in accordance with vendor suitable preparation and application painting cycle.

Painting shall be suitable for the site conditions which will be specified in the material requisition.

One liter of paint taken from the same batch as the factory pain shall be included for touching up after installation.

Finish color shall be as what will be specified in the requisition.

8. SPARE PARTS, SPECIAL TOOLS AND MANUALS

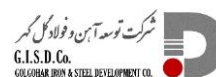
All special tools and spare parts required for commissioning, start-up, and two years operation shall be provided, as well as relevant documents such as drawing, maintenance, operating and installation manuals.

The VENDOR shall submit in its offer lists of recommended spare parts for the following categories:

- Commissioning spare parts: For the commissioning of the equipment, the VENDOR shall provide a complete set of spare parts, which in his opinion and experience are necessary during this period:



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شماره مناقصه: _____

ITEM	EQUIPMENT	QUANTITIES
1	MCB 2Ph & 3Ph	5%
2	Bulb for Signal Lamps	50%
3	Terminal	5%
4	Aux. Relays & Time Relays	2%

-Two years operation spare parts: These are spares, which the VENDOR recommends shall be held in stock in order to maintain the equipment in operation for a period of 2 years normal operation after setting to work. These spares will not be available for use by the VENDOR during commissioning of the PLANT.

Below table is minimum list of 2 years spare parts that should be supplied by VENDOR:

ITEM	EQUIPMENT	QUANTITIES
1	MCCB	10% (Min 1 for each type/ size)
2	CT	One for each type and size
3	PT	1 Set
4	MCB 2Ph & 3Ph	10%
5	Contactor	10%
6	Signal Lamp	10%
7	Bulb for Signal Lamp & Alarm Windows	10%
8	Terminal	10%
9	Aux. Relays & Time Relays	5%
10	Main Protective Relays	One for each type
11	Heater & Thermostat	1 Set
12	Ammeter	One for each type and size
13	Voltmeter & Selector Switch	1 Set
14	Astronomical Clock	1 Set

The vendor should recommend other necessary spare parts for 2 years of Operation in his offer.

9. SHIPPING

Manufacturer shall be solely responsible for the adequacy of the preparation for shipping provisions employed, with respect to materials and their application to ensure that the equipment reaches its destination in perfect working conditions when handled by commercial carrier systems.

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10. GUARANTEES

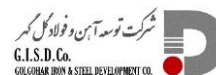
Manufacturer of the equipment under this standard, shall certify that such equipment meet all the requirement of this standard and is of first class material and workmanship throughout.

Vendor must guaranty all the system for 2 years.

10 years after sale services shall be provided by Vendor.



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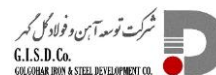
شماره مناقصه: _____

11. DATASHEET

Description	Requirements	Vendor Data
1. Manufacturer/Country	By Vendor	
2. Type	Metal Enclosed, Free Standing or Surface Wall Mounted (Acc. To SLD)	
3. Installation:	Indoor or Outdoor (Acc. To SLD)	
4. Execution	Fix	
5. Rated Short Current Of Busbars	According to SLD	
6. Mode of Operation	Heavy Duty	
7. Cooling	Natural	
8. Degree of Protection:	Indoor: IP42 Outdoor: IP55	
9. Access	Front	
10. Nominal Voltage	400V $\pm$ 10%	
11. Phase No.	3Ph+N+PE	
12. Rated Frequency	50Hz $\pm$ 5%	
13. Rated Voltage	1KV	
14. Power Freq. Withstand Volt. (1min)	2.5KV	
15. Impulse Withstand Voltage	8KV	
16. Rated Current	According to SLD	
17. Short Circuit Withstand Current	According to SLD	
18. Control Voltage	230V AC, Internal	
19. Control Wire Size	1.5mm ² min.	
20. Frame Material	Rigid Sheet Steel	



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شماره مناقصه: [REDACTED]

21. Steel Sheet Thickness:

▪ Frame	2.5mm	
▪ Enclosure	2mm	

22. Paint:

▪ Type	Epoxy Powder	
▪ Thickness	60-80µm	
▪ RAL No.	RAL 7035	

23. Cable Entry:

➤ Incoming	Bottom	
➤ Outgoing	Bottom	

24. Earth Connection Bar:

▪ Panel	Yes	
▪ Door	Yes	

25. Cable Gland Nickel Plated Brass, Based on SLD Requirements

26. Earthing System TNCS

27. Gland Plate Yes

28. Cable Holder Yes

29. Cable Type NYY-J

30. Spare 20%

31. Space 20%

32. Spare Terminal 20%

33. Door Type With Spring-Loaded Lock

34. Nameplates Engraved Stainless Steel
English Language

35. Heights of Cubicles: 1000mm, max.
By Vendor



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شماره مناقصه: _____

36. Overall Dimension (LxWxH mm):	By Vendor	
37. Weight of Panel (Kg):	By Vendor	
Busbar		
1. Manufacturer/Country	By Vendor	
2. Conductors	Copper, 99.9%	
3. Coating	Tin Plated	
4. Insulation	Bare	
5. Busbar Size (mm):		
▪ Phases (3Ph)	By Vendor	
▪ Neutral (N)	Equal to Phases	
▪ Earth (PE)	By Vendor (240mm ² min.)	
6. Busbar Color:		
▪ Phases (3Ph)	By Vendor	
▪ Neutral (N)	Blue	
▪ Earth (PE)	Yellow-Green	
MCCB		
1. Manufacturer/Country	By Vendor	
2. Type	By Vendor Refer to SLD	
3. Nominal Voltage	400V	
4. Phase No.	3Ph+N	
5. Rated Current	Refer to SLD	
6. Rated Short Circuit Breaking Capacity	According to SLD	
7. Other Specifications	By Vendor	
Miniature Circuit Breaker (MCB)		



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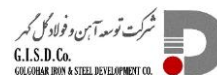
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شماره مناقصه: _____

1. Manufacturer/Country	By Vendor	
2. Type	C-Curve	
3. Nominal Voltage	400V	
4. Short Circuit Breaking Capacity	According to SLD	
5. Other Specifications	By Vendor	
Contactor		
1. Manufacturer/Country	By Vendor	
2. Type	AC1	
3. Nominal Voltage	400V	
4. Phase No.	3Ph	
5. Rated Current	Refer to SLD	
6. Coil Operating Voltage	230V AC	
7. Auxiliary Contact No.	Based on SLD Requirements	
8. Other Specifications	By Vendor	
Impulse Relay		
1. Manufacturer/Country	BY Vendor	
2. Type	By Vendor	
3. Operating Voltage	400V	
4. Coil Operating Voltage	230V AC	
5. Rated of Contact Current	16A	
6. Contacts No.	Based on SLD Requirements	
7. Other Specifications	By Vendor	
Auxiliary Relay		
1. Manufacturer/Country	BY Vendor	
2. Type	By Vendor	



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شماره مناقصه: _____

3. Nominal Voltage	230V	
4. Coil Operating Voltage	230V AC	
5. Auxiliary Contacts No.	Based on SLD Requirements	
6. Other Specifications	By Vendor	
Voltmeter		
1. Manufacturer/Country	By Vendor	
2. Type	By Vendor	
3. Size	Square Case, 96x96mm	
4. Accuracy Class	1	
5. Voltmeter Full Scale	Refer to SLD	
6. Other Specifications	By Vendor	
Ammeter		
1. Manufacturer/Country	By Vendor	
2. Type	By Vendor	
3. Size	Square Case, 96x96mm	
4. Accuracy Class	1	
5. Ammeter Full Scale:	Refer to SLD 2In	
6. Other Specifications	By Vendor	
Selector Switch		
1. Manufacture/Country	By Vendor	
2. Type	By Vendor	
3. Other Specifications	By Vendor	
Fuse		
1. Manufacture/Country	By Vendor	
2. Type	By Vendor	



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شماره مناقصه: _____

3. Other Specifications	By Vendor	
Push Button		
1. Manufacturer/Country	BY Vendor	
2. Type	By Vendor	
3. Nominal Voltage	230V	
4. Other Specifications	By Vendor	
Signal Lamp		
1. Manufacturer/Country	BY Vendor	
2. Type	LED	
3. Nominal Voltage	230V	
4. Other Specifications	By Vendor	
Terminal		
1. Manufacture/Country	By Vendor	
2. Type	By Vendor	
3. Other Specifications	By Vendor	
Other Accessories		
1. Manufacture/Country	By Vendor	
2. Type	By Vendor	
3. Other Specifications	By Vendor	
Socket Outlet		
1. Manufacturer/Country	BY Vendor	
2. Type	Coverd Type	
3. Nominal Voltage	400/230V	
Earth Leakage Relay		



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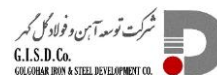
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شماره مناقصه: _____

1. Manufacturer/Country	BY Vendor	
2. Type	BY Vendor	
3. Nominal Voltage	400/230V	
4. CT (toroidal transformers)	BY Vendor	
- Type	BY Vendor	
- Ratios	BY Vendor	
- Dimensions	BY Vendor	
5. Other Specifications	Based on SLD	
CTs requirements (Metering)		
1. Manufacturer/Country	BY Vendor	
2. Type	BY Vendor	
3. Minimum cross section for wiring	4mm ²	
4. Burden	BY Vendor	
5. Accuracy	BY Vendor (Suggestion: Class 0.5)	
6. According to SLD	According to SLD	
7. Dimensions	BY Vendor	



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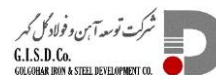
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Technical Specification For Cables

00	ISSUED FOR APPROVAL	M.KHAVARI	F.NIKNAM	A.MONFARED	1405/02/08
Rev.	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED	APP DATE



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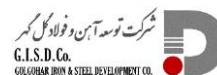
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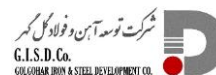
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پیوست ۱۸-۳

شماره مناقصه: _____

1. GENERAL

1.1 SCOPE

This Specification Describes the Minimum requirements for design, manufacturing and testing of multi-core/single-core LV and Control cable.

Metric SI system of units shall be applied to all dimensions and relevant documents.

All correspondence and submittals shall be in English.

1.2 DOCUMENT PRIORITY

In the event of any conflict between this specification, the requisition, codes and standards, the priority shall be given in the following order.

- Purchase order
- This specification
- Codes and standards

1.3 CONDITION OF OPERATION

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week, and 365 days/year operation.

Site Conditions

1.4 Plant Location

The Site is located at Gol-E-Gohar Iron Ore Complex, situated in Sirjan, Province of Kerman in southern part of Islamic Republic of IRAN, approximately 285 km southwest of Kerman city and 335 km north of Bandar Abbas port, in a semi-desertic high plateau terrain, 1750 m above sea level, and flanked by mountains over 2500 m high trending northwest to southwest.

1.5 Meteorological

Ambient Temperature

Max. Temperature:	+40 deg. C (Recorded) +50 deg. C (Design)
Min. temperature:	-12 deg. C (Recorded) -10 deg. C (Design)
Average temperature:	+15.9 deg. C (Design)
Wet bulb design temperature (summer):	+25 deg C
Relative Humidity:	Max. 70%



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Wind Velocity

According to National Iranian Code (6th revision):

Basic speed data: 130 Km/h

Basic pressure data: 0.845 KN/m²

Correction factor:

0 - 10 m: 2

10 - 20 m: 2.2

20 - 100 m: 2.4

Rainfall

Yearly 120 mm (average)

Monthly rainfall 260mm (Max)

Barometric Pressure

820 milliards

Geological Conditions

This data is belongs to the existing palletizing plant location. For the engineering the contractor shall be study geotechnical conditions for the essential location according to the project plan.

Altitude: About 1,750 m above mean sea level

Soil bearing: approx. 20t/m²

Ground water level: approx. 60 m below ground level

Earthquake Load

Equipment in plant will be dimensioned including a safety calculation against earthquake according to the "Iranian Code for Seismic Resistant Design of Buildings

– Publication No. S253-2nd edition, autumn 1999" ("Iranian Regulations 2800") and "Minimum

Design Loads for Building and Structures" (Iranian Regulations 519).

- Design base acceleration: 0.3·g

- Classification of Buildings: Group 2

- Soil classification: soil type III-b

2 STANDARDS AND CODES

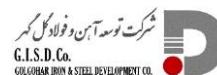
The capacity of the Emergency Diesel Engine Generator shall be able to take care of the following cases. (The cases, which demands maximum requirement will be considered for sizing).

IEC – 60502

Extruded solid dielectric insulation power cable for rated



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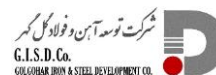
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IEC – 60055-2	voltage from 1kV up to 30 kV Paper insulated metal sheathed cables for rated voltage up to 18/30 kV
IEC – 60840	Power cables with extruded insulation and their accessories for rated voltages above 30 kV up to 150 kV
IEC – 60811	Common test methods for insulation and sheathing materials of electric cables.
IEC – 60228	Nominal cross-sectional areas and composition of conductors of insulated cables.
IEC – 60227	Specification for insulating covering and sheaths.
IEC – 60331	Fire resisting characteristics of electric cables.
IEC – 60332	Test on cables under fire conditions.
IEC – 60375	general instrumentation, general and communication cables.
B.S - 6346	specification for P.V.C insulated cables.
B.S - 5467	Cables with thermo setting insulation for electricity supply for rated voltage, up to and including 600/ 1000 V.

Where reference is made in this specification to other standards, it is understood that equivalent standards published by IEC are acceptable.



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شماره مناقصه: _____

3 DESIGN AND PERFORMANCE

3.1 LOW VOLTAGE POWER CABLES

CONROL CABLE:

NYCY Cable, 0.6/1 (1.2) kV, Class 2 circular stranded plain annealed copper wire conductor, PVC core insulated, Concentric conductor of copper Screen, unarmored and PVC outer sheath (UV resistant).

NYCY Cables (Single-Core, Twin, Three or Multi-Core)

Rated voltage (U0/U)	0.6/1 kV
Conductor	Class 2 circular stranded plain annealed copper wire conductor
Core Insulation	Polyvinyl chloride (PVC)
Screen	Concentric conductor of copper
Outer Sheath	Polyvinyl chloride (PVC), Black, UV resistant

Conductors

Conductors of LV and control cable shall be:

Conductor shall be Class 2 circular stranded plain annealed copper.

Conductors in the same cable shall be all same size except when four-core cable with reduced neutral is specified.

Primary insulation

Insulation shall be PVC extruded for Lighting, control and signaling cables. Insulation shall be XLPE for LV power cables.

Core screen

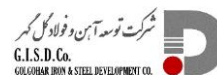
Core screen shall consist of a layer of semi-conducting compound and a metallic layer. The metallic layer shall be copper tape according to IEC 60502-1. Concentric conductor of copper Screen shall be used for NYCY cables.

Filler and Bedding

The Filler shall be Non-hygroscopic material, to obtain circular form of the cables, shall be pre-shaped PVC.



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The bedding shall be an extruded layer of PVC compound.

3.2 OUTER SHEATH

The outer sheath for the cables shall be applied by extrusion and shall be of PVC compound conforming to the requirement specified in the applicable standards. To protect the cable against rodent and termite attack suitable chemicals shall be added into the PVC compound of the outer sheath.

COLOR CODES FOR CONDUCTORS OF POWER CABLES

- | | |
|----------------------------|--|
| 3-cores: | Red, Black, Yellow/Green (L1, N, PE) |
| 4-cores: | Red, Yellow, Blue, Yellow/Green (L1, L2, L3, PE) |
| 5-cores: | Red, Yellow, Blue, Black, Yellow/Green (L1, L2, L3, N, PE) |
| 6-cores and up: | Black with White numbers (for Control Cables) |
| 1 or 2-Cores (DC- Cables): | Red (for Positive) & Blue (for Negative) |

COLOR OF EXTERNAL SHEATHS

- | | |
|------------------------------|---|
| Low Voltage Power cables: | Black |
| Low Voltage Control cables: | Grey |
| Low Voltage DC Power cables: | Red (+), Blue (-), Orange (for 2-Cores) |

3.3 CABLE MARKING

Cable shall be marked on the outer sheath to provide the following information:

- Manufacturer's name
- Number of cores and conductor size
- Construction code
- Insulation voltage
- Length of Cable (per meter)
- Cable Type

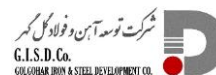
This marking shall be repeated at frequent intervals not to exceed 5 m, and this number shall be legible.

3.4 CABLING SYSTEM

Main cable route inside electrical room and also areas with congestion of many consumers shall run in concrete trenches, whenever possible. The main cable route between the areas and electrical rooms and other small area such as Bins, Towers, shall be concrete conduit bank using Rigid PVC conduits with required manholes to limit the number and length of



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curves of conduits and circuit splicing for pulling of cables. It is allowed to use cable tray beside conveyor walkway for cable laying of lighting and LV motor power cable.

If aboveground cabling is necessary, a hot-dip galvanized cable tray/ladder or rigid galvanized steel conduit shall be installed.

Cables leaving cable tray to reach equipment will be individually protected by close conduit system.

All cabling support materials (i.e. ladders, trays, and relevant fixing materials) used throughout the plant shall be hot-dip galvanized.

Cable trays shall be covered by removable top covers, allowing adequate ventilation, where mechanical damage is likely.

3.5 SPECIAL CHARACTERISTICS

Cables shall have all or some of the following special characteristics as will be specified in the requisition:

- Hydrocarbon resistant.
- Non – flame propagation.
- Non – fire propagation.
- Fire resistance.
- Low production of corrosion gas.
- Low production of toxics gas.
- Low production of opaque – smoke.

Listed characteristics shall be specified according to the reference code.

ADDITIONAL REQUIREMENTS

Cables shall be supplied on wooden drums in one continuous length.

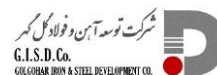
The wood used for construction of the drums shall be properly seasoned, sound and free from defects. Preservatives shall be applied to the entire drum.

Unless otherwise specified, the cables to be supplied on maximum per drum up to total drum weight of:

- a) 1.5 ton for cable size less than 6 mm².
- b) 3.0 ton for cable size from 6 mm² up to and including 50 mm².
- c) 5.0 ton for cable size greater than 50 mm².



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Supplier shall engrave or paint the following information on each drum. If paint method is used, it shall be weatherproof and not affected by direct sunlight. This label/plate shall be suitable for two years site storage and usage.

- a) Purchase order number.
- b) Purchase order item number.
- c) Cable type (size, number of cores, type, etc.).
- d) Cable length.
- e) Drum weight.
- f) Drum number.
- g) Manufacturer name and year of manufacture.

3.6 CABLE ACCESSORIES

The termination shall be suitable for the type of cables offered. The termination shall be supplied in kit form. The kit shall include all insulation and sealing materials apart from conductor fittings and consumable items. An installation instruction shall also be included in each kit.

The termination kits shall be suitable for termination of the cables to an indoor switchgear or to a weatherproof cable box of an outdoor mounted transformer/motor.

JOINTING KITS

The usage of straight jointing kits is not allowed in this project.

INFORMATION REQUIRED WITH BID

The following information shall be provided with quotation:

List of clausewise deviations from project specification. If the same is not furnished, it will be assumed that offered equipment meets all the requirements of this standard.

Catalogues and brochures giving technical and physical details of the cable like current rating, overall diameter, weight, etc.

Recommendations in respect of installation and limitation of use.

“Type Test” certificates and “Special Test” results for cables offered.

Type test certificated for cable accessories.

Note: Offer is likely to be rejected, if the above information is not furnished with bid.

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3.7 SHIPPING

Manufacturer shall be solely responsible for the adequacy of the preparation for shipping provisions employed, with respect to materials and their application to ensure that the cable reaches its destination in perfect working condition when handled by commercial carrier systems.

3.8 GUARANTEES

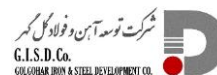
Suppliers of wires and cables under project specification, shall certify that such wire and cable meet all the requirements of project specification and is of first-class material and workmanship throughout. Suppliers shall replace any length of wire or cable failing under any of the following conditions:

Under a voltage test after installation is performed before the wire or cable is placed in service, but within 36 months from date of shipment.

During normal and proper use within one year of date of commissioning, the commencement of such a year being not more than 36 months from date of shipment.



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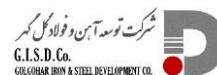
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Automation and Instrumentation



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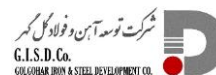
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TECHNICAL SPECIFICATION FOR CONTROL AND INSTRUMENTATION FOR TRANSFER LINE

01	ISSUED FOR APPROVAL	N.VAKILZADEH	F.NIKNAM	A.MONFARED	2026-JUN-27
A1	ISSUED FOR APPROVAL	N.VAKILZADEH	F.NIKNAM	A.MONFARED	2026-May-02
Rev.	DESCRIPTION	REVISED BY	CHECKED BY	APPROVED	APP DATE



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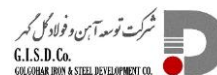
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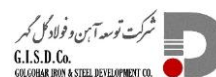
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1. Introduction

1.1. Project

GOL-GOHAR Iron & Steel Development CO. (GISD) located in Kerman Province of IRAN including three DRI and one Steel Making Plant intends to implement waste water transfer lines for further recycle. Blowdown wastewater from SMP, brine water of SMP RO unit and backwash streams and drains are collecting from the related TOPs and transferring to waste water treatment plant and raw water storage tank located at Kowsar unit.

1.2. Scop

This document contains the owner's minimum technical requirements for automation and instrumentation system design, hardware/software & component selection, system integration & testing, erection, commissioning and PLC-based system with DCS interface for monitoring and control of the transfer line.

Deviation from these specifications shall be raised and approved by client.

1.3 Use of Language & Abbreviation

1.3.1 General Definition

Shall: Shall is used in conjunction with an action.

Will: Will is used to indicate a statement of fact.

May: used to indicate possibility or probability.

1.3.2 Language

Drawings, technical specification, reports, manuals and other technical data shall be in English language.

2. Abbreviation & Definitions

DCS Distributed Control System

EIA Electronics Industries Association

IEC International Electro Technical Commission

IEEE Institution of Electrical and Electronics Engineers

IP Ingress Protection

IS Intrinsic Safety

LAN Local Area Network

NIS Non-Intrinsically Safe

OLE Object Linking & Embedding

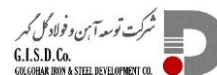
3. Standards and Codes

3.1 Terms and definition

- DIN 19226: Control engineering definitions and terms.
- ANSI/ISA S5.2: Binary logic diagram for process operations.



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- ANSI/ISA S5.5: Graphic symbol for process display
- ANSI/ISA S88: process modeling & control system structuring
- ANSI C85-1: Terminology for automatic control.
- ANSI/IEEE STD: Graphic symbol for logic diagrams.
- PCE-406-XX-TNDR-EL-GENR-MELT-INSTRUMENTATION STANDARDREV00.DOC
- ISO 31: Size, units, symbols, conversion factors and conversion tables

Signals for process control (analog/digital)

- IEC 381: Analogue signals for process control system
- IEC 382: Analogue pneumatic signal for process control system

Controller

- PLC: Programmable Logic controller
- Industrial control apparatus (general, control device, controller)
- Control equipment (limit control, main control center)
- IEC 546: Controller with analogue signal for use in industry
- IEC 1131: Programmable controllers
- ANSI/UL 508: Industrial control equipment
- ANSI/NEMA ICS.2: Industrial control devices, controllers, and assemblies
- ANSI C19.3: American national standard for industrial control apparatus
- IEEE 802.3: Information Processing Systems – Local Area Networks

Control Protocols

- ANSI/ISA S72.01: PROWAY-LAN industrial data highway
- IEC 1158: Field bus standard for use in industrial control system
- 7498 Information processing system-open system interconnection.
- ISO-8348 Information processing system-data communication network service definition.
- ISO-8473 Information processing system-data communication protocol for devising connection less mode network service.

Test of industrial control

- ANSI/ISA RP 55.1: Hardware testing of digital process computers
- ISA/S26: Dynamic response testing of process control
- IEEE STD 74: Test code for industrial control



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Safety Requirement

- IEC 1010: Safety requirement for electric measurement & control
- ANSI/ISA 91.01-2001: Identification of Emergency Shutdown Systems and controls
- ANSI/ISA S82.01: Safety standard for electrical & electronic test
- NFPA 77: Recommended practice on static electricity
- IEC-61508: Functional safety of safety-related systems.
- IEC 839: Alarm systems

Software Requirements

- IEEE-830 Guide to software requirements specification.
- IEEE-1012 Standard for software verification and validation plans.
- IEEE-1016 Recommended practice for software design descriptions.

4.Control & Automation description

4.1. General

The control system shall include all required hardware to enable complete operation and supervision of the transfer line, including alarm indication, protective functions, and data recording capabilities.

RIO Panel shall be provided and Interface signals shall be provided to RO Kowsar Plant for alarms, status, and remote start/stop as required.

4.2.Automation Levels

A complete plant automation system is a sequence of layers, organized into a pyramid shape, where each level is superimposed the lower one, starting from the field instrumentation:

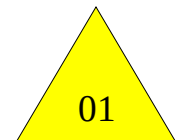
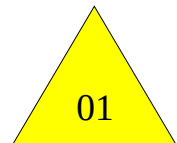
Level 0: Field Instrumentation

This level includes all field-mounted instruments, switches, actuators, and status signals required for measurement, protection, and operation of the transfer line .

This level shall include:

- Level transmitter / level switches on RO brine water basin
- Pressure transmitters / pressure switches on pump suction and discharge lines
- Flow transmitter on RO brine water transfer line to Raw Water Tank
- Valve open / close status signals
- Pump run / trip / fault feedback signals
- Local push buttons and selector switches installed on the package
- All hardwired analog and digital input/output signals between field devices and the local control station

In addition, this level devices shall provide the process measurements and equipment status required for monitoring, alarms, interlocks, and protection .





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The maximum reliability and availability shall be provided .

Field instruments used for control and monitoring shall be separated from those used for protection.

Level 1: Basic control, automation and supervision

Level 1 includes the local control and functions including :

- Execution of control logic, permissives, interlocks, and trip functions
- Pump start/stop control
- Duty / standby pump logic and automatic changeover
- Valve control logic
- Alarm generation and event handling
- Local / remote operation selection
- Interface with local HMI
- Communication of RO Brine water signals to RO Kowsar plant for control ,supervisory ,monitoring and remote command.

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4.3.Control System

The Transfer Line shall be controlled by Kowsar RO Unit control system and RIO modules .

The control system shall include required digital and analog I/O modules, power supplies, communication interface, terminal assemblies, and all accessories necessary for complete operation, protection, alarm handling, and interface with the RO Kowsar PLC .

The transfer line I/O modules shall be Siemens ET200M Series installed in the Local Control Panel , including the required digital and analog I/O for pumps, valves, pressure switches, level switches, pressure transmitters, flow transmitter, and level transmitter.

For communication distances exceeding 80 meters or where required by environmental conditions, optical fiber cables shall be used.

All field instrumentation signals shall be hardwired to the RIO Panel.

The RIO Panel shall communicate with the RO kowsar control center (Upstream) via PROFIBUS (Fiber Optic).

4.3.1.Cybersecurity and Data Protection Requirements

The control system shall include basic cybersecurity measures to protect against unauthorized access and operation.

The control system shall comply with IEC 62443 cybersecurity principles and shall achieve a minimum Security Level SL1.Where the system is connected to plant networks, Security Level SL2 shall be considered.

The RIO Panel shall be physically secured with restricted access.

Communication with plant systems shall be via a secure industrial network (Profibus/Ethernet), with network

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segregation from non-industrial networks.

All programs and configurations shall be backed up and protected against unauthorized modification.

Direct internet access to the control system shall not be permitted

User access levels shall be implemented (operator / engineer)

Unused services and ports shall be disabled.

4.4. Control & Automation Hardware

All field instrumentation and control signals for the Transfer Line shall be hardwired directly to the RIO Panel.

The system shall include the following signal types:

Digital Inputs (DI): Pressure switches (PS), level switches (LS), pump status signals, valve position feedback signals.

Digital Outputs (DO): Pump start/stop commands, valve open/close commands.

Analog Inputs (AI) with HART compatibility: level transmitter (LIT), flow transmitter (FIT), using 4–20 mA signals.

All field signals shall be wired using suitable industrial cables and terminated on marshalling terminals inside the RIO Panel.

For signals located in hazardous areas, appropriate intrinsic safety barriers shall be provided.

Communication between the RIO Panel and the plant control system shall be via industrial Ethernet network and is separate from field hardwired signals.

4.5. Software requirements

The control system software shall be added to engineering and monitoring RO Kowsar control system software.

General Requirements

All software shall be original, licensed, and legally supplied

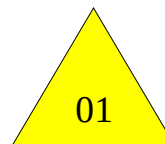
The software and firmware versions shall be:

- Latest stable version available at the time of commissioning
- Compatible with supplied hardware

4.6. System spare capacity and expansion

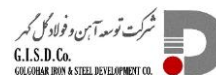
The system shall be designed to facilitate future expansion with no major modification. The following spare capacity shall be provided in the design of the system unless otherwise stated elsewhere in this specification.

- RAM Back up Battery: Minimum 2 weeks
- Spare fully wired and installed I/O: minimum 20 % of total I/O channels (Including I.S. barrier)
- Spare space for future expansion: minimum 20% of total I/O
- Each power supply shall be sized So that not to carry more than 75% load of its capacity under normal operation.
- The system supplied shall have a minimum installed spare capacity of 30% including memory, data communication links & disk storage.





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- Each Ethernet Switch shall have 20% spare ports.
- Panels, Junction Boxes, LCBs shall have 20% spare space
- 30% power supply capacity

4.7. Modes of operation

The normal mode of operation of plant is fully automatic, so the operator shall retain a supervisory role such that he remains aware of the control requirements and operational procedures. Also the possibility of operator intervention at each control stages shall be considered via operator console keyboard and high resolution LCD displays.

The following mode of operation selectable from the operator console:

a) Manual

The output will be manipulated directly from the operator station.

b) Automatic

The output will be computed by the DCS controller.

c) External/internal set-point

The set point will be the output from another controller loaded with another algorithm. Bump less transfer between different modes shall be provide in the controllers.

d) Local /Remote

Local push buttons and local remote key type selector switches for electrical users shall be provided. All electrical users shall have remote push buttons too.

Local/Remote permission shall be considered through Control system.

The system configuration shall, basically, comprise of the following building block sub-systems:

- Process interface and data acquisition system
- Man-Machine Interface
- Data highway ports for interfacing with PLC's
- Data highway interface to higher level automation computer system

5. Field Instrument

5.1.General Requirement

The instrumentation equipment is designed suitable for continuous outdoor industrial service and for installation in corrosive brine water environment.

Analog signals shall be 4-20 mA shall be used for transmission of process data to the control system, Where applicable 2-wire or 3-wire transmitters shall be used.

Electronic transmitters shall be 24VDC, 4-20 mA, with HART capability for integration with the control system.

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All instruments shall be supplied with 316 stainless steel name plate with identification tag number permanently fixed, and not glued to all casing.

Movement parts for instruments shall be 316 stainless steel or better when specified.

Wetted parts shall be SS316L, Stainless Steel, Hastelloy, or equivalent corrosion-resistant material suitable for brine service.

All instrument will be included mechanical box protection, this box used for protecting of equipment from undesirable impact.

Level measurement on brine tanks/basins shall be by radar type level transmitter and independent switch shall be provided for low level and low-low level protection and interlock duty.

Pressure transmitters shall be provided for pump suction and discharge service, suitable for corrosive brine water service with diaphragm seals to protect against corrosion and salt crystallization.

Pressure switches shall be used for interlock or protection shall be mechanical with corrosion-resistant wetted parts and adjustable setpoint.

5.2. Level Measurement

Level measurement on brine tanks/basins shall be by non-contact radar Type level transmitter

This type transmitters emit microwave signals toward the liquid surface and the signal is reflected back from the liquid surface. The time for radar waves to travel and return is used to calculate the level of liquid.

System accuracy shall be 0.1% of span & shall not be affected by wind vibration, noise, and changes in temperature due to sun radiation and ambient condition.

This transmitter shall be suitable for water-tight and dust-tight (IP65 min.).

The sensors shall be outdoors, exposed to the weather and micron sized metal particles.

The instrument shall be equipped with a horn antenna suitable for reliable continuous level measurement of RO brine water in tanks and process vessels. The horn antenna shall be designed to provide focused microwave signal transmission and reception to ensure stable measurement in the presence of vapor, dust, or process disturbances.

The antenna and all wetted parts shall be manufactured from corrosion-resistant materials such as SS316L, Stainless Steel, or equivalent suitable for brine service. The design shall minimize fouling and salt deposition.

The level transmitter shall be equipped with digital LCD display.

The Radar level transmitters shall have 24 VDC, 2-wire, 4~20 mA, HART protocol output.

5.3. Pressure Measurement

As far as required and specified in the scope of supply and depending on the use the following devices are foreseen:



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Pressure Gauge

Pressure gauges shall normally be Bourdon tube-type with external part filled with glycerin or silicone oil where required to damp vibration and pulsation . The liquid filling shall be suitable for ambient temperature conditions. Diaphragm seal shall be supplied where required to protect the sensing element from corrosion ,fouling ,or salt crystallization .

The pressure gauge shall be designed to withstand overpressure of at least 1.3 to 1.5 times the design pressure without loss of accuracy or damage.

All wetted parts shall be manufactured from corrosion-resistant materials suitable for brine service, such as: SS316L.

The gauges shall have dial diameter size of 100 mm. The numerals shall be printed in black with 270° rotation on white laminated plastic background.

Case material shall be constructed from corrosion – resistant material (stainless steel or suitable coated aluminum) with black color, and shall have minimum IP65 protection for outdoor installation.

Pressure Switch

Pressure Switch shall be a mechanical type designed for reliable pressure monitoring and protection. The pressure switch shall have an adjustable setpoint with field calibration capability . The adjustment mechanism shall be provided with suitable locking device to prevent unauthorised changes. The switch shall provide a snap-acting SPDT contact output suitable for connection to PLC-based control or protection systems. Mercury switch type shall not be used.

All wetted parts including the sensing element shall be manufactured from corrosion resistant material such as SS316, Stainless Steel, or equivalent material suitable for brine water service. Where required for corrosive or fouling service, the pressure switch shall be provided with a diaphragm seal to protect the sensing element from corrosion and salt crystallization. The enclosure shall be weatherproof with a minimum protection rating of IP65, suitable for outdoor installation. The case material shall be corrosion-resistant, such as stainless steel or suitably coated aluminum.

Pressure sensing elements shall be bourdon tube, spiral, helical, bellows or diaphragm type depending pressure range and service condition.

The accuracy of the switches shall be better than $\pm 1\%$ of full scale and the switch shall have a repeatability of $\pm 0.5\%$ of overall range.

5.4.Flow Measurement

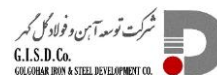
Magnetic flowmeters shall be used to measure and monitoring the flow rate of Brine water

In addition, flow meter shall measure daily water consumption of RO Brine water and recoded data will be processed in order to report the average weekly RO brine water consumption.

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The magnetic flowmeter shall have 24 VDC, 2-wire, 4~20 mA, HART protocol output.

Enclosures shall be weatherproof (IP65 or higher) .

Flow tubes shall be lined with corrosion-resistant material (e.g., PTFE or rubber) compatible with the process fluid.

Mounting of transmitter shall be remote from metering body, and thus a special sensor cable shall be provided by the Vendor.

Electrodes shall be made of stainless steel (SS 316L) or Hastelloy according to Vendor advise .

5.5. Valves

All Electrical parts of valves shall be minimum IP65.

On/Off Valves

The type of On/Off valves shall be selected considering the process condition, full bore Ball Valve or Butterfly Valve depending on line size and piping specification..

All valves shall be suitable for isolation service in RO brine water applications.

The valve body and all wetted parts shall be suitable for brine service.

Each valve shall be equipped with a pneumatic actuator suitable for remote operation, operating on instrument air supply.

The actuator shall be sized with a minimum 25% torque margin above the maximum required torque at maximum differential pressure.

The actuator shall be provided with spring return to achieve a defined fail-safe position (fail-open or fail-closed as required by process conditions).

By loss of signal/supply the valve shall take the specified safe position.

Limit switches and hand wheels will be provided for on/off valves to show the open/close status and to make the manual operation possible.

The valve shall include the following accessories:

- Solenoid Valve (24 VDC)
- Limit Switch Box for valve position indication (Open/Close)
-

5.6. Instrument Installation

All installation shall be according to international standards.

Instruments shall be installed such that walkways and access to other equipment is not obstructed.

Transmitters shall be installed on robust pipe stands, which in turn shall be welded to structural steelwork, or shall form part of a built-in item embedded in concrete.

All instruments shall be accessible from front or rear or both sides.

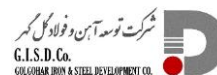
Tubing and capillaries shall be adequately supported and protected from mechanical damage.

Impulse lines shall be suitable for any movement between instrument and transmitter.

Local protection boxes (with glass door for e.g. transmitter boxes) with IP 54 for outdoor installation.



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5.7. Electrical Power supply

The control and instrumentation system for the Transfer Line shall be supplied from an industrial AC UPS system. Two feeder at 230VAC standard , 50Hz, +/-5% shall be provided from the AC UPS for the Local Control Station(UCP) and Instrumentation.

A separate feeder at 230 VAC standard, 50Hz, +/-5% for shall be provided within PLC cabinet supply (including Panel lighting, socket outlets, and Panel heaters and ventilation fans).The UPS shall supply the equipments including PLC system (CPU and I/O modules),Field instrument, trnsmitter ,valve and solenoid ,communication and network equipment.

Individual protection (fuses or MCBs) for field circuits and proper sepration of AC and DC shall be considered.

6. Control Cable

Control cables shall be supplied by shielded or unshielded cables accordance with international standards and the type of cables shall be suitable for the specified environmental condition.

Cross section 1.5mm² for cables shall be considered.

Separate instrument and control cabling path from electrical cabling path and seprate cable tray without dividers shall be considered.

Analog cables shall have individual shields in addition to the overall shield, and with proper grounding. Overall shield for more than 1 pair cable shall be considered.

The conductor insulation shall be suitable for 70 C.

An individual tinned copper with drained wire shield shall be provided in each pair.

Each pair is black & white and conductors shall be tinned copper and number Coded (for more than 1 pair) and twisted pair.

7. Termination

Each conductor shall be terminated using pre-insulated crimped lugs or ferrules of the correct size. Only one conductor per terminal shall be allowed. In-line joints or tee connections in wiring are not permitted. All field signals shall be terminated through marshalling terminals within the Local Control Station(UCS).

Analog signals shall be wired using shielded cables, with shields grounded at one end only (typically at panel side).

Terminal fuse with LED indicators shall be considered for all analog and digital, input and output signals (AI, AO, DI, DO).

Interposing relays shall be considered for "all" DO signals.

Separation shall be considered for analog and digital terminal strips ,Separation of motor and instrumentation type signal terminal strips , Separation of all AC and DC level cables, wires and terminal strips.

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8. Earthing System

Each panel section shall be provided with two 5 mm * 25 mm twinned copper earthing bars. One shall be used as a signal wire screen earth (isolated from panel frame) and the other shall be used as an equipment earth.

Each panel-mounted module shall be electrically connected to the earthing bars.

The ends of the earthing bars shall be connected so that when all modules on the panel are in place, each earthing bar shall form part of one continuous system.

Each control panel shall be provided with separate earthing bars for:

- Protective Earth (PE) – for equipment grounding
- Instrument Earth (IE) – for signal shielding and clean earth (less than 1Ω resistance)

The Earth bar will be connected to the central earthing point with earthing wire.

Continuous ground bus bar attached to the panel is required.

All metal parts, e.g., doors, swing- out racks, enclosures, etc. shall be earthed to PE.

Earth bars shall be used as follow:

The following earthing system shall be used:

All earth bars shall be clearly labeled.

The earthing is performed as a site run and connected to the main earth in the plant.

9. Protection Degree

Local instruments shall be dust weather proof, explosion proof if necessary, suitable for use under ambient conditions prevalent in a specific plant. Minimum Protection degree for instruments and control devices (Control Panels,...) and JBs, LCS, etc.. shall generally be:

Indoor installation	IP54
Outdoor installation	IP65
Instruments	IP65

10. Factory Acceptance Test (FAT) and Inspection

The factory acceptance test procedure, will be used as a guideline to conduct the factory acceptance test. During the factory acceptance test, the Vendor will demonstrate the completeness and proper of the DCS system. The factory acceptance test will be a 100% visual and functional inspection including all inputs / outputs.

The factory inspection will be executed as follows:

- That all equipment specified (documents, specification, requisition, etc) will be present during the inspection
- The identification of cards, equipment, etc
- The good presentation of equipment (cards, racks, cabinets, wiring, cables, etc.)
- The overall documentation has been submitted, accepted and fits the delivered hardware
- All system functions including service functions of supplied diagnostic equipment
- Accuracy and operation of all I / O cards
- Complete system reloads
- Power failures and restarts
- Failure diagnostic, automatic back-up and recovery for all redundant devices
- Electrical insulation of internal circuits
- 100% logic schemes
- Connections and interfaces with other systems



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11. Site Acceptance Test (SAT)

After successful factory installation of the DCS system, a site acceptance test will be performed.

The SAT shall comprise a hardware function test and an integration test with other systems.

The site acceptance test procedure shall be used as the guideline to conduct the site acceptance test.

The purpose of the SAT is to test the functionality of all installed devices and software to ensure that the requirements and specifications of the installation are met. Detected defects are identified and corrected in this way. If the SAT has been carried out to the customer's satisfaction, the customer accepts the commissioning of the tested hardware and software.

A final inspection of the list of defects is carried out before acceptance of the SAT.

Tests will be included (but not limited) as follow:

- Sat Schedule
- SAT Duration
- Duration of Pre _SAT
- Duration of SAT
- Test Procedure
- Rack/Remote I/O
- Profibus
- Communication

Documentation Check

- HARDWAR AND SOFTWARE
- Inventory Inspection
- I/O Loading

System Inspection

- System Startup & General System Functions
- System Alarm Test

Application Inspection For Human Machine Interface

- Analog Window
- Trend Window
- Graphics Window

Application Inspection For Human Machine Interface

Station Load Function (Offline)

12. Spare Part

Considering at least 20% of the total number of each type of instrument and control system equipment as 2 years SPARE PARTS (if 20% of the total number of each type used is less than one, at least one of them shall be considered as 2 years SPARE PARTS).

13. Training

Training for Instrumentation and control system shall be considered.



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شماره مناقصه: [REDACTED]

Inspection ,Testing &Quality Control Requirements (ITQC)



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Inspection ,Testing &Quality Control Requirements(ITQC)

1. GENERAL

- 1.1 – Scope
- 1.2 – Definition Abbreviation
- 1.3 – Language
- 1.4 – Codes & standard
- 1.5 – Client's rights for access to site

2. REPORTING

3. CATEGORIZE OF MATERIAL AND EQUIPMENT'S

- 1.1 – Level Definition's
- 1.2 – Inspection visit frequency
- 1.3 – Allocation of inspection levels to equipment and materials

4. Announcing Client for Inspection

5. SUBMISSION OF SUPPLY LIST

6. Quality Control and Testing Manual (QCTM)

7. Final Book

8. Inspection Type and Extension

9. Inspection at Sub – Supplier's Work Shop

10. Documentation required for the issuance of quality test certificate (QTC)

11. Test Pieces for Destructive Testing

12. Repairs

13. Packing and Marking 14. APPENDIX

- 14.1. APPENDIX 1: Final book Check lists
- 14.2. APPENDIX 2: QC form checklists
- 14.3. APPENDIX 3: BARSOO Inspection Procedures
- 14.4. Abbreviation

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1.1 Scope

General Inspection Procedure (GIP) covers all procedure of quality control, inspection and testing to be applied for equipment's and steel structure supply for Installation, and Testing of Effluent Transfer Pipelines from the Steelmaking ESP Unit to the Kowsar OR Unit PROJECT.

1.2 Definitions

The Following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires:

- Client or buyer: Co
- Client Inspector: Means Client representative that nominated for inspection and quality control activities (BARSOO).
- Local Supplier:
- Local Suppliers Inspector: representative for inspection of the work.

Sub Supplier &/or manufacture: means the firm or company for local supply employed by local supplier.

- Plant: Means

1.3 Language

All Drawings, design, information's, documentations, erection, operation & maintenance manuals & instructions shall be in English & or Persian. The language used during inspection as well as all correspondences shall be in English &/or Persian.

1.4 Codes & Standard

The inspection, test and supply shall be in accordance with the present specification and with the latest edition of the documents listed below.

Industry Codes and Standards/Norms

IEC:	Electrical Equipment of Machines
ASME:	American Society Mechanical Engineering
ASTM:	American Society for Testing and Materials
AWS:	American Welding Society (for structural components)
ISO:	International Organization for Standardization
API:	American Petroleum Institute RP 582 (mandatory for welding)
BARSOO SPEC:	BARSOO General Welding Specification

All other proposed standards shall be approved by Buyer or his technical consultancy.

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1.5 Client's rights for access to the site

Client and representatives of the client have right to inspect in offices and workshop, warehouses and storage areas and any other places of the manufacturers and/or Sub Suppliers while manufacturing, erection assembling is performed for quality control and tests.

2.Reporting

Supplier shall furnish, with reference to the plant it's implementing of updated inspection and testing schedule during manufacturing based on updated project progress report. Supplier also should provide permanent or temporary possibilities for attending Client inspector as required.

3. CATEGORIES OF MATERIAL AND EQUIPMENT'S AND STEEL STRUCTURE

The inspection of equipment and materials and steel structure shall be classified in 3 levels as defined in below. This organization and all consequences shall be considered in QCTM and Quality control and Testing plan.

3.1- Level Definitions:

The levels of equipment and material and steel structure in regard of importance and quality control are defined in below: In each level QCTM shall be submitted prior to construction and before inspection and test.

LEVEL A or I

Inspection level A: is defined as a full stage inspection carried out progressively from commencement of manufacturing to final acceptance, and should be required on occasions where work program demands regular attendance.

The scope in shall include:

- Review/witnessing of source material's chemical and physical properties – including metallurgical enhancement and traceability to approved certification level.
- Verify the use qualified welders and qualified welding procedures monitor manufacturers' Assembly, fabrication and erection and all prescribed tests.
- Check on materials, material traceability, dimensions and finishes.
- Monitor manufacturer's assembly, fabrication and erection and all prescribed test.
- Scrutinize manufacturer's quality assurance / quality control system.
- Review/audit witness of non – destructive examinations including alloy verification if required.

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- Ensuring that personnel are qualified to perform these examinations.
- Witness all pressure and performance tests followed by inspection of disassembled equipment, if applicable.
- Review witness all major tests required by approved QA/QC vendor documents, including on and off load tests of machinery or type tests of electrical as required.
- Final visual and dimensional inspection of equipment.
- Review of final data book package in accordance with approved index.
- Verify packing and marking identification.
- Issue of QCTM, ITP, I.C and final release certificate(s).
- NDT personnel's and company must be qualified by main purchaser inspector.

Level B or II

Inspection Level B: : is defined as specific stage inspection of equipment and final inspection of equipment and steel structure prior to shipment. Stages of inspection shall be agreed upon during a pre – inspection meeting to be held with the vendors after purchase award and shall include:

- Scrutinize material test certificates.
- Check at random of materials, dimensions and finishes monitor specific tests and stage inspections.
- Witness specific tests and stage inspection.
- Auditing of the vendors quality control program.
- Witnessing final pressure and workshop performance testing on and off load tests as applicable simulation of automatism and followed by inspection of disassembled equipment if required
- Final visual and dimensional inspection and packing and marking
- Review data book package in accordance with approved index.
- Verification of packing and marking.
- Issue of QCTM, ITP, I.C and final release certification.
- NDT personnel's and company must be qualified by main purchaser inspector.

2 Level C or III

Inspection Level C: : is defined as the review and acceptance/endorsement of manufacturer's attestation, including data book requirements. Class C equipment can be included less important supplies, where failure of equipment and steel structure will not be cause a major production less or

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personalize injury and those applies to products which are manufactured according to standard procedure by the manufacturer ,are currently checked during production by manufacturers routine procedure. Such products are defined as shelf materials and catalogue materials. This equipment and steel structure should be provided from approved vendor list. If manufacture or supplier of the parts or equipment is not in the vendor list, before providing them, necessary approval from main purchaser should be taken. Data sheet of catalogue items should be submitted before inspection. Purchase order should be submitted before inspection for approved of main purchaser. Purchase orders should be according to main purchaser approved bill of materials. For equipment and steel structure that are manufacturing by any approved supplier, QCTM shall be submitted

3.2. INSPECTION VISIT FREQUENCY

For local supplier the purchaser shall perform inspection visits in vendor's shops, as well as in their sub vendor's shops, at specific stages of equipment, fabrication, assembly, testing, lining, painting and packing. such specific inspection stages are to be determined for each category of equipment and steel structure in accordance with the finalized and approved test plan which the stages of inspection, type of inspection/control (such as witnessing of dimensional, NDT, pressure test and other tests) and output documents, applicable to all phases of fabrication, assembly and testing, shall be defined for manufacturer/supplier, contractor quality control department and main purchaser representative. In addition to specific inspection visits, for local manufacturing the contractor shall also conduct regular inspection visits in accordance with the frequencies indicated hereafter which are to be understood as minimum frequencies to be applied to each component of each equipment and steel structure item. Such frequencies are intended to cover inspection visit by professional inspector only. The contractor shall not combine inspection and expediting functions, nor have them performed by the same individual.

For Foreign supplier, the main purchaser will decide to employ the inspector as his representative and receive the Notice of Inspection (NOI) from supplier based on ITP. In this regard, the purchaser and main purchaser inspector will visit the work shop and do the tests based on ITP under the supervision of main purchaser.

Pre-Inspection meeting

A Pre inspection meeting (PIM) is a meeting to review and finalize the all inspection requirements, documents and all parties' responsibilities and actions. The PIM shall be held before inspection of equipment or material carry out for mutual confirmation of necessary inspection documents such as drawing, QCTM, inspection procedure, inspection item, necessity of inspection record, applied standard and code, criteria for acceptance, witness inspection item, inspection schedule and etc.

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3.3 Allocations of inspection levels to equipment and materials: Equipment and materials will be allocated to the A.B.C levels of inspection will be specified at the time that QCTM was submitted.

4. Announcing Client for inspection

The announcing / confirmation / waiting of inspection and tests will be ruled as follows:

- Preliminary manufacturing time schedule and inspection/test time chart will be submitted to main purchaser within 15 calendar days before the manufacturing.
- Preliminary announcement for test execution will be sent to main purchaser inspector within 10 calendar days in advance.
- Any deviation in time of test activities shall be informed in reasonable time to the main purchaser to avoid excess cost to him.
- In items that is necessary to submit QCTM, during sending document until approved by main purchaser, the QCTM was submitted is the criteria for construction and inspection. If main purchaser presented a note on the documents, notes and documents provided criteria for manufacturing and inspection.

5. SUBMISSION OF SUPPLY LIST

For local supplier the contractor shall be submitted the supplier list before purchase and fabrication.

6. Quality control plan and testing Manual (QCTM)

For each item/equipment a quality control and testing manual (QCTM) will prepare that includes the inspection references, method of inspection, quality plan, supplier's inspector and main purchaser representative's responsibilities, acceptance criteria and type of record/report issued correspondence to the inspection and control conducted on times. Any exceptional deviation has to be discussed between the main purchaser and the supplier during manufacturing and before the start of inspection. QCTM will include:

- Reference specification (includes project specifications, Drawings, international standards, common practice or acceptable standards).
- Definitions
- Subproject name
- The name of sub-supplier or manufacture of the subproject
- Scope
- List of approved drawings (Main purchaser DWG No.)
- List of units
- Inspection Test Plan (ITP)
- NDT map (Plans)
- Level II time schedule of proceed
- Contractual number
- Inspection class



- Weld map (plan)
- Painting cycle and color coding
- Instruction of tests (Procedures)
- Appendixes (include specifications, guidance for inspection and QC forms if there Is)
- WPS&PQR
- Welder Qualification Certificate
- NDT Personnel Certificate
- Paint supplier
- Vendors

The QCTM shall be prepared by manufacture and submitted to purchaser. After Commenting and approved by purchaser the true document is submitted to main purchaser and approved finally.

7. Final Book

8. Final book is final quality documents for each item and includes a collection of inspection documents and it will be completed gradually during the inspection activities. Final Book at the end of inspection and issue of certificate shall submit to the main purchaser representative for final approval maximum six month after installation at site. One complete copy of each final book will be delivered to the main purchaser. The Final book of each item/equipment shall include the items shown in the Appendix 1 tables

9. Inspection Type and extension

Following requirements provided as general. Detailed requirements will be mentioned in QCTM of each equipment.

Type of inspection will be carried out according to the table below. Specific inspection or any exception will be indicated in individual QCTM of equipment. The extension of test shall be in according to that defined in Level definition in clause 3.1

(MI=Manufacturer inspector, SI=Supplier Inspector, CI=Client

Inspector/Representative)

ITEM	DOCUMENT	A			B			C		
		MI	SI	CI	MI	SI	CI	MI	SI	CI
1	MATERIAL CERTIFICATE (MAJOR ITEM)*	H	H	H	H	H	W	H	H	R
2	WELDER QUALIFICATION*	H	H	W	H	H	R	H	R	R

ITEM	DOCUMENT	A			B			C		
		MI	SI	CI	MI	SI	CI	MI	SI	CI
3	WELDING PROCEDURE QUALIFICATION AND SPECIFICATION (WPS & PQR)*	H	W	A	H	W	A	H	W	A
4	NDT personnel certificate*	H	R	R	R	R	R	R	R	R
5	VISUAL INSPECTION*	H	H	W	H	W	W	H	R	R
6	UT*	H	H	W	H	W	R	H	R	R
7	RT*	H	W	W	H	R	R	H	R	R
8	MT. PT*	H	H	W	H	R	R	H	R	R
9	ASSEMBLY AND FIT UP CONTROL*	H	W	W	H	W	R	H	R	R
10	FINAL VISUAL AND DIMENSIONAL CONTROL *	H	H	H	H	H	H	H	W	W
11	PRESSURE TEST*	H	H	H	H	W	W	H	W	W
12	PERFORMANCE / FUNCTION TEST *	H	H	H	H	H	H	H	W	W
13	ON/OFF LOAD TEST*	H	H	W	H	W	R	H	W	W
14	TYPE TEST*	H	W	W	H	W	W	H	W	R
15	SAND BLAST ,RUST PREVENTION ANPAINTING *	H	H	H	H	W	W	H	R	R
16	PACKING AND MARKING VERIFICATION	H	H	R	H	W	R	H	W	R
17	FINAL RELEASE NOTE	H	H	H	H	H	H	H	H	H
18	FINAL DATE BOOK *	H	H	A	H	H	A	H	H	A

3 COMMENT:

Hold (Inspection) point: The Manufacturer shall to notify the client to performing the designated inspection. Activities Shall not proceed until the continuation of work is permitted by the client representative or waved in writing.

- WITNESS (Inspection) Point: Manufacturer shall to notify client 2 working days prior to designated inspection and one working day prior to performing sand blast and painting. If the client representative was not present, activities may proceed without witnessing or waiving of the inspection by the client and then activities reports will be

approved by client inspector.

- **REVIEW (Documentation):** Documentation will be reviewed by the client representative during his visit to shop.

- **SPOT WITNESS (SW):** Spot Witness point is a designate point during or following an activity at which randomly inspection or examination is required in accordance with the relative procedures. Work may proceed through the designate spot witness point if the inspector is not present for the previously established activity.

- **REVIEW APPROVED (RA):** Documentation will be reviewed by the client representative

- during his visit to shop/site or his office and Approved to proceed.

Performance and functional test = mechanical run, vibration, noise, temperature & act test;

10. Inspection at sub – supplier's work shop

Supplier will instruct the sub-suppliers of machinery and equipment ordered in accordance with relevant contracts to comply with the following procedures where ever applicable.

9.1 Each sub-supplier shall expedite the manufacturing and the delivery of materials/or equipment of the plant. client shall be entitled at all reasonable times during manufacturing, storage and packing, to inspect, examine and test on each supplier's or sub- supplier's premises the qualities and workmanship as well as progress of the works performed under the contract (with supplier coordination).

9.2 The pieces of machinery and equipment to be delivered will be examined by client representative according to QCTM. if a large number of pieces of the same kind will be fabricated, the client representative will take samples for examination in proportion to the quantities to be supplied, according to QCTM.

9.3 Special tests discussed and agree between the parties that cannot be performed with equipment at supplier's/sub-supplier's laboratories, shall be performed by qualified institutes/inspector agreed upon.

9.4 Sub-suppliers, as the case maybe, shall provide free of charge to supplier client adequate office space, secretarial assistance and telecommunication services during the execution of inspection activities as per contract.

9.5. where the contract provides for tests on the premises of a supplier or any sub-supplier

, said sub supplier shall provide such assistance ,labor, materials, electricity, fuel, stores, apparatus and instruments as may be required and as may be reasonably demanded to carry out such test efficiently.

9.6 Safety: During test execution the safety regulations, in force in the country where the inspection takes place, shall be fulfilled by the manufacturer. Safety garments, whenever required, will be made at disposal of the client's inspectors.



9.7 Sub-supplier should be selected from approved vendor list. If they are not in vendor list, before starting the contract, it is essential that approval from client should be taken.

11. Documentation required for the issuance of quality test certificate (QTC)

Together with pertinent technical specification the supplier will make available to the main purchaser the following for main purchaser approval: (if the frame of QCTM)

Reports on all test performed mentioned in QCTM

Casting certificates

Pressure test certificates

Certificates of pertinent testing laboratories

Result of any destructive test, together with pertinent sketches and description

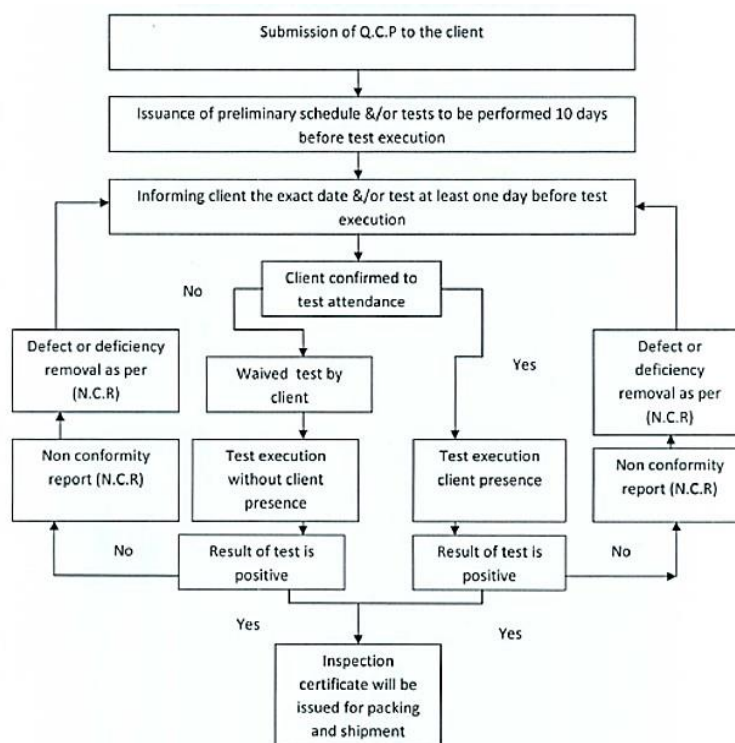
Reports on welder's qualification certificate

Reports of repairing

Certificate of purchased items should be added to QTC

Any other report which assigned in QCTM

Inspection Procedure Flow Chart



12. Test pieces for destructive testing

Test pieces agreed between the parties shall be branded in the presence of Buyer representative for important forgings and casting. (If required by QCTM) VI/here h e a t treatment of the casting of the casting or forging is necessary, the test piece shall not be removed before the treatment is earned out.

13. Repairs

In case of defect or deficiency which affects any critical item, sub supplier shall submit to supplier, before proceeding to make good the defect or deficiency, a report explaining the measures they intend to adopt, and their consequence with applicable standards. All relevant reports should be submitted by supplier to client.



14. Packing and Marking

1. Packing & Marking Procedure

1.1. General

1.2. Equipment Marking and Tagging

1.3. Packing

1.4. Packing size

1.5. Content Protection

1.6. Package Construction

1.7. Marking

1.1. Packing Lists



1. PACKING & MARKING PROCEDURE

1.1. General

The intent of these instructions is to establish the minimum requirements for packaging and marking the Equipment, Materials and Spare Parts to be supplied under the Contract and for handling, transportation and extended storage at Site. It shall be responsibilities of contractor to design and provide adequate protection for the above items to be supplied and /or his Sub-suppliers, subject to the inspection as herein described.

1.1.1.

Identification, protection and packaging shall be suitable for the following conditions, as a minimum:

- Lifting and handling shall be suitable for forklift handling and hoisting with certified slings and/or spreader beams as required to prevent damage and to ensure safe lifting.
- Under-deck sea voyage and probable ling demurrage in the Persian Gulf, (for ocean shipment).
- The possibility of being the lowest package in multiple stacking. Outdoor storage, up to 18 months, in ambient temperatures reaching + 40 °C, and -10 °C varying substantially, subject to rain and dust storm. Adequate identification of the contents of each package both before and after being opened.
- Adequate protection of the goods for the prevention of damage, injury or breakage during handling and transshipment by boat, train, truck or other types of carriers.
- Sufficient packing or guarding for the prevention of damage, injury or breakage during handling transshipment by boat, train, truck or other types of carriers.

1.1.2.

Drawings or sketches and description of the packages, including approximate sizes and weight of the contents, sheeting, as well as the lining or wrapping materials shall be submitted to the Owner or his appointed representative(s) for review and comment prior to the construction of the packages.

1.1.3.

The packing procedure and shipping may be subject to inspection by appointed representative(s) of Owner before the goods are put into case/crate and before a case/crate is closed. However, the inspection made by Owner's representative(s) shall not relief contractor from any of his obligations under the terms of this Contract.

1.2. Equipment Marking and Tagging

1.2.1.

A metal nameplate, of rust-resistant material, bearing the following information (as applicable) shall be attached to each item of Equipment.

- Manufacture's name and address



- Serial number
- Rating or capacity

1.2.2.

When the Equipment is disassembled for shipment or components are fabricated without assembly, each piece shall be adequately identified for the Ease of assembly at Site. Each identity mark shall contain the Contract number, Equipment number and either of the following data:

- Manufacture's identification number or letter designation, appearing on a
- Reference drawing and the reference drawing number. Match marking which are identical for each side of Equipment separation and which are non-repeating for the entire lot of Equipment. All match marks to be used shall appear on one or more drawings, which shall be enclosed with the shipment, as described herein.
- Part identification shall be paint stenciled, conspicuously, on large pieces of Equipment. As an alternative for smaller parts, self-adhesive aluminum embossed labels may be used on selected Materials. Small parts shall have a metal tag, wired (only for the parts to be shipped in boxes) or tack welded in place, with the identification stamped or etched.
- Paper or cardboard tags shall not be used.

1.3. Packing

1.3.1.

All mechanical parts, all items with electrical or electronic components, all instrumentation, all fire able Materials or components or other Materials subject to damage by moisture shall be packed sealed with aluminum foil protection. For sensitive items such as the precision instrumentation and electronic, such cases shall be housed in standard containers for sea and road transport.

1.3.2.

Small parts such as nuts, bolts, washers^ small machine parts and similar items shall be corrosion protected, put into sealed plastic bags marked for identification and packed into a drum or box and shall be included in container. Welding rods shall be vacuum packed in metal cans and shall be included in a container.

1.3.3.

Structural fabrications, except as included above, with projections subject to damage on impact, or with shapes unsuited to stacking and bulk Materials such as pipes smaller than 100mm (but not fittings), shall have suitable corrosion protection and be enclosed in skidded open crates, fastened securely in place.

1.3.4.

Structural steel shapes, plates, knocked down vessel sections and similar components not otherwise limited above, shall be formed into a unit package, by tack welding braces and suitable spacers, and fastened to a pallet or skid base. Only sections of comparable size

and length shall be combined into one package. Provision shall be made to prevent individual pieces from moving in a longitudinal direction.

1.3.5.

For pieces which are not skidded, provisions shall be made for safe lifting by cables, i.e. lifting lugs or equal.

1.3.6.

Fragile Materials, oil products and all inflammable and combustible Materials shall be separately packaged in suitable drums, cases, etc. and clearly identified.

1.4. Packing size

1.4.1.

Normal dimensions for the packages shall be:

- Height: 2.5m
- Width: 2.8m
- Length: 12m

1.4.2.

Minimum size for a package shall be 2 cubic meters except for large and heavy items such as structural beams and large pipes. Single drums, barrels or individual items shall be combined to meet or exceed these dimensions, or enclosed within larger containers.

1.4.3.

Normal weight limitation for the shipment of packaged or crated Materials and Equipment is 20 tons.

1.4.4.

For the packages larger and heavier than those described here above special arrangements shall be made in advance.

1.5. Content Protection

1.5.1. Against Contact and Impact

1.5.1.1. Wherever possible, all Equipment shall be bolted to the case/crate base. Bulk items shall be banded or otherwise utilized and fastened to the case/crate. Shock absorbing media, such as felt layers, shall be placed between Equipment base and the case/crate, for rotating machinery and large electrical equipment.

1.5.1.2. Fragile items shall be wrapped in crepe-cellulose wadding or some equally efficient cushioning material such as cast "Styrofoam" or floated in excelsior.

1.5.1.3. When several items are packed in the same case/crate, they shall be packed in such a manner as to prevent one from damaging another, wood spacers shall be used between the parts weighing more than 20Kg.

1.5.1.4. As tilting or upending of any case/crate is likely to occur, all contents shall be protected and blocked to avoid damage at such times.



1.5.1.5. In all cases items shall be nested or packed to reduce volume as much as possible.

Waste space within any container is a source of weakness and shall be avoided as far as practically possible.

1.5.2. Water and Corrosion Protection

1.5.2.1. Each item in a case shall be enclosed in a separate, sealed plastic wrapping, made vapor-tight by heat seams. Where penetrations are necessary such as for the bolts fastening to the base, gaskets around the bolts shall seal the penetration before the Equipment is set in place.

1.5.2.2. Plastic used shall be of a type and of a thickness which shall limit the penetration by vapor to less than 1 g/m²/day at 40cC.

1.5.2.3. Openings in electric motors, generators and other electrical equipment shall be sealed with waterproof tape or in some equally efficient manner. A Protective greaseproof paper shall be inserted between the brushes and armature of motors and generators.

1.5.2.4. Sharp corners of the contents and protuberances shall be wrapped in felt taped into position, to prevent damage to the plastic.

1.5.2.5. Bagged desiccant shall be fastened to the contents in each sealed wrapping. If silica gel is used, approx.2 kg/irT of enclosed is recommended prior to sealing the plastic.

1.5.2.6. All parts not protected by primer shall be coated with a corrosion inhibitive compound suitable for long term storage and easy removal at Site, especially when applied on parts in crates or on skids.

1.5.2.7. For the items not shipped in closed cases, such as vessels, all openings shall be sealed. Flange openings shall have gaskets and metal plate covers bolted to flanges. Threaded openings shall have a screw cap. Non-flanged opening shall be soundly plugged or plastic-warp sealed and banded. Bagged desiccant, as specified above, shall be fastened inside each sealed item.

1.5.2.8. Pumps, compressors, electrical cabinets and similar items, which may be sealed prior to packing, shall have bagged desiccant fastened inside the enclosed space in addition to the desiccant for the case packing.

1.6. Package Construction

1.6.1. Skidded and Framed Boxes

1.6.1.1. Skidded and framed boxes shall be constructed upon skid members joined by headers and shall be decked with lumber.

Each head shall be double bolted to each skid member. Each baring surface of the Equipment shall rest over a skid member and the bolts securing the Equipment to the skid shall pass through a skid member. Log sowers are not acceptable for this purpose. 25mm x 100mm lumber, as a minimum, shall be used for X-bracing framing on the interior of all box faces except the base. Interior frames shall be provided along the length of the box and spaced not greater than 1 meter apart.

1.6.1.2. The skids shall be suitable for fork lift handling.

1.6.1.3. Box sheathing shall be not less than 20mm in actual thickness for boxes weighing less than 1000kg, and not less than 25mm in actual thickness for boxes less than 10,000kg, and not less than 30mm in actual thickness for boxes of 10,000kg and over. Floor or deck thickness shall not be less than 50mm.

1.6.1.4. Lumber shall be sound and well-seasoned with a moisture content not exceeding 12-18%. Knots shall be sound and not in excess of % the width of the board. Exterior type plywood may be used, not less than V2 of the above thickness, provided that all inside edges are fully supported by the framing.

1.6.1.5. All nails shall be cement coated, wire box nails. For maximum strength, they shall be driven into side grain of lumber used for packaging, with a minimum of 4 nails per board.

1.6.1.6. Steel strapping shall be applied to every box, spaced not greater than 600mm apart, and with not less than two bands per box and the end straps approximately 100mm from the end of the box. Straps shall be a minimum of 8.2mm wide, of unannealed steel applied with a stretching tool and secured with crimped steel seals. Each strap shall be stapled to every intersected board.

1.6.1.7. For relatively larger boxes, ventilation-holes, about 6mm in diameter, shall be drilled at intervals slanted upward around the box just under the top bracing, and drainage holes of the same size in the bottom of the box in the same locations where the plastic wrapping will not block them.

1.6.2.OPEN CRATES

1.6.2.1. Crates shall be constructed of nominal lumber sizes and in the same manner as indicated for boxes, except for sheathing. Additional slats shall be provided as necessary for anchoring material, for strength in handling and stacking, and for minimizing pilferage.

1.6.2.2. A common point of weakness in a crate containing over 3000kg is its top edge, upon which a severe strain is placed by slings each time it is handled. Furthermore, the side wall construction shall be capable of accepting loads of interior blocking when the crate is tipped.

1.6.3.Pallets

Pallets are acceptable provided they are suitable for export/shipping, forklift handling, and long-term outdoor storage (as applicable), and are adequately secured and protected.

1.6.4.teel drums

When steel drums are used for packing, they shall be non-returnable steel export barrels.

1.6.5.Pipes

Each length of pipes of 150mm or larger diameter shall be treated as an individual package and shall be marked accordingly. Pipes smaller than 150mm but larger than 100mm in diameter shall be bundled in units not exceeding 2000kg by strapping cleats of 50mm x



100mm lumber or greater above and below the load. Different sizes of pipes shall not be nested without Approval by Owner or his appointed representative(s).

1.6.6. Bundles

Materials bundled in packages exceeding 2000kg shall be fastened with steel rods; framed end plates may be required in certain cases and this shall be discussed with Owner or his appointed representative(s).

1.7. Marking

1.7.1. Identification shall be stenciled on three sides, in letters 50mm size (if possible) and on top of the box/crate? in black waterproof and sun proof ink paint, as following:

Tel:

Fax:

Via BANDAR ABBAS (or other relevant harbor point) Point Contract No. of embarkation.

L/C No.

Shipment No. of

Package No. of

Suppliers Serial No.

Item No.

Net Weight kg

Gross Weight kg

Dimensions mm(H) x mm (W) x mm(L)

Maximum permissible weight on top of package kg

Area designation (indoor, outdoor, temperature limitation etc)

1.7.2. Package number shall identify the individual package and shall also indicate the total number of packages in the shipment.

1.7.3. Special Markings, such as "Fragile Handle With Care" "This Side UP, and Sling Here", together with their international pictorial symbol, shall be used wherever possible. The center of gravity shall be marked with an "X" and the letters ~C.G".

1.7.4. Cases containing Spare parts shall be marked on three sides with a horizontal "Red" color paint stripe, 50mm wide, but not obliterating any printing. Certain packages may be required by Owner or his appointed representative(s) to be similarly marked to indicated special handling requirements.

1.7.5. Upon receipt of the export data, a special identification code shall be issued by Owner to the Contractor for each package.

1.7.6. Should sufficiently room on packages not be available for identification, this matter shall be discussed with Owner or his appointed representative.

1.7.7. No advertising or mark to indicate the contents (except for spare parts stripe) shall appear on the package.

1.7.8. For skids and loose pieces, the "green" paint for Site identification shall be applied to the ends of each pipe, structural members and similar items.

1.8. Packing lists

1.8.1. A separate packing list shall be prepared for each package shipped. In addition to the identification as marked on the box, the following data shall be listed for each item in the package:

- Description of part or assembly.
- Part number of assembly number.
- Quantity of the part or assembly, or Material.
- Drawing number on which the part or Material is shown.

1.8.2. One copy of the packing list and the Bill of Lading shall be sealed in waterproof envelope and fastened to the lower side of the package face. A thin metal plate shall be fastened to the box completely covering the envelope.

4 15.APPENDIX

APPENDIX B: Final book Check lists

APPENDIX C: QC form checklists

APPENDIX D: BARSOO Inspection Procedures



APPENDIX B Final
book Check lists.rar



APPENDIX C QC
form checklists.rar



APPENDIX D
BARSOO Inspection



QCTM Content.pdf